



D3.3 ARCH city baseline report

Baseline reviews for the cities of Bratislava, Camerino, Valencia and Hamburg

17 December 2021



Deliverable No.	D3.3
Work Package	WP3
Dissemination Level	PU
Author(s)	Chapters i-v by Eleanor Chapman, Serene Hanania (ICLEI) Individual city report authors vary. See individual cover pages for details.
Co-Author(s)	Individual city report co-authors vary. See individual cover pages for details.
Due date	2020-03-31
Actual submission date	2021-12-17 2020-04-30
Status	For submission
Revision	2 (2020-10-02) 3 (2021-12-17)
Reviewed by (if applicable)	Chapters i-v by Saskia Maresch (DIN) Chapters i-v by Eleanor Chapman, Serene Hanania (ICLEI) Individual city report reviewers vary. See individual cover pages for details.
Deliverable No.	D3.3

This document has been prepared in the framework of the European project ARCH – Advancing Resilience of historic areas against Climate-related and other Hazards. This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 820999.

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This project has received funding from the European Union’s Horizon 2020 research and innovation programme under Grant Agreement no. 820999.

Version	Date	Released by	Comments
1	2020-04-30	DL	
2	2020-10-02	DL	Addition of City of Hamburg baseline report .
3	2021-12-17	EC	Additions to all four cities' baseline reports (Chapters 3, 4 and 5: reflecting on extent to which local governance framework is aligned with key internal instruments, i.e. UNESCO Charters, the Sendai Framework and the Paris Agreement)

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Executive Summary

This report establishes the baseline for the municipalities of Bratislava, Camerino, Hamburg and Valencia, with respect to their selected cultural heritage sites. All four are pilot municipalities in the research project ARCH: Advancing resilience of historic areas against climate-related and other hazards. The ARCH project has a multi-dimensional thematic focus on 1) cultural heritage management, 2) disaster risk reduction and 3) adaptation to climate change, and as such all three dimensions are addressed in each city's baseline review. The primary aim of this report is to introduce the scientific partners to the pilot cities, and specifically to their selected cultural heritage sites for further analysis in the context of the ARCH project. A secondary aim is, through the writing process, to equip the city partners (as lead authors) with expanded knowledge of the governance frameworks relevant to all three thematic areas mentioned.

This report was originally submitted in April 2020, then updated in October 2020 to include content from the City of Hamburg, and **updated again in November 2021 upon request from the project reviewers** to include some reflection on the extent to which the existing local governance framework in each city takes into account key international instruments for cultural heritage management, disaster risk reduction and climate adaptation (namely, selected UNESCO charters, the Sendai Framework and the Paris Agreement). These latest changes are included in sections 3, 4, and 5 of each individual baseline report.

The first five chapters (i through to v) provide an introduction to all four baseline reviews, covering the aims of the reviews, the methodology used to conduct them, and the relationship of this report to other ARCH tasks and deliverables. This is followed by each city's baseline review in turn. Each review has the same structure, as follows: chapter 1 provides an overview of the city profile (with a brief physical description, along with demographic and economic data), chapter 2 introduces the historic areas of cultural heritage significance selected for study within the ARCH project, chapters 3, 4 and 5 outline the existing governance frameworks at international, national, regional and local levels concerning cultural heritage management; disaster risk reduction; and climate adaptation. Chapter 6 identifies the hazards and associated impacts relevant to the selected historic areas (along with existing resilience-building measures that are already planned or implemented), as well as classifying these according to established frameworks and standards, and outlining a possible direction for future risk and vulnerability assessment within the ARCH project. Chapter 7 provides results of a preliminary resilience assessment using the original short version of UNDRR's Disaster Resilience Scorecard for Cities. Chapter 8 concludes with a reflection on the information compiled for the review, identifying key local objectives and related priorities for future work in the context of the ARCH project, as well as outlining relevant policies, strategies or projects that may be supported by the ARCH project.

For the **City of Bratislava**, the target historic areas that will be addressed by the ARCH research team are: the medieval town centre (monument preservation reserve), the Devin

Castle located on the dolomite cliff above the Danube River, and Celto-Roman structures on the Bratislava Castle hill. These sites face risks from a number of different hazards. The town centre is greatly threatened by pluvial flooding, as the majority of objects are preserved in situ. Additional threats to these objects come from moisture and humidity, and there is a risk of danger to visitors too, which could mean closing some sites to the public in future. The cliff below Devín Castle suffers from erosion, which could force the castle to close if it continues to worsen. The remaining castle walls are also threatened by cliff movement as well as rapidly changing temperatures. Gaps in knowledge exist concerning the future trajectory of this erosion and how it may evolve for different climate change scenarios, and modelling possible trends to help select the type and extent of adaptation measures to be implemented at Devín Castle is an example of possible support from the ARCH project team.

Bratislava has already conducted two vulnerability assessments; the first to prioritise the most vulnerable sectors and groups, and the second to analyse the impacts of recent heatwaves and pluvial flooding on the population and selected critical infrastructure. The City would like to take this analysis further to include cultural heritage protection, to be able to adapt the historical centre and other valuable cultural heritage sites to the impacts of future climate scenarios. The City's new Action Plan for Climate Change Adaptation is currently in preparation, which provides a good opportunity for the ARCH project to support actions and strategies that will require implementation.

Furthermore, whereas the issue of fluvial flooding and associated disaster risk management is very well elaborated in the City's existing governance frameworks, similar policies to help prevent and deal with other hazards caused or exacerbated by climate change need further elaboration – especially pluvial flooding from intense rainfall, and heatwaves. Bratislava's municipal staff intend to utilise their experience and data, and to mobilise local stakeholders, in order to better understand the cascading effects of climate change impacts on their cultural heritage sites, as well as to plan adaptation pathways and suitable measures – as part of a wider resilience-building approach.

The **Municipality of Camerino's** target historic area is the entire Old Town, which suffered serious damage due to a major earthquake in central Italy in 2016. Many buildings were destroyed or seriously damaged, and all residents and businesses were relocated. The area remains abandoned while the reconstruction process continues. The Old Town is home to many buildings and objects of historical, architectural and artistic cultural heritage significance, many of which were seriously damaged or destroyed and are in need of restoration, as well as facing the threat of further damage from future seismic activity. Of these, Ducal Palace and Santa Maria in Via's Church will be the focus of the ARCH project, in addition to analysis at the urban and district scales. Aside from the clear threat posed by seismic hazards (and related geomorphological hazards such as landslides) the Old Town is also impacted by climatic hazards such as heavy snowfall.

Investigations conducted for this report found that maps and information about earthquakes and geomorphological hazards are available to municipal staff, but these are currently not utilised to define future risk scenarios. The local civil protection office has defined procedures for post-disaster management, however, pre-disaster planning is hindered by a lack of detailed risk scenarios for future emergencies. Furthermore, critical infrastructure providers currently have no specific agreement with the municipality for resilience improvement, but rather support

the municipality on an ad-hoc basis when disasters occur. This means there is potential to improve Camerino's resilience to seismic and climatic hazards through the identification and use of detailed risk scenarios, and planning of institutional strategies to lead future actions for current post-earthquake reconstruction, mitigate the effects of future events and enhance the preparedness for natural hazards;

Specific objectives to support Camerino's improved resilience through the ARCH Project include: 1) improving the predictive models and risk assessment methods; 2) increasing the knowledge base on the geological-structural setting of the "Camerino hill" and the geomorphological processes, thereby determining the hydrogeological hazard scenarios for the historical centre; 3) better understanding the vulnerability of historical buildings with reference to construction materials and techniques; 4) monitoring cultural heritage of significant value in order to provide alerts and real-time information about damage resultant from natural hazards and degradation due to environmental conditions; 5) developing guidelines for managing and securing artefacts and artwork after seismic events.

For the **City of Valencia**, the selected target historic areas are two large cultural landscapes: the Huerta irrigated peri-urban farmland, one of six remaining such landscapes in Europe and the Albufera, a large coastal lagoon, supporting a diverse range of species including birdlife and fish, and bordered by land for rice cultivation. These two geographic areas partly overlap with one another. Both are of high historic, cultural, natural and agricultural heritage significance. The Huerta in particular has been legally recognised as performing an important social function, supporting food sovereignty, human welfare, sustainable development and climate change mitigation and is included on a register of Globally Important Agricultural Heritage Systems (GIAHS), managed by the UN Food and Agriculture Organization (FAO).

Hazards faced by the Huerta include flooding, wave action in specific locations, convective storms, extreme temperature and drought, and insect infestation. The Albufera is also threatened by convective storms, as well as wildfire risk associated with extreme temperatures, water temperature rise, decrease in rainfall, heavy rains, sea level rise, and pollution.

Among the key strategies and policies that are expected to align with the ARCH project's research agenda are those developed by the municipal and regional departments of agriculture and climate change, in key documents such as the city's Sustainable Energy and Climate Action Plan and the regional Climate Change Strategy 2020-2030. However, some gaps have been identified in relation to the basic scientific knowledge which should be available prior to developing any resilience strategy for Huerta and Albufera, such as a more detailed vulnerability analysis, or impact modelling on agriculture, aquatic and forest ecosystems, in order to be able to better assess the several meteorological, climatological, hydrological, biological and human-induced hazards identified. Due to the complexity and size of both geographical areas, further discussion with stakeholders is also needed in order to prioritise specific support needs which might be addressed via the ARCH project.

At the time of writing, three priority objectives can be identified with respect to building resilience of both the Huerta and Albufera cultural landscapes: 1) to acknowledge and explore how the Huerta and Albufera help to mitigate the effects of climate change in the urban environment of València, 2) to understand and demonstrate in detail the impacts of possible

climate change scenarios on the Huerta and Albufera, and 3) to design detailed resilience strategies in order to cope with these identified impacts.

The focus in the **Free and Hanseatic City of Hamburg** is on the UNESCO World Heritage Site known as ‘Speicherstadt and Kontorhaus district with Chilehaus’. Speicherstadt and the Kontorhausviertel are neighbouring districts that together represent an outstanding example of a combined warehouse-office district within a port city. Speicherstadt, which borders the Hamburg city centre, is a former warehouse complex of the port of Hamburg, and part of the newly developed HafenCity district since 2008. Overall, this area is characterised by retail and offices, gastronomy and cultural facilities, and it is one of the most important areas in the entire city, particularly in terms of tourism. The public space is mainly defined by the water of the port of Hamburg and the numerous canals that run through it. Speicherstadt originally developed on a group of narrow islands in the Elbe River between 1885 and 1927 (partly rebuilt from 1949 to 1967) and is one of the largest unified historic port warehouse complexes in the world, at a total footprint of 300,000 m². The adjacent Kontorhausviertel is a dense urban area, consisting mainly of eight large office complexes that were built from the 1920s to the 1950s to house businesses engaged in port-related activities. A Management Plan was developed and adopted in 2013 to guide future protection of the whole area and its unique architectural, historical and social heritage values, as part of the World Heritage nomination process (see Annex 12.5). Future management and development of the Speicherstadt in particular is also supported by the 2012 Speicherstadt Development Concept (see Annex 12.4).

Hazards of particular relevance to this historic area include tidal changes, storm surges and extreme precipitation (and related flooding from all of these), extreme heat, and bacterial attack. Of these, flooding due to storm surges is to some extent addressed in the Management Plan, while others have received less attention. There is in general potential to improve understanding of the impacts on the historic area arising from these hazards (e.g. through data collection and modelling), with a view to better protecting them in future, while also integrating with the administration’s existing extensive data management systems. The investigation conducted for this report has also shown that in Hamburg there are only very limited links between the governance frameworks for cultural heritage protection, disaster risk management and climate adaptation.

The following strategies and actions have been identified as priorities for the Hamburg team in the context of the ARCH project at the time of writing: 1) Integration of climate change and related hazards within the future revised Management Plan and associated periodic reporting to UNESCO in the years to come, with a related objective to identify the different plans the City has in this respect, and to identify specific gaps in the Management Plan, 2) Expansion and improvement of existing tools and procedures to support data management concerning the existing historic built fabric, and ongoing remedial or development measures (for example, by constructing digital 3D models of existing structures using Building Information Modelling [BIM]), 3) Greater awareness-raising in the community of the relevance of climate change to Speicherstadt and the Kontorhausviertel.

Gender Statement

This report has been developed with regard to the guidance provided in the ARCH Project Handbook (D1.2, Part 7) with respect to gender aspects in publications and research. Efforts have been made in the writing and review process to ensure the use of gender inclusive language.

I. Introduction

This report has been prepared for the European Commission-funded research project ARCH: *Advancing Resilience of historic areas against Climate-related and other Hazards*. The ARCH project will develop decision support tools and methodologies with a view to improving the resilience of cultural heritage to hazards, including those resulting from a changing climate. The project team includes local government staff from the pilot cities of Bratislava (Slovakia), Camerino (Italy), Hamburg (Germany), and Valencia (Spain), and will focus in particular on the needs and capacities of these locations, however results will also be extrapolated for use by other local governments elsewhere in Europe.

II. Purpose of this report

The purpose of this report is to:

- provide the ARCH consortium, as well as local stakeholders in each city (both inside and outside the city administration) with relevant existing information regarding the governance of cultural heritage in the pilot cities, with a particular focus on disaster risk reduction and climate adaptation, in order to provide a common understanding for collaboration;
- act as a baseline by which to refine project objectives and specific tasks, and review progress over the course of the project;
- provide a basis for ARCH city partners to develop a local work plan, in conjunction with local partners (D3.2);
- provide a basis for ARCH city partners to review, confirm and/or adjust the priorities identified prior to commencement of the project.

III. Structure of this report

This report is structured as follows. The first five parts (i through to v) provide a common context for all four baseline reviews, covering the purpose of the reviews, the methodology used to conduct them, and the relationship of this report to other ARCH tasks and deliverables. This is followed by each city's baseline review in turn. Each review has the same overall structure, as follows: chapter 1 provides an overview of the city profile (with a brief physical description, along with demographic and economic data); chapter 2 introduces the historic areas of cultural heritage significance selected for study within the ARCH project; chapters 3, 4 and 5 outline the existing governance framework at international, national, regional and local levels concerning cultural heritage management, disaster risk reduction, and climate adaptation. Chapter 6 identifies the hazards and associated impacts relevant to the selected historic areas (along with existing resilience-building measures that are already planned or implemented), as well as classifying these according to established frameworks and standards, and outlining a possible direction for future risk and vulnerability assessment within the ARCH project. Chapter 7 provides results of a preliminary resilience assessment using the original short version of

UNDRR's Disaster Resilience Scorecard for Cities. Chapter 8 concludes with a reflection on the information compiled for the review, identifying priorities for future work in the context of the ARCH project, as well as outlining relevant policies, strategies or projects that may be supported by the ARCH project.

IV. Relationship to other ARCH tasks and outputs

This report (D3.3) is the key output of Task 3.3 "Identify the baseline in each partner city" within Work Package 3 (WP3) "City Cases – Co-creating resilience and sustainable historic areas". WP3 is a cross-cutting package of tasks intended to shape and support the work of all other members of the research consortium. As such, the city baseline reviews are relevant to several other tasks and deliverables, however some in particular should be highlighted:

Deliverable D3.2 Local partnership and work plan

As part of WP3, city partners (supported by their local research partners) have mapped their local stakeholders and identified key stakeholders to engage as 'local partners' for the duration of the project (and ideally beyond). Together with these local partners, each city partner will develop a local work plan, defining an overarching aim, as well as key corresponding local actions and time frames. Key findings from the baselines established in this report will be summarised in the local work plan and contribute to the basis for defining local actions. Each city's local work plan should be read in conjunction with its baseline review.

Task T3.4 Co-create methods and tools for making historic areas more resilient (and all sub-tasks)

This task defines a set of methods and tools that ARCH scientific partners propose to develop in collaboration with city partners, including a *Hazard and Object Information Management System*, an *Impact and Risk Assessment Methodology*, a *Resilience Options Inventory* and *Resilience Pathways*, and a *Resilience Assessment Framework and Platform*. The content of the baseline reviews provides an important departure point for all scientific partners leading and contributing to these tasks.

Task T3.5 Co-create local measures in pilot cities for making historic areas more resilient (and all sub-tasks)

This task outlines a series of priorities and potential local activities, identified prior to commencement of the project, to be addressed in the context of the ARCH project. City partners should use the process of developing the baseline reviews – and the resulting content – to review, confirm and/or adjust these initial plans.

Task T3.7 Analyse experiences and lessons learnt

This task will be conducted towards the end of the ARCH project's duration and will involve reviewing the situation in the partner cities, as well as reflecting on the experience of engaging in the project. Discussion will include the status of the selected historic areas, the governance framework (including any changes), local partners or stakeholders involved, the local actions implemented, their direct and indirect results (including immediate impacts and potential longer

term ones), obstacles encountered and lessons learnt. This reflection will form the basis for recommendations on building the resilience of historic areas. The baseline reviews will serve as a key reference point in evaluating the situation in each partner city in future.

V. Methodology

This report was collaboratively and iteratively developed by several authors in order to establish a baseline review of the current status and resilience of the identified cultural heritage sites in the project cities to act as a basis for the activities and analyses planned within ARCH. ICLEI developed the overall structure, authored the content of this common introduction, as well as substantially reviewing iterative drafts from all contributors and editing the final version.

Chapters 1 through to 5, introducing the cities, their selected historic areas and overarching governance frameworks, were written by staff from the Cities of Bratislava, Camerino, Hamburg and Valencia, along with their local research partners University of Bratislava, University of Camerino, Fraunhofer and Tecnalía. The lead authors representing each city were instructed to seek input from colleagues in other departments as needed, to ensure an accurate and comprehensive review of the governance frameworks for cultural heritage management, disaster risk reduction and climate adaptation – as they relate to the selected cultural heritage sites.

Chapter 6, which provides an initial reflection on hazards affecting the selected sites and associated impacts, was designed and written by ENEA, based on the information provided by city partners in the Risk Profile Table at Part 6.2 (see Chapter 6 for a detailed description of the methodology used to interpret and classify this information). The template for the risk profile table that forms the basis for Chapter 6 was developed by ENEA, Fraunhofer, ICLEI and Tecnalía, with the content filled out by the city partners and their local research partners.

Chapter 7 includes results of preliminary resilience assessments conducted by Fraunhofer, the city partners, as well as the local research partners between December 2019 and February 2020. These resilience assessments employed the original short version of the UNDRR Disaster Resilience Scorecard for Cities.

Once all parts of the report were drafted, the conclusion, Chapter 8, was written by the city partners (again with support from local research partners), summarising the key local priorities and needs identified through the baseline review exercise, and their relevance for the ARCH project, as well as reflecting on the additional content introduced in Chapters 6 and 7.



ARCH D3.3 City baseline report - Bratislava

17 December 2021



Deliverable No.	D3.3
Work Package	WP3
Dissemination Level	PU
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Due date	2020-03-31
Actual submission date	2021-12-17
Status	For submission
Revision	3.0 (2021-12-17)
Reviewed by (if applicable)	Rene Lindner, Anne-Kathrin Schäfer (DIN); Eleanor Chapman, Iryna Novak (ICLEI); Artur Krukowski (RFSAT); Anna Gondova (MUOP)

This document has been prepared in the framework of the European project ARCH – Advancing Resilience of historic areas against Climate-related and other Hazards. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 820999.

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1. City Profile

The city of Bratislava has an overall territory of 367.66 km² and, by the end of 2018, the population of the city was 432 832. The city is administratively divided into 5 districts, which are the basic administrative units of the state administration. However, for self-government purposes, it is further divided into 17 city boroughs, each of which is governed by an elected local government and an elected Mayor. Bratislava City is governed by the City parliament and the elected Mayor – currently Matúš Vallo.



Figure 1.1. Bratislava City – divided by administrative borders into 17 city boroughs (municipalities).

The administrative organisation into districts and boroughs is as follows:

- District: Bratislava I – consists of City Borough Stare Mesto;

- District: Bratislava II – consists of City Boroughs Ruzinov, Vrakuna and Podunajske Biskupice;
- District: Bratislava III – consists of City Boroughs Nove Mesto, Raca and Vajnory;
- District: Bratislava IV – consists of City Boroughs Karlova Ves, Dubravka, Lamac, Devin, Devinska Nova Ves and Zahorska Bystrica;
- District: Bratislava V – consists of City Boroughs Petržalka, Jarovce, Rusovce and Cunovo.

1.1. Population Growth

Table 1.1 shows the development of Bratislava's population in the period between 2008 and 2018. The population has been steadily increasing since 2008 with exceptions in the years 2010 and 2011 when there was a slight decrease in the number of men, and in 2016 and 2017 when there was a slight increase in the numbers. Bratislava's female population has remained mostly steady throughout this period.

Table 1.1. The population dynamics of Bratislava since 2008 by gender [1].

Year	Population	Men	Women
2018	432 832	203 658	229 174
2017	429 432	201 799	227 633
2016	425 883	199 767	226 116
2015	422 453	197 921	224 532
2014	419 788	196 271	223 517
2013	417 597	195 199	222 398
2012	415 405	194 198	221 207
2011	413 054	193 103	219 951
2010	433 077	203 440	229 637
2009	431 067	202 440	228 627
2008	428 530	201 049	227 481

In terms of population growth, a study conducted on Bratislava's demographic potential anticipates a natural decline shortly after 2020 according to all three scenarios considered. On the other hand, the migration prognosis varies: in the most conservative scenario it is on a decline, in the moderate scenario it remains steady, and in the optimistic case it is on the increase then remains steady. The highest natural population decline is expected just after 2030 in all three scenarios, where the number of deceased people is expected to exceed the number of new-born citizens. At this milestone, the annual values of natural population decline are estimated to be around 1 400 inhabitants/year. According to the moderate scenario of the forecast, by 2034, the annual natural population increase in Bratislava will be lower than present by more than 2 300 inhabitants. In the next period (years 2035-2050), it is expected that the natural decline in Bratislava's population will slightly decrease. Annual values of population decline in the middle of the 21st century will range from -600 (optimistic scenario)

to -1 750 persons (conservative scenario). In the case of less favourable demographic trends and lower immigration, Bratislava's population might decrease after 2025. It is expected that in 2050, the population will be from 420 000 to 490 000; most likely just below the limit of 460 000, which amounts to an increase of less than 8% compared to the current situation [2].

1.2. Age

The most accelerated population ageing in Bratislava is expected by 2035. In less than twenty years, the average age of the population will increase by more than four years, resp. 10%. Subsequently, the ageing will slow down, and shortly after 2040, the ageing of Bratislava's population should stop at values that are more than five years higher compared to the present. More intensive population ageing is not expected in Bratislava [2].

1.3. Population density

Bratislava's population density has not changed rapidly since 2008, which is, in fact, a positive indicator for the future development of the city. The lowest density was reached in the year 2011. Table 1.2 below shows Bratislava's population density per km² [1].

Table 1.2. The population density in Bratislava – persons per km² [1].

Year	Population density [per km ²]
2018	1172.97
2017	1163.53
2016	1154.51
2015	1146.01
2014	1138.47
2013	1132.91
2012	1127.2
2011	1120.17
2010	1175.16
2009	1168.72
2008	1163.49

1.4. Average age distribution and life expectancy

The ageing index compares the number of seniors (persons aged 65 and above) to the number of children, i.e. children under 15 years. It is one of the basic indicators for a population's ageing dynamics. In general, demographically young populations are characterized by the predominance of children, and the opposite is found in demographically ageing and old populations. According to the Study of Demographic Potential of Bratislava, despite the decline of the ageing population in the last ten years, the ageing index is the highest in the central

parts of Bratislava. Except for the fifth district, it is already possible to identify the prevalence of the number of seniors over children in all districts. There is a certain slowdown in the growth of the ageing index in some urban districts as a result of increased fertility, and thus a more dynamic increase in the weight of the child component in proportion to that of the seniors. This is usually the case of boroughs which offer new development areas. Also, Bratislava is the centre of economic activity in the country with many universities, which makes it appealing for people to migrate and settle there for work or studies.

From an economic point of view, the ratio of the productive and non-productive share of the population is the most relevant. The economic index is defined as the ratio of the number of children (0-14 years) and seniors (65+ years) per one or per one hundred people of working age (20-64 years). The total economic index was in decline in the 1990s and at the beginning of the new millennium. The cause was a sharp drop in the children component. Since then, the overall economic index has remained steady on average with a slight increase over the past five years in some of Bratislava's districts. In the long term, the lowest ratio between the unproductive and the productive component is foreseen to be in Bratislava's fifth district. In contrast, the highest is foreseen to be in the first district (Old Town) where the senior component is higher with a lower proportion of children [2].

As Table 1.3 below shows, the highest percentage of citizens in Bratislava is represented by the category "productive aged resident". The least number of citizens are aged 85 + years [1].

Table 1.3. The population of Bratislava by age categories (2019) [1].

Age	Population	%
(0-5)	32652	7.54
(6-17)	45647	10.55
(18-24)	20241	4.68
(25-34)	64266	14.85
(35-44)	82414	19.04
(45-64)	109270	25.24
(65-84)	70185	16.21
(85+)	8189	1.89

Life expectancy in the city of Bratislava between the years 2007 and 2018 is as seen in Table 1.4 below. The statistics also show a noticeable difference between men and women, with women in Bratislava having a slightly longer life expectancy than men. [3]

Table 1.4. Life expectancy for different sexes in the five administrative districts of Bratislava [4].

Life expectancy in male citizens	2007-2011	2008-2012	2009-2013	2010-2014	2011-2015	2012-2016	2013-2017	2014-2018
Bratislava I	75.37	75.47	75.51	76.34	76.66	76.85	77.19	77.41
Bratislava II	73.46	73.59	73.79	74.32	74.66	74.87	75.14	75.32
Bratislava III	73.36	73.47	73.74	74.17	74.50	75.10	75.24	75.64
Bratislava IV	75.34	75.39	75.76	75.92	76.28	76.52	76.85	76.96
Bratislava V	73.65	73.92	74.31	74.32	74.69	74.68	74.53	74.50
Life expectancy in female citizens	2007-2011	2008-2012	2009-2013	2010-2014	2011-2015	2012-2016	2013-2017	2014-2018
Bratislava I	81.37	81.95	82.12	82.30	82.41	82.26	82.29	82.34
Bratislava II	80.15	80.55	80.79	81.12	81.17	81.60	81.82	81.70
Bratislava III	80.46	80.98	81.41	81.39	81.60	81.45	81.32	81.22
Bratislava IV	80.45	80.64	80.97	81.44	81.89	82.23	82.46	82.75
Bratislava V	80.07	80.57	80.93	80.85	81.11	80.90	80.60	80.54

1.5. Poverty index

According to the publication of the Slovak Statistical Office on income and living conditions (EU-SILC), the number of people at risk of poverty living in the Slovak Republic has decreased over the last decade. The region of Bratislava remains the least vulnerable region in terms of poverty, where the at-risk-of-poverty rate was at 4.6 %, which is below the national level of the Slovak Republic (12.4 %). According to EUROSTAT, this indicator does not measure wealth or poverty, but low income in comparison to other residents in that country, which does not necessarily imply a low standard of living. Bratislava region also has the lowest percentage of people at-risk-of-poverty or social exclusion (8.6 %) in all Slovak Republic (average in the Slovak Republic is 16.3 %). This indicator corresponds to the sum of persons who are at risk of poverty or are severely materially deprived or living in households with very low work intensity [5] [6].

1.6. Population growth rate and vulnerable groups

Bratislava has seen steady population growth over the decades. Its position as the capital city and the fact that it is home to many corporations indicate that this growth pattern is likely to continue. The city's location, economic potential and favourable business conditions for entrepreneurs make it an ideal location for start-ups as well as international corporations. The number of legal persons has risen by 4% in the period 2014-2018. However, the number of self-employed persons has been on a steady decline (- 25% since 2014). The housing stock has increased astonishingly by 64.4 % (completed apartments 2014-2018), with new development projects densifying the city, but also spreading over what used to be agricultural areas, unused land or brownfields (e.g. in the city boroughs Petržalka, Devínska Nová Ves, Dúbravka, Ružinov, Nové Mesto, etc.) [3].

With the support of the Horizon2020 project RESIN, Bratislava was able to elaborate the results of the risk-based vulnerability assessment in a comprehensive Atlas of climate change impacts on Bratislava City with a particular emphasis on the impacts and risks to its population and critical infrastructure (road infrastructure and built areas). The assessment was done using the IVAVIA tool and had two stages – a qualitative and quantitative part, with the participation of local stakeholders in the assessment process. The assessment is used as a strategic planning tool, as well as a supporting document for different administrative tasks performed at the City Hall. For this assessment, several vulnerable population groups were identified by local stakeholders in the qualitative assessment workshops: In the case of heatwaves, it is mainly the elderly population over 65 years and the population under 14 years of age, people with cardiac and respiratory diseases, and hospitalised and homeless population groups. Age, health situation and overall capacity and means for responding to the negative impacts of heatwaves are all precursors for defining the vulnerable population groups in Bratislava. Since both case study areas represent famous monuments of national and even European importance, tourists need to be also included amongst the vulnerable populations in future assessments [7]. The level at which the assessment was undertaken was the city boroughs; however, the majority of the indicators were created first on a finer scale – developed based on existing data and information (object level which is finer than the borough level resolution) and then generalised to borough level.

1.7. Economic features

Gross value added (GVA) in current prices for the Slovak Republic was slightly over 76.43 billion EUR in 2017 of which 21.372 billion EUR was generated by the Bratislava region (NUTS 2) as seen in Table 1.5 below. Gross value added at basic prices (in USD billion) is shown in Table 1.6. Both Tables show a steadily increasing trend in Slovak Republic's economic productivity [1].

Table 1.5. Gross value added in current prices (in mil. EUR) [1].

	Slovak Republic	Region of Bratislava (NUTS 2)
2017	76 430.454	21 372.567
2016	73 436.195	20 716.842
2015	71 446.186	20 116.751
2014	68 907.405	19 120.993
2013	67 521.912	18 940.368
2012	66 410.254	18 150.194
2011	63 981.788	17 753.312
2010	61 368.250	17 245.925
2009	58 032.905	16 274.844
2008	62 121.709	16 322.383

Table 1.6. Gross value added at basic prices in USD billion [1]

2018	80.494
2017	75.786
2016	72.948
2015	71.776
2014	68.843
2013	67.264
2012	66.775
2011	64.088
2010	61.659
2009	57.993
2008	61.813

Gross domestic product in the Slovak Republic in 2018 was 3.9%. This constitutes an increase in comparison with the previous two years but is not the best result when considering a ten-year window. The highest rate of real GDP per capita occurred in 2010 as the peak reached 5.5%. On the contrary, the worst result was noticed in 2009 when the rate was negative (See Table 1.7 and Figure 1.2) [1].

Table 1.7. The annual growth rate of real GDP per capita [1].

2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
3.9 %	2.9 %	2.0 %	4.7 %	2.6 %	0.5 %	1.7%	3.5 %	5.5 %	-5.7 %	5.4%

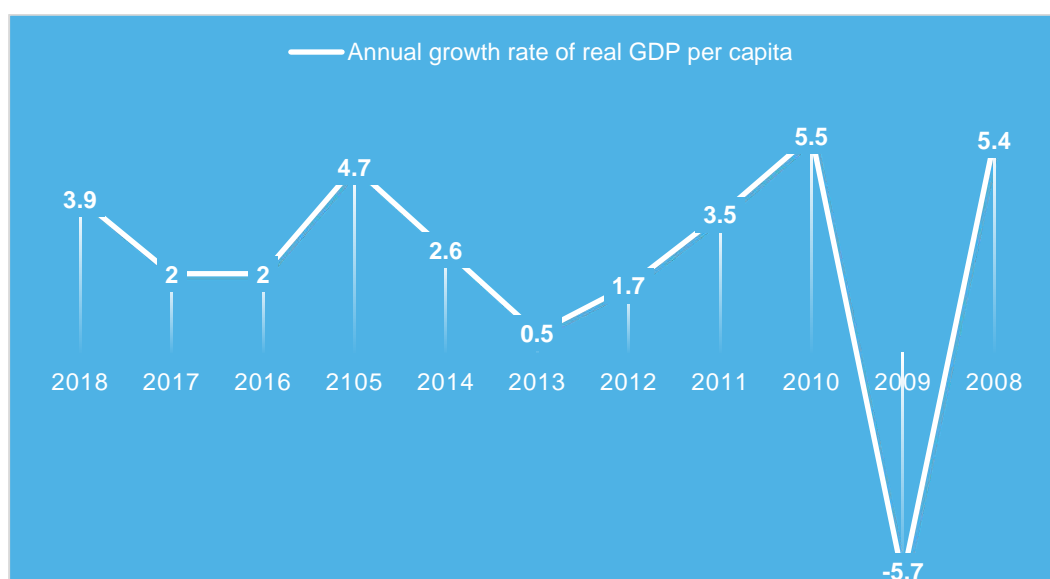


Figure 1.2. The annual growth rate of real GDP per capita in yearly % [1].

Table 1.8 below presents the gross domestic product by production divided into eleven economic sectors. The highest GDP in 2018 was reached in manufacturing, wholesale, automotive services and gastronomy as well as in public services, education, health and social work. The lowest GDP was reached in arts, entertainment and recreation [1].

Table 1.8. GDP by production at current prices in mil. EUR [1].

Sectors	2018**
Agriculture, forestry and fishing	2 119.88
Manufacturing total	20 661.03
of which Industrial production	17 653.49
Construction	6 374.75
Wholesale and retail trade; repair of motor vehicles and motorcycles; transportation and storage; Accommodation and food service activities	15 684.99
Information and communication	3 786.20
Financial and insurance activities	2 508.01
Real estate activities	7 902.13
Professional, scientific and technical activities	8 166.85
Public administration and defence; compulsory social security; education; human health and social work activities	11 626.46
Arts, entertainment and recreation	1 664.61
Gross value added by economic activity total	80 494.91
Taxes on products except for subsidies on products	9 226.05
Gross domestic product	89 720.96

Table 1.9 below demonstrates the strongest areas of the service sector. The dominant area on the Slovak market is mainly real estate activities together with the commercial real estate market where retail and offices dominate. The second one is public administration and social security, followed by wholesale and retail trade which are related to the fact that, e.g. real estate activities play an important role in the Slovak market [1].

Table 1.9. Gross value added by industry at current prices in mil. EUR [1].

Type of industry, service	mil. EUR
Real estate activities	7902.13
Public administration and defence; compulsory social security	5581.18
Wholesale trade except for motor vehicles	4299.79
Retail trade except for motor vehicles	4119.74
Land transport and transport via pipelines	3066.49
Human health activities	2559.24
Electricity, gas, steam and air conditioning supply	1973.12
Financial service activities, except insurance and pension funding	1870.62
Warehousing and support activities for transportation	1682.85
Computer programming, consultancy	1664.34
Legal and accounting activities	1332.21
Activities of head offices; management consultancy	1329.80
Office administrative, office support	1243.47
Architectural and engineering activities	1195.77
Telecommunications	1140.11
Wholesale, retail trade and repair of motor vehicles	918.48
Civil engineering	895.72
Food and beverage service activities	877.87
Advertising and market research	716.43

1.8. Employment

The highest number of employed people is in the District of Bratislava I – Old Town with almost 6000 more than the District of Bratislava II – Ružinov, Vrakuňa, Podunajské Biskupice for example. The lowest number of registered employed people is in the District of Bratislava V – Petržalka, Jarovce, Rusovce, Čunovo. In the Slovak Republic, the sectors with the most employed people are manufacturing, wholesale and retail trade, repair of motor vehicles, and motorcycles. Manufacturing is essential mainly for the Districts II-IV. The wholesale and the

automotive services are important for all of Bratislava's Districts. See Table 1.10 below for employed people per economic activity [1].

Table 1.10. Employed people by economic activity collected through workplace method [1].

	Slovak Republic	District of Bratislava I	District of Bratislava II	District of Bratislava III	District of Bratislava IV	District of Bratislava V
Total	1 589 270	104 468	98 790	54 930	44 988	29 576
Agriculture, forestry and fishing	37 334	N/A	206	N/A	-	100
Manufacturing total	437 396	4 296	11 191	5 555	17 915	1 531
Mining and quarrying	6 221	N/A	-	-	N/A	N/A
Manufacturing	389 323	3 102	7 741	5 255	16 901	1 137
Electricity, gas, steam and air conditioning supply	16 462	981	1 269	N/A	N/A	N/A
Water supply; sewerage, waste management and remediation activities	25 390	N/A	2 181	N/A	158	258
Construction	71 288	1 158	6 866	2 544	571	1 654
Wholesale and retail trade; repair of motor vehicles and motorcycles	219 481	15 580	18 607	10 258	5 857	7 508
Transportation and storage	111 663	4 995	5 902	8 486	3 608	2 037
Accommodation and food service activities	31 257	3 434	1 300	1 001	617	657
Information and communication	44 082	3 391	11 480	3 083	2 805	3 929
Financial and insurance activities	30 348	11 676	5 607	2 463	695	1 033
Real estate activities	21 032	D	2 015	D	367	286
Professional, scientific and technical activities	76 931	19 760	8 875	4 278	3 274	2 659
Administrative and support service activities	68 001	6 797	5 825	1 704	1 122	2 620
Public administration and defence; compulsory social security	143 013	14 637	6 197	5 394	1 725	1 593

	Slovak Republic	District of Bratislava I	District of Bratislava II	District of Bratislava III	District of Bratislava IV	District of Bratislava V
Education	142 099	6 965	4 163	3 508	4 989	1 668
Human health and social work activities	113 099	4 240	8 093	3 699	996	1 347
Arts, entertainment and recreation	24 609	3 414	1 391	792	186	470
Other service activities	17 637	2 376	1 073	1 029	260	485

1.9. Unemployment

Over three years (2016-2018), a noticeable decrease in unemployment rates can be marked, registering the lowest rate over the last ten years. The highest unemployment rate was noticed in 2012 and can be connected to the European debt crisis. The highest unemployment rate in the District of Bratislava I-II was in 2014, District of Bratislava III-V in 2013 (see Table 1.11 below) [1].

Table 1.11. The registered unemployment rate in the Slovak Republic and in the districts of Bratislava City in % [1].

Year	Slovak Republic	District of Bratislava I	District of Bratislava II	District of Bratislava III	District of Bratislava IV	District of Bratislava V
2018	5.04	2.66	2.83	2.94	2.62	2.07
2017	5.94	2.91	3.39	3.40	3.12	2.51
2016	8.76	4.11	4.70	4.83	4.69	3.89
2015	10.63	4.81	5.63	5.69	5.14	4.67
2014	12.29	4.99	6.67	5.87	5.49	5.30
2013	13.50	4.93	6.08	5.90	5.71	5.70
2012	14.44	4.15	5.48	5.58	4.66	4.93
2011	13.59	3.53	5.60	4.65	4.36	4.98
2010	12.46	3.18	4.6	3.80	3.58	3.98
2009	12.66	2.71	4.00	3.39	3.39	3.84
2008	8.39	1.46	1.87	1.75	1.75	2.06

As can be seen in Table 1.11, the highest number of unemployed young people in 2017 was in District of Bratislava II. The highest unemployment rate in the age group from 15 to 24 was in 2012, coinciding with the highest unemployment registered for the overall population. One potential reason for this is the immigration of people in search of work due to the European debt crisis [1].

Table 1.12. The unemployment rate in the Slovak Republic in % [1].

	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
15-64	8.2	9.7	11.5	13.2	14.3	14.0	13.7	14.4	12.1	9.5
15-24	18.9	22.2	26.5	29.7	33.7	34.0	33.4	33.6	27.3	19.0
25-54	7.6	8.7	10.5	12.0	12.8	12.4	12.1	12.8	10.8	8.7

Table 1.13. Unemployed citizens by age in Districts of Bratislava I-V [1].

Age group	Total	District of Bratislava I	District of Bratislava II	District of Bratislava III	District of Bratislava IV	District of Bratislava V
Total	7 919	673	2 196	1 251	1 761	2 038
15 – 19	68	2	28	11	11	16
20 – 24	555	50	162	88	140	115
25 – 29	1 031	77	302	173	247	232
30 – 34	1 109	88	257	174	228	362
35 – 39	1 208	93	322	176	247	370
40 – 44	1 015	112	298	159	229	217
45 – 49	751	54	236	139	205	117

1.10. Old Town and Devin city boroughs

1.10.1. Overview

The Old Town City Borough (where the monument preservation reserve and preservation zone is located) is a historical centre of Bratislava City. It is the most visited part of Bratislava by tourists. In addition to historical monuments, there are many museums, galleries, embassies, consulates and governmental and state offices and institutions, newly built high-rise office buildings, restaurants and bars. The historic core of Old Town, which is partly surrounded by medieval fortification walls, is a pedestrian zone.



Figure 1.3. Aerial view of Bratislava in autumn time, on the photo we can observe most of the historical city centre, the Bratislava Castle on the southern tip of Male Karpaty mountain range and St. Martin's Cathedral. Partly also the Hviezdoslavovo square and the Main square. Photo: P. Chromek, Foundation for Cultural Heritage Preservation.

The Devin city borough is a city borough of a rather rural character. The first settlements date back to 1800 AD. The city borough is located in the western part of the City territory (see Figure 1.1), between the Danube River and the Devínska Kobyla natural reserve, just several kilometres away from the Old Town City borough. It is known for Devin Castle; a national natural and cultural heritage site and for winemaking. Despite its rather small population, Devín is the fastest growing city borough with 32% newly build-up area since 2014 [3].



Figure 1.4 (left). Devin Castle from the air. Photo: P. Chromek, Foundation for Cultural Heritage Preservation. Figure 1.5 (right). Devin – the upper castle on the cliff, where the hazard of rockfall is monitored. Photo: M. Musilová, MUOP.

The Old Town City Borough has an uneven distribution of the different age categories, with the elderly population prevailing. During an ordinary working day, the Old Town receives a large number of people commuting there for work and education from other city boroughs as well as from satellite settlements located outside the city borders. In Devin, however, the age categories are more evenly distributed, and its citizens commute to work to other boroughs. Vulnerable population groups in both city boroughs are mainly the elderly (especially in the Old Town City borough), children and visitors (tourists). Another vulnerable group is the hospitalised people in many healthcare and hospital facilities in the Old Town.

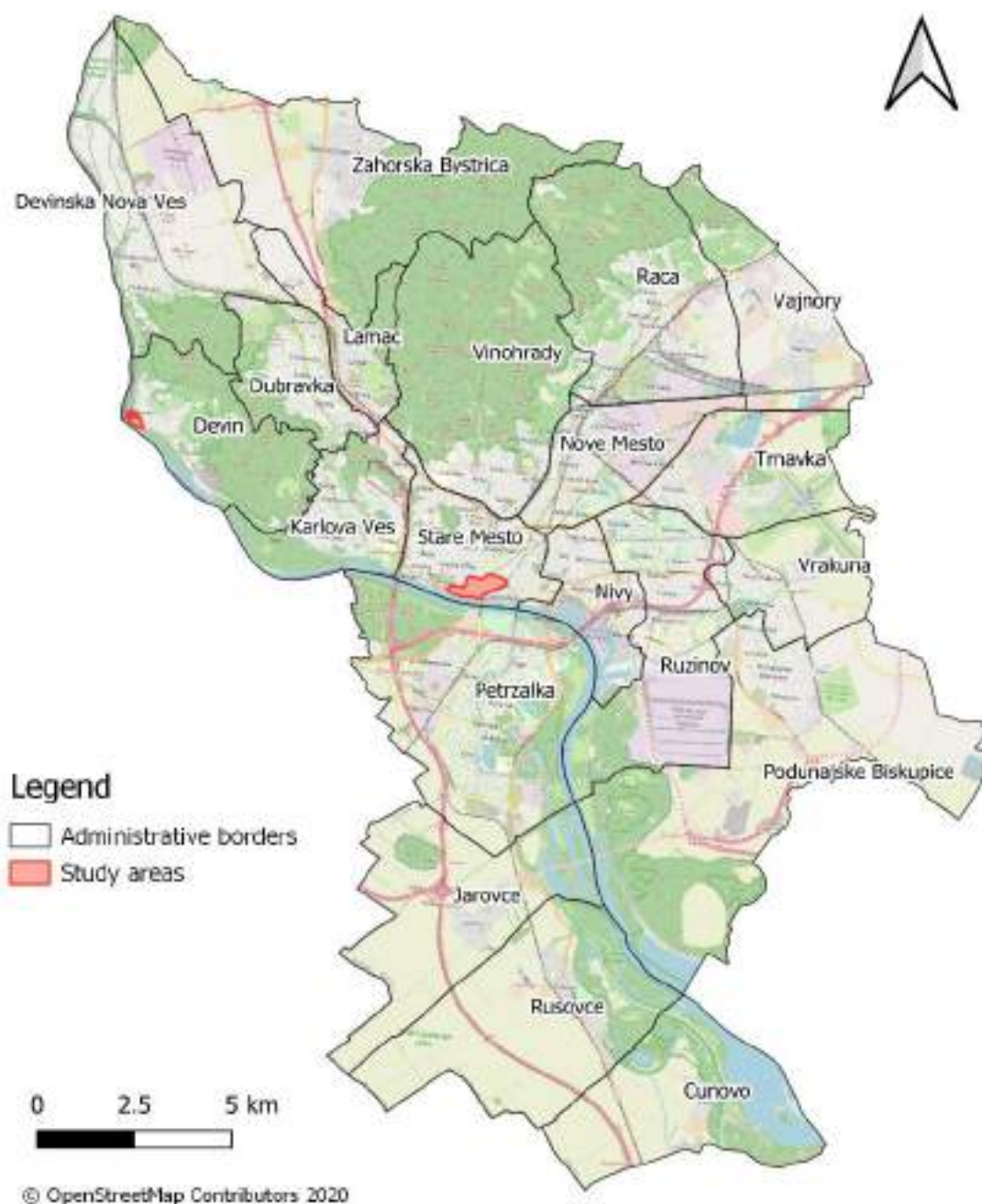


Figure 1.6. The focus sites in Devín City borough and Stare Mesto (meaning Old town in English).

1.10.2. Overview of the existing local frameworks for cultural heritage management, disaster risk reduction and climate adaptation

Both city boroughs – the Old Town and Devín, are of exceptionally high cultural importance, and monuments of national significance and many archaeological findings can be found here in large numbers. All heritage assets and their respective conditions are listed in the **Central List of Monuments Stock of the Slovak Republic**, maintained by the Monuments Board

(MB) of the Slovak Republic, which contains registers of immovable and movable cultural monuments, monument preservation zones and reserves. It is the primary groundwork for the performance of the state heritage administration. It applies to those assets that are considered national conservation monuments (NCM) and are subject to the highest legislative protection as governed by the **Act of the National Council of the SR No 49/2002 on the Protection of Monuments Stock** (as amended by the Act of the NC SR No 479/2005 Coll). The condition of heritage assets is also partially monitored by the **Principles of Protection of Conservation Sites (Zones, Reservations)** developed by the Monument Board of the Slovak Republic. The latter was established in 2002 and ensures the protection of the monuments stock of the Slovak Republic, following scientific findings and international conventions on the protection of cultural heritage. The Monument Board of the Slovak Republic has assumed decision-making power in legal terms, provided by the Monuments Act and the Statute.

The Municipal Monument Preservation Institute in Bratislava (MUOP) – a municipal research and preservation organisation, also runs a catalogue of city sights, which have lesser legislative protection.

Besides, information that has already been mapped out regarding disaster risk reduction, climate adaptation and cultural heritage management in the City of Bratislava is provided below. It will be expanded in Chapters 3, 4 and 5:

- Emergency response procedures and responsibilities in the city;
- Existing adaptation measures, strategies and key legislation in the city;
- Existing cultural heritage protection measures, strategies and key legislation in the city;
- Existing databases on climate risk information for the city;
- Decision-making structures in the city regarding adaptation;
- Decision-making structures in the city regarding cultural heritage protection;
- Inventory of heritage assets and their condition.

2. Target historic areas identified for ARCH

The target historical objects are in the historical city centre as well as at the City's outside border (see Figure 2.1 below).

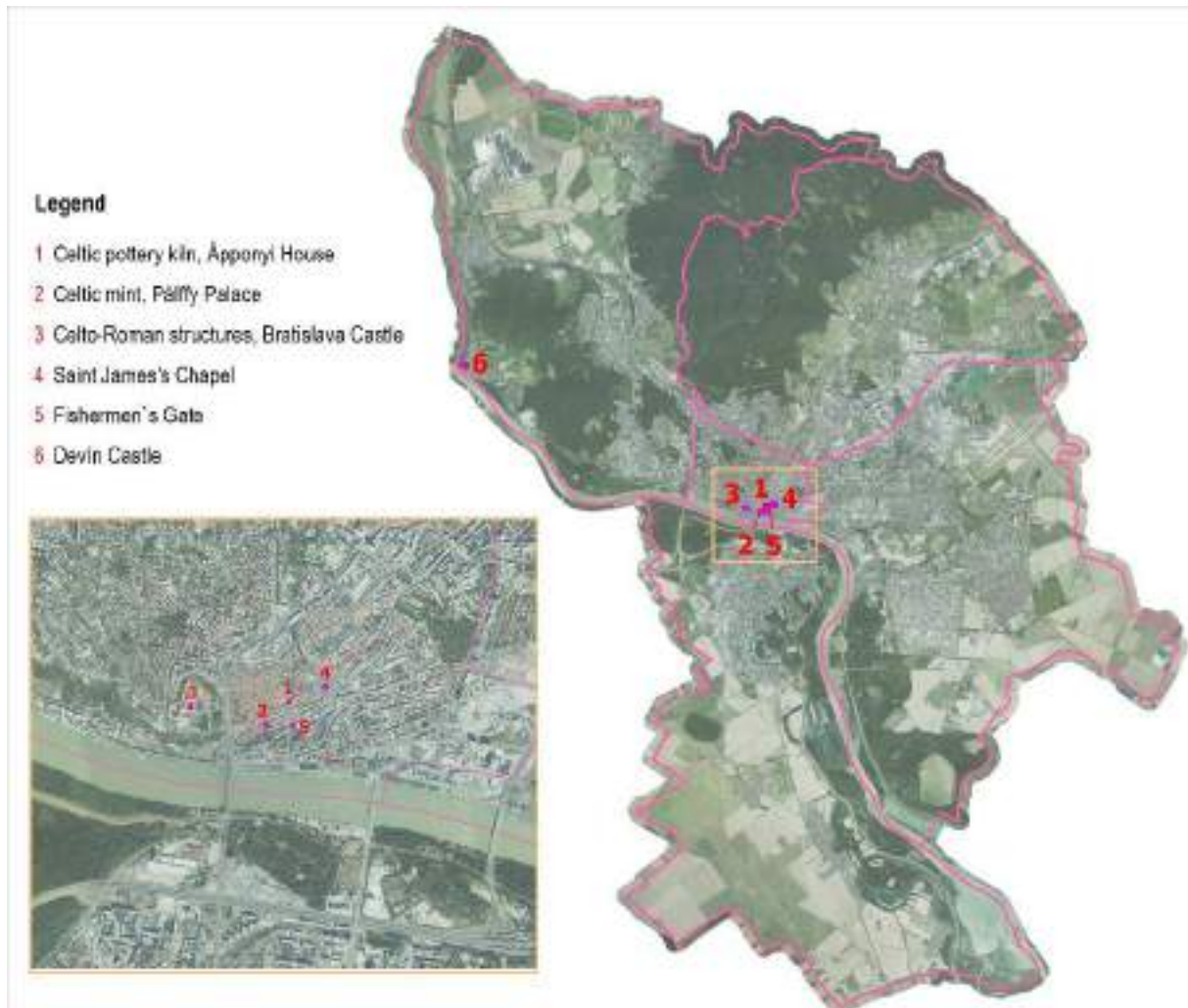


Figure 2.1. Location of historical monuments selected for ARCH project. Source: UNIBA.

2.1. Historical monument preservation reserve (Old Town City Borough)

Bratislava's historical centre is situated within the ancient city walls in the Old Town city borough. Based on the terrain and the character of development, the Old Town can be divided into four areas: the western part, the northern part, the eastern part and the historical centre with the Bratislava riverfront (on the left bank of the Danube River). From monument preservation and historical perspectives, the area can be divided into a central historical monument zone and monument reservation (the medieval core of Bratislava). The monument preservation zone is further divided into smaller areas called sectors, based on the character of built-up area, architecture, terrain and landscape.



Figure 2.2. The Bratislava Castle with the St. Martin's Cathedral in the background. Source: www.visitbratislava.com.

The western part of the Old Town is different from the other parts; it is situated on the Small Carpathian Mountain foothills, and mainly provides residential housing (villa houses). The western border of the Old town is the Mlynska valley – which was once a valley of watermills and its history translates into its current name (*mlyn* means *mill*). The Bratislava Castle is situated on the southernmost tip of the Small Carpathian Mountains and above the western side of the medieval fortification walls (with the northern and western sections of the walls still standing). The historical centre reaches to the left of the Danube (Dunaj) river bank. The northern and eastern borders of the historical centre are outlined by the Square of Slovak national uprising and Štúrová Street. The eastern and northern parts of Old town city borough are mostly residential with amenities and services as well as modern high-rise buildings (Mlynské Nivy, Eurovea, Landererova, Pribinova street), an international bus station and the river port (cargo and passenger). The northern border of the Old Town is outlined by the railway which connects Bratislava with the Czech Republic and Austria.

The surface area of the Old Town Borough is approximately 10 km² and has a population of 41 095 (population density is thus more than 4 000 inhabitants per km², 2018). During the day, around 70 000 commuters travel to the Old Town Borough. This makes it Bratislava's most crowded borough.

Bratislava's Old Town is known for St. Martins Cathedral and its many churches, the Bratislava riverfront and cultural landmarks (monuments). It is also the residence of most of the foreign states embassies and important Slovak institutions, including the National Council of the

Slovak Republic and Parliament building; the Summer Archbishop's Palace, the seat of the Government of Slovak Republic; and Grassalkovich Palace - the seat of the President of Slovak Republic and other important governmental institutions (such as the Ministry of Interior, the Ministry of Culture, Ministry of Foreign Affairs and the Ministry of Justice).



Figure 2.3. The Michael's gate – the last standing of four gates of the city fortifications walls. The historical core of the city is a designated pedestrian zone called "Korzo". Photo: www.visitbratislava.com.

Other notable buildings, squares and streets include Trinity Church, Bratislava's Town Hall, Michael's Gate, the Primate's Palace, Comenius University, the Slovak National Theatre, National Uprising Square (Námestie SNP), the Main Square (Hlavné námestie), Hviezdoslav Square (Hviezdoslavovo námestie), Kamenné námestie ('Stone Square'), Obchodná Ulica ('Shop Street'), the building of the Pharmacy Salvator, Zochova Street from the 19th century and many other old churches and palaces. There are still some remnants of the medieval fortification walls (the northern and western section), currently closed to the public due to reconstruction.



Figure 2.4. Bratislava plan of 1765, which was prepared by Michael Marquart, and therefore, we call it Marquart's plan. This plan is very valuable also as it shows the overall town fortification; shortly after its preparation, after 1775, significant changes occurred – by Maria Theresa's order the fortifications and gates (except the Michael's Gate) were torn down, many bastions were demolished, and embankments were refilled, on which new buildings were developed. Source: Archive of Bratislava City, inventory no. 1021.

There are several sites of Celtic specialised industry facilities in the territory of the historical monument preservation reserve in the Old Town dating back to the first century BC and the acropolis of a Celtic oppidum at the Bratislava castle hill. These include pottery kilns (Hlavné square, Uršulínska Street, Radničná Street 1), ironwork workshops (Ventúrska Street. 12/Zelená Street 10, Michalská Street 9), minting workshop (Panská Street 19) and an iron melting furnace on Rudnayovo square 4. These monuments, as well as other (unknown) underground monuments, are vulnerable to changes relating to surface permeability, intense precipitation and rising groundwater levels, which are driven by climate change and urban development in the surrounding areas.



Figure 2.5. A map showing the location of study sites in the historical monument reserve in Bratislava.

2.1.1. Celtic pottery kiln, Ápponyi House

In the western part of the Ápponyi House courtyard, a Celtic pottery kiln was found in 2007. The Ápponyi house belongs to the City Museum of Bratislava at Radničná Street 1. The twin chambered kiln of vertical type is on in situ display and is the best-preserved kiln. Its circular rack with evenly positioned air-holes had a diameter of 156 cm. One section of the rack had collapsed into the fire-pit, the other section remained intact.



Figure 2.6. The kiln in Ápponyi House (original) and its reconstruction. Authors: J. Minaroviech, J. Šimún, STUDIO 727. Source: MUOP.

Prints of the original twig structure which was burned in the course of firing are clearly visible on the reverse side of the rack. Hot air was drawn into the kiln from the pre-kiln pit via two heat ducts. The circular clay dome with a top opening which covered the upper chamber did not survive. Ceramic pottery shards were found in the fire chamber. Experiments have shown that depending on the dimensions of the kiln and its load, firing of a batch of pottery could take from 48 up to 72 hours. The kiln and the place around it were protected against the weather by simple roofing.



Figure 2.7. A 3D reconstruction of the original structure of the twin chambered kiln. Authors: J. Minaroviech, J. Šimún, Studio 727. Source: MUOP.

2.1.2. Celtic mint, Pálffy palace, City Galery Bratislava, Panská Street. 19, Bratislava

So far, the most extensive collection of technical ceramics comes from the Celtic workshop in Panská Street 19. The permanent exhibition of the Celtic minting is situated in the basement of the Pálffy palace. Besides the artefacts documenting the minting workshop (technical ceramics), there is also a pit with human bone remains on exhibition. The findings from the late 1980s consisted of dosage cups and fragments of clay plates used for dosing of coinage metals (silver, gold, lead and bronze); 75 casting cups and 22 fragments of dosages plates used for the production of coins on the site. The level of local metalworking is also attested to by an iron anvil, pieces of a clay mould, and smelting slag lumps. These findings are credible indications that a workshop of minting local coins was situated in this part of the Celtic *oppidum* of the *La Tene* period (140 – 1 BC). Possibly, there was more than one mint operating in the territory of Bratislava in the late *La Tene* period. The Celtic *oppidum* – a settlement of proto-urban character, was built around today's castle hill area.



Figure 2.8. The Celtic mint exposition inside the Pálffy palace. Photo: M. Musilová, MUOP.

2.1.3. Celto-Roman structures at the Bratislava Castle

Very recent archaeological research of the Bratislava castle, conducted by MUOP (Municipal Monument Preservation Institute in Bratislava) in the years 2008 – 2014, brought forth the discovery of precious Celto-roman architectures, built by Roman builders for the Celtic elite in the second third of the 1st century BC. The castle hill served as an acropolis of the Celtic city, the so-called *oppidum*. The stone architectures reveal the luxury of the Middle Danube region of that time. A structure with late Roman republican pavement of the *opus caementitium* type with floral patterns and meander was found under the palace courtyard. The *opus caementitium* pavement created part of a representative audience hall. Today, these finds are presented *in situ*. Similar types of such floors were found only in the Mediterranean area from the same period. Foundations of seven other buildings dating to the same period were found on the so-called Northern terrace of the castle. Three of them are also preserved *in situ*. The best preserved and presented is structure No. II - the Merchant's House with luxurious imported goods and domestic Celtic wares. All Celto-Roman buildings are part of the so-called Celtic Path.



Figure 2.9. Details of the *opus caementitium* pavement and remains of Celto-Roman buildings found during the archaeological research lead by MUOP at the Bratislava the castle hill in 2008-9. Photo: B. Lesák, M. Musilová, MUOP.

2.1.4. Saint James's Chapel

Besides the above-ground historic buildings and monuments, there are many underground monuments preserved in situ within the monument preservation reserve in Bratislava. The Saint James's Chapel (Kaplnka sv. Jakuba) is the oldest sacral medieval structure and the only ossuary (charnel or bone house) in Bratislava. It is located underground next to the Old market hall (Stará tržnica) at the Slovak National Uprising square (Námestie SNP). Archaeological excavations in the late 1990s documented four structures from various times: a pre-Romanesque rotunda, a Romanesque charnel house and two construction stages of a Gothic charnel house. The rotunda was the oldest structure with the outer diameter of about 8.3 m, built around 1100. After its demolition around 1200, it was replaced by a Romanesque charnel house (a chapel with a circular floor plan, a semi-circular apsis, and an underground charnel house (bones house). The first record of the St. James's Chapel dates to 1422; at that time, a Gothic chapel with rectangular aisle and polygonal apsis rebuilt around 1400, already stood there. The chapel was demolished during anti-Turkish actions around 1529.



Figure 2.10. A hypothetical reconstruction model of the different development stages of Saint James chapel and St. Laurence church. Authors: J. Minaroviech, B. Lesák, J. Hoško. Source: MUOP.



Figure 2.11. Ossuary in the Saint James chapel. Photo: E. Pauditšová, UNIBA.

2.1.5. The fore-gate of the Fishermen`s Gate at Hviezdoslavovo square

The foregate of the Fishermen`s Gate is a uniquely preserved example of 15th-century Gothic fortification architecture in the Slovak Republic. The rectangular structure had two corner turrets and a drawbridge in the middle. It was built within the city`s six-metre-deep moat. After infilling in the main carriage entrance, due to the threat of Ottoman invasion in 1529, only a small, lateral door for pedestrians survived. Also, a wooden bridge, the piles of which have been preserved, remained in use. In 1756 the Fishermen`s Gate and its foregate were restored and renamed after Empress Maria Theresa. The Empress later had it demolished in 1776. Today, visitors can observe the remaining walls of the gate through a glass plate at Hviezdoslavovo square. The walls on display were discovered by the archaeological research directed by Dr. Margaréta Musilová from the Municipal Institute for Monument Protection in Bratislava (MUOP).



Figure 2.12. A fresco painting of Bratislava found on the Michelozzo courtyard in the Palazzo Vecchio in Florence. The yellow circle highlights the Fisherman's Gate. Photo by: M. Musilová (MUOP).



Figure 2.13. The Fishermen's Gate during and after excavation. Photo: M. Musilová, P. Horanský, MUOP.

2.2. Devín Castle (Devín city borough)

The Devín city borough is one of the smaller city boroughs in Bratislava. The population is 1 636 (2018), and the entire cadastral territory is roughly 14 km². The Devín city borough is situated in the western part of the cadastral territory of Bratislava City at the confluence of the rivers Morava and Danube. It is well known for the Devín Castle national monument, the ruins of which are one of the most visited monuments in Bratislava. Despite its small size, the Devín Castle Hill is surprisingly rich in rock variety and geological history starting from Early Paleozoic to Late Tertiary period. Twelve open fissures with narrow karst and pseudo-karst caves (16 – 13 million years old) are beneath the castle in the rock cliff, where a permanent exhibition was reopened in 2017. The castle is a historical monument of national as well as of European importance.



Figure 2.14. The Devin castle and its surroundings, before the recent reconstruction of the upper castle. Photo: P. Chromek, Foundation for Cultural Heritage Preservation.

Although located only several kilometres away from the city centre, the borough has a rural character with natural protected areas in its cadastral territory such as the Devínska Kobyla national natural reserve (5th highest level of nature protection) and the alluvium of Morava river (4th level of nature protection). Above the confluence of the rivers Danube and Morava, a medieval castle's ruins are lying on the limestone promontorium (212 m a.s.l.) which belongs to the most important historical and archaeological sites of Central Europe. The cliff along with the castle offers charming natural scenery with a beautiful view. This National Cultural Monument is under the administration of the City Museum of Bratislava.



Figure 2.15. The Sandberg – at Devínska kobyla once used to be a sandpit. Today it is one of the most important paleontological sites in the country, protected with 5th (highest) level of nature protection. It is rich in fossil remains of marine coastal fauna and flora that lived the sea that used to cover the area some 14 – 16 million years ago. Photo: www.visitbratislava.com.

Thanks to its strategic position, the Devín hill was settled by humans since the young Stone Age – Neolithic. The importance of the site rose with the significance of the crossroads of transcontinental Amber and Danube routes. The Celts built here a hillfort before the arrival of Germans. The Romans besieged the site at the turn of the ages. The significance of the site doubled after the Romans took permanent control of the Middle Danube and made the nearby town of Carnuntum (today in Austria) the capital of the Pannonia Superior Province in the 2nd century under Traianus.

The Germanic nobility adopted the Roman fashion of building stone residences, remains of which have been found on the Devín Castle hill too. The first written document about Devín is from the year 863 – in which the castle was referred to as Dowina. In the time of the Great Moravian Empire, Devín (Dowina) was an important fortification. A one-aisle church with a nearby cemetery was found on the castle hill, serving the local elite of the Slavs. After the fall of the Great Moravian Empire, the owners of the castle changed frequently and each gradually developed and extended it. The last noble family, which bought the castle, was the Pálffy family from 1635. The castle was hugely damaged in 1809, when the French army of Napoleon blew the castle up, and has not been restored to its original state since then. In 1932 the Pálffy family sold the Devín castle to the Czechoslovak Republic for a symbolic 1000 crowns. Devín Castle became a symbol of the national awakening, and some of its fame was restored. Various sensitive reconstruction projects throughout the 20th century and very recent restorations of

the upper castle have helped to maintain the castle in better condition and make it accessible to the public.

In May 2017, the museum opened the upper part of Devín Castle with a new exposition in the caves in the cliff underneath the upper castle called “Devín Castle in the 13th - 20th Centuries”. Through more than 300 archaeological finds from Devín Castle, it presents the history and development of the castle, its owners and the most important events that took place in Devín.

The exposition is also complemented by the geological history of the castle and a unique presentation of the remains of the sea from the Tertiary period (16 million years ago), which are preserved here in the form of sea sand and also observable sea-level effects in the Devín rock cliff. Currently, there is ongoing archaeological and geological research in the area as well as plans for the reconstruction of ruins (the walls) and buildings on site.



Figure 2.15 and 2.16. New permanent exhibition “Devín Castle between the 13th and 20th centuries” in the cave of the upper castle (left), newly discovered structurally disturbed medieval fortification after removing of self-seeding trees (right). Photos: Bratislava City Museum, 2017.

2.3. Stakeholders

The following stakeholders are significant (in terms of direct monument protection competence) for the management and maintenance of both historical areas – the monument preservation reserve in the Old Town and the Devín Castle and its surroundings:

- Bratislava City Museum
- Bratislava City Gallery
- Old Town City Borough (municipality)
- Devín City Borough (municipality)
- Regional Monument Board of SR
- Slovak National Museum – Historical museum

The following stakeholders are considered relevant in terms of their competencies in different areas (not necessarily monument protection), which contribute to proper preservation of cultural monuments and historic areas:

- Bratislava-Old town city borough (municipality)
- Bratislava-Devín city borough (municipality)
- Metropolitan Institute of Bratislava (MIB)
- State Nature Conservancy
- Slovak Hydrometeorological Institute
- Bratislava Water Company
- Slovak Water Management Enterprise
- General Investor of Bratislava (GIB)
- Bratislava-self-governing region
- Bratislava Tourist Board

2.4. Challenges and hazards affecting the historical areas

The Old Town becomes increasingly crowded during the day as people commute to work or universities and visitors arrive either by buses or by ship cruises. Due to the high concentration of impermeable surfaces, high population density as well as the concentration of cultural heritage sites, the Old Town is especially vulnerable to climate change impacts such as pluvial flooding and heatwaves.

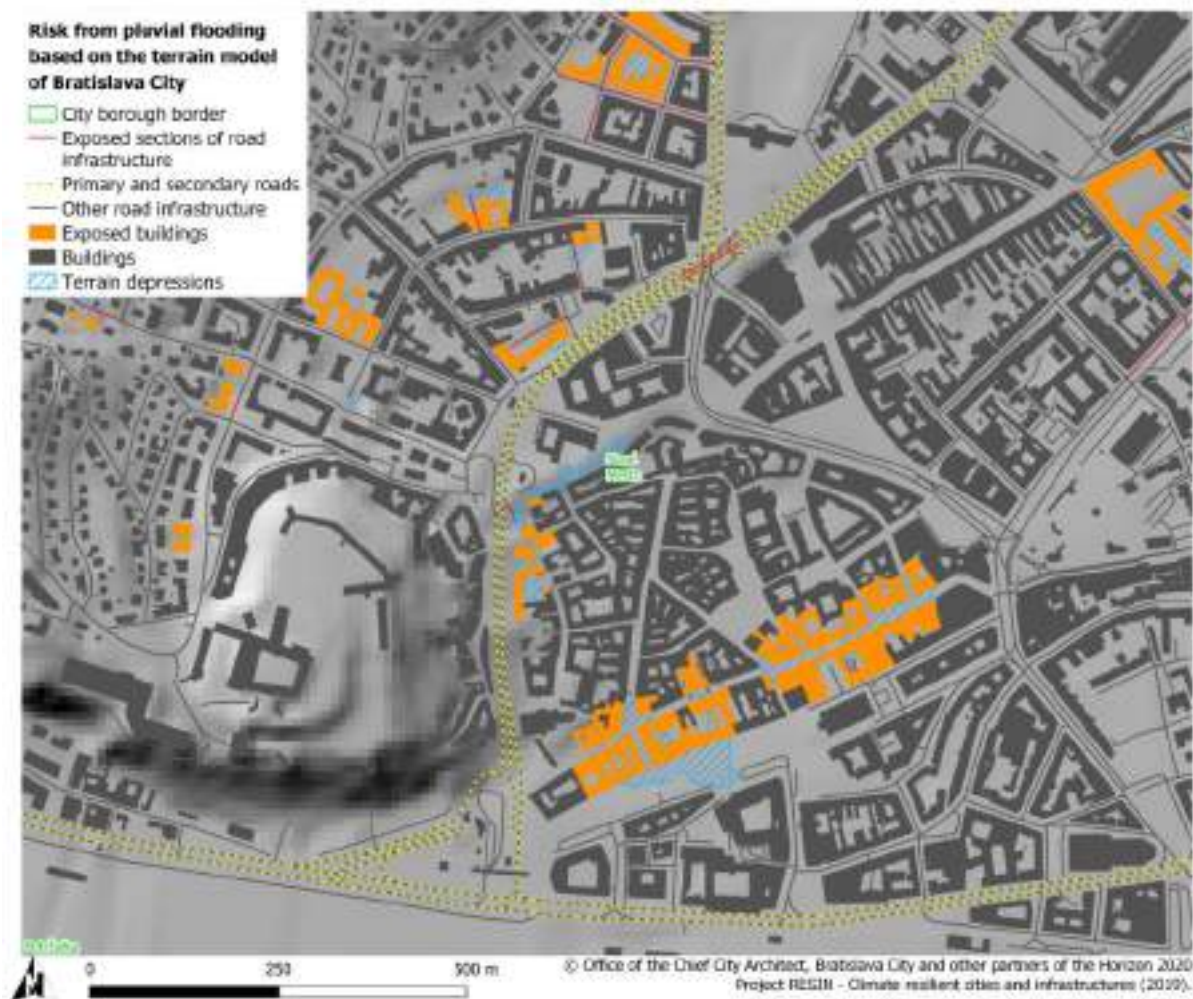


Figure 2.17. Model of the risk of pluvial flooding in the historical monument preservation reserve – the most vulnerable are the Laurinská, Panská street, Klariská as well as and Kapucínska street [7].

The high share of impermeable surfaces become quickly warmed up, and it gets very uncomfortable for pedestrians during the summer heatwaves. Paved roads and sidewalks, high building density, as well as topographical relief, increase the risks of pluvial flooding in the historical city centre. The Old Town is located at the foothills of Male Karpaty mountains, which are densely built-up with villa houses (see Figure 1.3.). During heavy rainfall, the rainwater comes rushing down into the lower parts of the historical centre. Underground historic buildings and monuments are at risk from pluvial flooding as a result of intensive rainfall periods, especially during summer months and augmented by aspects such as building density, surface permeability and terrain.

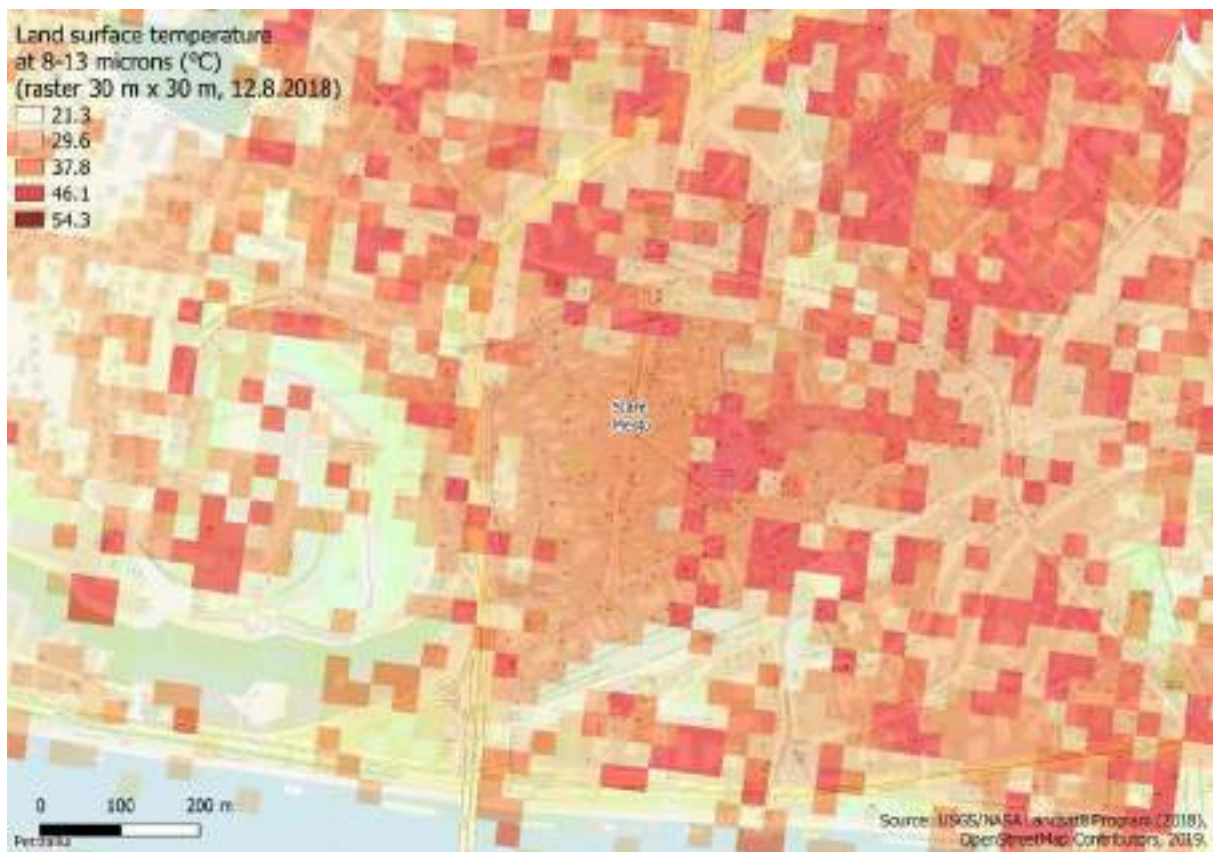


Figure 2.18. Land surface temperature model based on the evaluation of a multispectral satellite image of Landsat 8 [7]. The image shows the historical centre and the castle hill on the left.

Bratislava city is also planning the revitalisation of several squares, parks and courtyards as well as the reconstruction of medieval fortification walls so that they could be again accessible for the public. The public spaces which will be made greener and better suited to their functions also concerning the needs for adaptation to climate change are: the area of bus stops at Zochova street, Hodžovo sq., Freedom sq. (Námestie Slobody), Comenius sq., City hall sq., National Uprising sq., Suché mýto sq., Stone sq. (Kamenné nám.), Skatepark Nový Most and Park Dunajská street.

2.5. Gaps and needs for cultural heritage resilience

2.5.1. Old Town

The Old town itself has been evaluated as a borough with very high or high risk (compared to other boroughs) in all the areas of vulnerability assessment in the Atlas as follows: risk of extreme heat to the urban population, risk of pluvial flooding to the urban population, to buildings and to road infrastructure. The local stakeholders identified underground in situ archaeological objects and monuments as extremely vulnerable to intensive rainfall events, which are channelled through the narrow and paved streets into the historical city centre and some of the streets and buildings become flooded (especially their basements or lower levels). During summer, the accumulated heat from a series of tropical and supertropical days in

Bratislava makes walking in the city centre almost unbearable at noon and in the afternoons. The squares and paved public spaces with minimum shade, vegetation or breeze are the hottest surfaces.

For the City to plan its implementation of adaptation measures and to its resilience to climate change impacts, there is a need to develop adaptation pathways for the historical monument reserve with possible additional applications in the Bratislava castle area or other areas adjacent to the historical monument reserve, where there are also buildings and monuments of great historical value. The measures need to be adapted to the current needs of multifunctional public space and to respect proper monument preservation practices and relevant regulations. Bratislava City has developed, with the support of H2020 RESIN project, a model of areas at most risk from pluvial flooding; however, this model is based only on above-ground hydrological models. What needs to be considered in more detail is the permeability of materials used on the surface, together with the dynamics of underground water, relief, buildings, and the capacity of the sewage system to name a few [7].

In terms of making the city more resilient to heat, Bratislava City has been relying mostly on the data from Landsat 8 on the land surface permeability and other information evaluated in the Atlas [7]. However, the Slovak Hydro-Meteorological Institute has been testing an urban heat model on the territory of Bratislava, and the results are already available for the public [8].



Figure 2.19. The Main square in Bratislava. In the second half of the 20th century, the park-like square was paved to match its origin from medieval times. In 2017 the City decided to plant mature trees on this square, and the adjacent Franciscan (Františkánske) square, to help ease the impact of summer heat on the pedestrian zone as can be seen in the picture. Photo: www.visitbratislava.com.

2.5.2. Devín Castle

The most significant hazard at Devín castle is most likely rockfall due to the erosion of cliffs and castle walls, thereby threatening the expositions in the caves and the safety of its visitors. In fact, the whole upper castle is going to be lost due to rockfall in the future; when this will occur is unknown. Climate change – especially droughts, extreme temperatures during summer and heatwaves – contributes to increased morbidity of vegetation and especially trees (as the vegetation becomes more prone to diseases), increased cost for maintenance and irrigation of natural assets as well as the built environment (castle walls, other service buildings present at castle site, etc.). This, however, is an overall condition relevant for urban vegetation in Bratislava, not just in Devín.



Figures 2.20 and 2.21. The danger of rockfall on the north-western side of the cliff (left), crack-gauge for monitoring rock displacement adapted specially for this Devín site using silica rods inert to temperature fluctuation (right). Photo: Bratislava City Museum, 2017.

The remaining castle walls are threatened by erosion due to the use of inappropriate materials for their reconstruction in the second half of the 20th century. The physical properties of the joining material used are different than those of the rocks which holds it together. This results in creating cracks and fissures in the castle walls when the temperature quickly changes, as well as during the winter months, where moisture and water enter the cracks and freezes which speeds up the process.

Within the subsystem 06 Stability of rock massifs under historical objects (which is a subsystem of the “Partial monitoring system of the Ministry of the Environment of the Slovak Republic” – see chapter 8), a complex continuous monitoring system was installed on Devín Castle (Bratislava) in November 2005, for monitoring static disturbances. The monitored sites are situated on a natural overhang in the central courtyard, by the staircase in the relic of the circular building with significant static failures and in the fortifications of the central castle. Based on the results of monitoring measurements, reconstruction work began at Devín Castle. Monitoring is currently suspended for technical reasons.

Restoration of the castle walls and the inner underground exhibitions, as well as the purchase of monitoring devices, was supported by previous projects funded by EEA Grants and Norway Grants. This included the monitoring of displacement of the most tectonically-disturbed parts of the rock cliff. The Bratislava City Museum oversees the implementation of active measures

as well, which include removing naturally seeded vegetation at the rock face (cliff), stabilisation of the loose parts, rainwater diversion in case of rock falls of smaller volume. Larger volume rock falls require stabilisation works – filling of the cracks, rock nailing and anchoring.

The Bratislava City museum together with the Bratislava City applied for external funds for the restoration of the remainder of most threatened walls. Another problem at the Devín castle seems to be rainwater and moisture that find their way into the caves and chambers, which are open to the public and used for expositions and the presentation of archaeological objects. Spreading of algae and fungi happens as a result of access humidity, which negatively impacts the condition of the exposed objects (see Figure 2.22). An air-drying system for reducing the humidity in the interiors has been installed; however, this measure is not as effective as needed.



Figure 2.22. The land surface temperature model based on the evaluation of a multispectral satellite image of Landsat 8 [7]. The image shows the Devín Castle on the hill on the left.



Figure 2.23. Traces of moisture inside the caves in the upper castle (left), impact of the additional moisture can be seen on the remaining tertiary sands inside the cave (right), as green algae. Photo: E. Streberová.



Figures 2.24 and 2.25. Damage to the middle castle by rainwater (left), erosion in the castle walls in the upper castle (right). Photos: E. Streberová.

Another part of the Devín castle, the so-called middle castle, is covered partly in grass and partly in a smaller fraction of gravel. Both these materials allow visitors to move freely and to explore. Planting of higher vegetation is not possible due to strong winds on the exposed castle hill and the possible damage that the roots could cause to the underlying chambers and caves. This makes it easy for the weather extremes to continue eroding the slightly sloped sections of the middle castle or to continue widening existing cracks or contribute to creating new ones in the castle walls.

3. Governance framework for cultural heritage management

This section looks at the governance framework for cultural heritage relevant to Bratislava's identified sites. It elaborates existing policies, strategies, visions and action plans for the management, protection and use of cultural heritage in Bratislava at the different governance levels, and concludes with a reflection on to what extent the local level takes into account key international governance instruments created by UNESCO.

3.1. International

The following international policies and declarations are relevant for the conservation of monuments in the Slovak Republic: the Convention for the Protection of Architectural Heritage of Europe, European Convention for the Protection of Archaeological Heritage or European Landscape Convention, Convention on the Underwater of Cultural Heritage Protection, and UNESCO Conventions concerning the Protection of the World Cultural and Natural Heritage and the Safeguarding of the Intangible Cultural Heritage. The Slovak Republic is a signatory to all of these internationally important declarations.

3.2. National

Declaration of the National Council of the Slovak Republic on the protection of cultural heritage (National Council of the Slovak Republic, 2001). This declaration of the National Council of the Slovak Republic recognises that irreplaceable cultural values created by previous generations are constantly threatened not only by the natural causes of deterioration and decay, but also by changes in lifestyle, the transformation of social and economic conditions, the decline and disappearance of traditional crafts and techniques, and the application of technologies which are often incompatible with the nature of these cultural assets. The declaration supports the implementation of principles enshrined in international treaties, conventions and recommendations of international organizations for the protection of cultural heritage in particular UNESCO and the Council of Europe. It documents and applies these for the development of the rights and obligations of everyone to protect cultural heritage under Article 44 of the Constitution of the Slovak Republic.

Strategy for the Conservation of Monuments (2017 – 2022). The Strategy aims to create such conditions and tools for the protection of monuments, which will guarantee their authenticity and integrity under current conditions, and which will contribute to improving the construction and technical condition of the heritage fund. In the area of territorial protection, it mainly promotes cultural heritage protection interests through spatial planning tools. The Strategy emphasises that the effectiveness of applying historical monuments protection strategies into land-use planning documents is dependent on how regulations are formulated and on their clear quantification. The Strategy is an opportunity to initiate the elaboration of a methodology focused on practical feasibility within territorial and construction proceedings.

Guideline of the Ministry of Culture of the Slovak Republic on the protection of national cultural monuments in crisis situations (Ministry of Culture of the Slovak Republic,

2008). This guideline regulates the procedure of legal entities and natural persons responsible for the special protection of movable national cultural monuments referred to as 'special protection of cultural monuments' in the context of preparation for crisis situations and during crisis situations. The Regional Monument Board plays an important role in the area of special protection of cultural monuments and the fulfilment of tasks ensuing from providing special protection to cultural heritage. It provides legal entities and natural persons (owners or administrators) with professional and methodological assistance. The degree and method of special protection of cultural monuments shall be ensured depending on local sources of danger and the resulting categorization of the territory of the Slovak Republic, which is decisive for differentiating the scope of planning and implementation measures.

Last but not least, the Act on the protection of monuments and historic sites No. 49/2002 Coll. [9], governs the protection of cultural heritage monuments, historical sites, archaeological finds and archaeological sites. It is based on scientific knowledge and international conventions in the field of European and world cultural heritage to which the Slovak Republic is a signatory. According to Paragraph 1, this Act further regulates the organisation and competence of state administration authorities and territorial self-government authorities, as well as the rights and duties of owners and other legal entities and natural persons, and the imposition of fines for unlawful conduct in the field of the protection of monuments and historic sites which form an important part of cultural heritage and the conservation of which is in the public interest.

3.3. Regional

The framework of the future **Strategy for Development of Local and Regional Culture and Culture of National Minorities of the Slovak Republic by 2030 (Ministry of Culture of the SR, 2019)**. The Concept serves as a basis for the creation of a comprehensive “Strategy for the Development of Local and Regional Culture and Culture of National Minorities of the Slovak Republic by 2030”, which the Government ordered the Ministry of Culture to submit by 31 December 2020. The main priorities of the strategy include improving the quality of public libraries, creating a legislative framework to ensure the support of cultures of national minorities, creating tools for coordinating and optimizing the performance of professional activities of regional cultural institutions, expanding regional activities of departmental organizations and intensifying the heritage. The strategic aim of the Ministry of Culture is to strengthen cultural centres to become a really attractive place for education, creating a cultural environment and awareness-raising.

Development Strategy for Culture in the Bratislava self-governing region for years 2015-2020. This strategy addresses the development of culture in the spirit of four priorities, which are consistent with those applied across Europe: promoting cultural identity, promoting cultural diversity, promoting creativity and promoting citizens' participation in culture.

3.4. Local

In 2016, Bratislava City initiated the preparation of a conceptual and strategic document named the **Framework for development of culture in Bratislava**; however, it has not yet been finalised. The City borough of Staré Mesto has a **Cultural policy concept of Bratislava-Staré Mesto** for the period of 2016-2020. The document emphasises support for the socio-economic

use of the cultural potential of the Old Town as well as for public and cultural activities and better involvement and cooperation among individual departments of the Office district and city district organizations. An action plan for implementation is part of the document to help implement the individual goals of the Framework.

Of the existing UNESCO Charters, the Convention for the Safeguarding of the Intangible Cultural Heritage and the Recommendation on the Historic Urban Landscape are of key relevance (since the target historic areas are not of World Heritage significance). The main goals of the former are¹:

- (a) to safeguard the intangible cultural heritage;*
- (b) to ensure respect for the intangible cultural heritage of the communities, groups and individuals concerned;*
- (c) to raise awareness at the local, national and international levels of the importance of the intangible cultural heritage, and of ensuring mutual appreciation thereof;*
- (d) to provide for international cooperation and assistance.*

The Recommendation on the Historic Urban Landscape outlines specific 'steps' (or strategies) for local authorities to undertake in implementing a more holistic approach to understanding and managing heritage places in connection with the wider urban fabric, specifically²:

- To undertake comprehensive surveys and mapping of the city's natural, cultural and human resources;*
- To reach consensus using participatory planning and stakeholder consultations on what values to protect for transmission to future generations and to determine the attributes that carry these values;*
- To assess vulnerability of these attributes to socio-economic stresses and impacts of climate change;*
- To integrate urban heritage values and their vulnerability status into a wider framework of city development, which shall provide indications of areas of heritage sensitivity that require careful attention to planning, design and implementation of development projects;*
- To prioritize actions for conservation and development;*
- To establish the appropriate partnerships and local management frameworks for each of the identified projects for conservation and*

¹ See <https://whc.unesco.org/en/hul/>

² Ibid.

development, as well as to develop mechanisms for the coordination of the various activities between different actors, both public and private.

Given that key local document, the **Framework for development of culture in Bratislava**, remains under development, a detailed analysis of the extent to which the above strategies are already integrated into it was not possible at the time of writing. The first version of the framework is planned to be completed at the end of 2021, with the final version to be approved in May 2022. The draft document refers to the Sustainable Development Goals, and in particular those related to culture, and is expected to be based on five principles: sustainable city, availability and inclusion, environmental responsibility, equality and diversity, and participation and democracy³. The HUL strategies are recommended to be taken into account by the framework authors for its ongoing development. Of particular interest is the specific reference made by the HUL to the vulnerability of places of cultural heritage to the impacts of climate change, pointing to a need for more integration between departments and actors responsible for climate action and civil protection with those responsible for managing cultural heritage.

4. Governance framework for disaster risk reduction

This section looks at the governance framework for disaster risk reduction (DRR) with relevance to Bratislava's identified sites. It elaborates the relevant policies, strategies, visions and action plans for disaster risk management in Bratislava at national, regional and local governance levels. International frameworks for DRR are listed in Annex 10.3, rather than elaborated on in this section. Among these, the Sendai Framework warrants a particular mention. As such, this section concludes with a reflection on to what extent local level governance takes into account the Sendai Framework.

4.1. National

The basic document for the identification of a potential threat in the territory of the Slovak Republic is **Analysis of the territory in terms of possible extraordinary events of the Slovak Republic**. The document is drawn up at all levels of state administration based on Act No. 42/1994 Coll [10]. on civil protection of the population, as amended, in accordance with Article 6 of Decision no. 1313/2013 / EU of 17 December 2013 on the European Union Civil Protection Mechanism. Under the Act, an emergency is defined as a natural disaster, accident, disaster or terrorist attack. A natural disaster is an extraordinary event in which the accumulated energies or masses are undesirably released as a result of the adverse effects

³ See more at <https://dekadaprekulturu.sk>

of natural forces, in which hazardous substances may act or cause destructive factors that have a negative impact on life, health or property.

The Act also regulates the structure and content of the territorial analysis document in terms of possible extraordinary events of the Slovak Republic. The introductory part of the analysis focuses on geographical, demographic and economic characteristics of the territory. For the risk assessment the following structure is recommended: identification of the crisis phenomena and threatening factors, threat to the population, size of the hazard zone - area in km², anticipated secondary phenomena and possible overlap from territory to municipality / district / county / state. This analysis, however, does not directly assess the level of risk, but only identifies the risk and further identifies the resources and means available for managing the emergency in the analysed area. The list of risks to be assessed is included in the analysis, which modifies the structure and content of assessments on extraordinary events a document prepared at all levels of state administration [11].

In the Slovak Republic, flood risk is assessed in accordance with Directive 2007/60 / EC of the European Parliament and of the Council on the assessment and management of flood risks and **Act no. 7/2010 Coll. on flood protection** [12] [13]. This law was created as a consequence of the European Commission's Communication on Evaluation COM (2004) 472, Brussels, 12.7.2004 [14] and is in accordance with Directive 2007/60/EC [12]. When assessing the existing potential of significant flood risk in the Slovak Republic, the risk was considered potentially significant in those geographical areas where the flood in the past endangered health, the environment, cultural heritage or economic activity. In assessing the likely occurrence of a potentially significant flood risk, information on the current status of flood protection in individual geographical locations was used. The evaluation process was based on the available materials, and expert estimates were carried out to determine whether, within the expected flood range whose maximum flow rate can be reached or exceeded on average once every 100 years – such as buildings, infrastructure and industrial or agricultural estates [15].

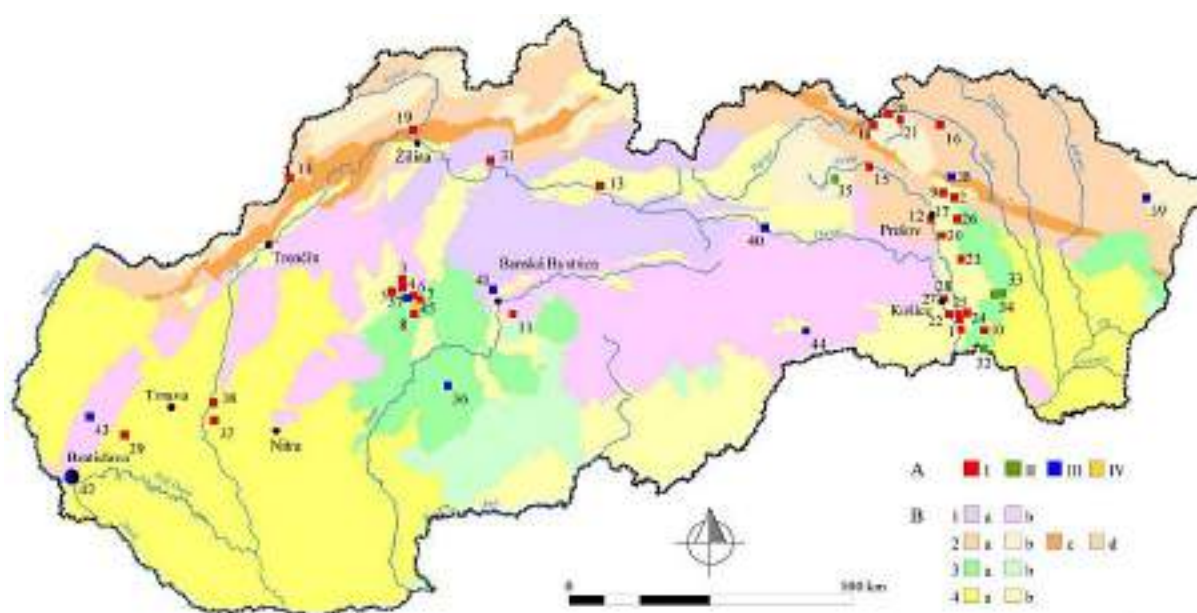
Preliminary flood risk assessment in the Slovak Republic – update 2018 was prepared in accordance with the requirements of Directive 2007/60/EC. This document includes information about particular river basins in Slovakia. Preliminary assessment documents are publicly available on the website of the Ministry of the Environment SR [16]. Information about flood risk prediction is based on records of changes in the hydrological regime of Slovak rivers [17] [18]. This data is together with the proposal of adaptation measures part of the **National Climate Program of the Slovak Republic** [19].

Since 2002, Slovakia has the **Concept of sustainable exploitation of rock environment**, which implies to monitor geological environmental factors. The aim is to predict impending disasters. In 2006 the agreement on cooperation for the provision and use of geological information was signed between the Civil Protection Office of the Ministry of the Interior of the Slovak Republic (now the Crisis Management and Civil Protection Section) and the State Geological Institute of Dionýz Štúr (SGIDŠ). At the beginning of 2007, a working group for geological hazards so-called Geohazards Working Group as a part of **EuroGeoSurveys** (EGS) was created. One of the results of EGS activities is a strategic plan for assessment and prevention of geological hazards in European countries (including the Slovak Republic). In the Slovak Republic the plan includes eight subsystems:

- 01 – Landslides and other slope deformations;
- 02 – Tectonic and seismic activity of the territory;
- 03 – Anthropogenic sediments of environmental burden character;
- 04 – Impact of mining on the environment;
- 05 – Monitoring of radon volume activity in the geological environment;
- 06 – Stability of rock massifs under historical objects;
- 07 – Monitoring of river sediments;
- 08 – Volume unstable soils.

These partial information subsystems are continuously updated. The **Concept of Geological Research and Geological Survey of the Slovak Republic** is currently in force [20]. Monitoring of slope deformations is performed within the **Partial Monitoring System (PMS)** "Geological factors" in subsystem 01 - Landslides and other slope deformations. The PMS is part of the Monitoring System of the Environment of the Slovak Republic, which was approved by the Government Resolution no. 620 (September 7, 1993). Monitoring of geological factors is provided by the State Geological Institute of Dionýz Štúr. The PMS is focused on geological hazards, harmful natural or anthropogenic geological processes that endanger the natural environment. Monitoring of slope deformations is based on observation and subsequent evaluation of the state of activity or landslides, eventually control of slope deformations after implementation of remediation measures. Monitoring offers objective information necessary for decision-making, management, control, scientific research activities and for the public. Government administration and local/regional self-government and relevant legal and natural persons are being informed about monitoring results. The selection of monitored sites is continually adjusted according to the current society-wide requirements as well as the monitoring of the assessed stability state of the observed sites.

In 2019 a total of 43 sites were monitored for various types of slope movements (Figure 4.1).



Legend:

I – sliding; II – earth creep; III – topple fall, rockfall (stability of rock cuts); IV – special sites,

Figure 4.1. The monitoring sites of slope deformations in the Slovak Republic. State Geological Institute of Dionýz Štúr [21].

Table 4.1. Violation of territory by slope deformations in Bratislava [22].

Number of deformations	District area [ha]	Area of violation territory [ha]				Failure [%]
		Total	Arable land	Forest soil	Other	
18	36 800	11.1	1.0	0.4	9.8	0.03

According to the Geological Act [23], the Ministry of the Environment of the Slovak Republic is obliged to ensure the carrying out of the engineering geological survey, monitoring of geological factors of the environment and remediation of the geological environment to avert, mitigate or eliminate the consequences of natural disasters. Therefore were issued recommended procedures to ensure the activities of the municipality in case of emergency or occurrence of an extraordinary event in connection with the occurrence of slope deformations in accordance with Act no. 42/1994 Coll. on Civil protection of the population [24], as amended and in accordance with the Geological Act.

In the period 1997-2006, the Ministry of the Environment of the Slovak Republic with the aim of comprehensive processing of data from the registration and mapping of slope deformations and surveys focused on slope deformations and their mapping provided a geological task – Compilation of Atlas of slopes stability maps of Slovakia at scale 1: 50 000 [22]. This atlas is accessible on the geo server of the State Geological Institute of Dionýz Štúr. It contains the maps showing areas where there is a risk of slope deformation and provides detailed regional analyses of slope deformations in the Slovak republic in relation to the territorial units of so-called engineering geological regions and areas. For the needs of both the professional and

the public, it provides data on the area disruption by slope deformations in the form of passports and summary tables.

With the preparation of the Atlas of slope stability maps of the Slovak Republic, the Ministry of the Environment of SR initiated a project to compile **maps of geological environmental** factors for selected regions of Slovakia. Engineering-geological maps are the foundation of the maps of environmental geofactors, which include a map of susceptibility to slope movements. In these maps, the areas of interest are divided into stable, potentially unstable and unstable areas and evaluated in terms of the occurrence of slope deformations and the susceptibility of these areas to the development of slope movements. Maps of the area susceptibility to slope movements cover 73% of the territory of the Slovak Republic. The activation of slope deformations associated with extreme precipitation and floods in the Slovak Republic has recently caused significant damage in the affected areas.

4.2. Regional

The **Prevention Program of Landslide Risk Management (2014-2020) – update** [25] was approved by Government Resolution no. 738/2013 and represents a strategic document in the field of slope deformations. One of the objectives of this program is to support adaptation to climate change and mitigate the negative impacts of these changes by supporting the prevention, exploration and remediation of emergency landslides directly related to excessive rainfall. The program aims to improve the prevention and management of landslide risks. Landslides and slope streams represent 94.5% of the total number of registered slope deformations. Figure 4.2 shows the area (in hectares) disturbed by slope deformations on the territory of the Slovak Republic.

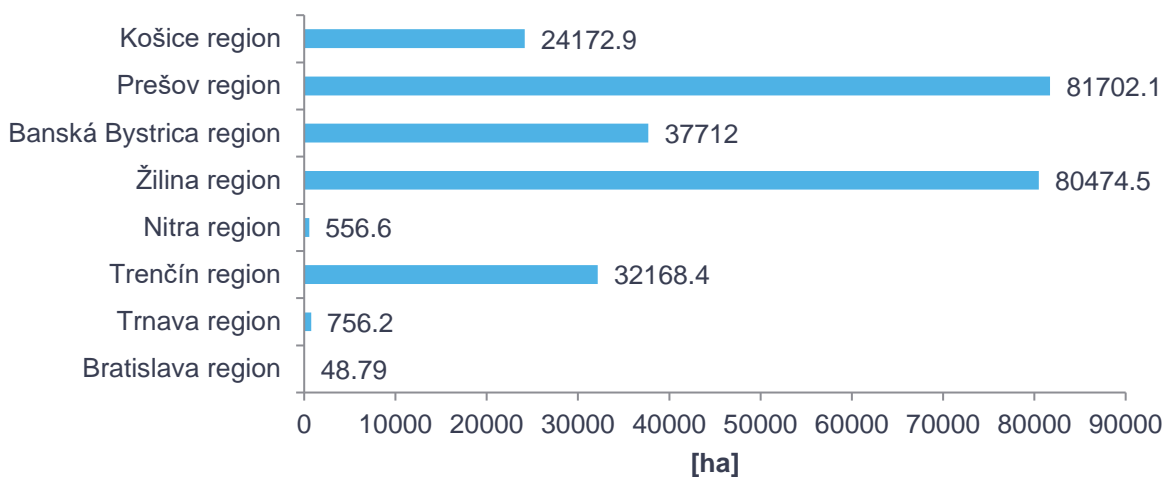


Figure 4.2. Violation of territory by slope deformations in Slovak regions. Ministry of the Environment of Slovak Republic [25].

In the Slovak Republic, there is no database focused on the damage caused by extraordinary events [11]. Vulnerability analysis is not carried out as part of the national level risk analyses.

Some of its parts are part of the described assessment of the likely occurrence of potentially significant flood risk.

4.3. Local

In the Slovak Republic, there is no complex database focused on the damage caused by extraordinary events. Damages to the property of municipalities and towns are most often reimbursed by the state, either from the special reserve of the Prime Minister or from the relevant ministries. In order to approve the expended funds, a commission of the Regional Office, which is competent for the impacted municipality, is established. The municipality proves damages by invoices from suppliers, photo documentation, invoices for the rental of construction machinery and machines, etc. The reported amount of damage does not always correspond to reality, as in many cases, volunteers help in emergencies in municipalities [15]. Financial compensation may be requested by a natural person under the Civil Protection Act [24] when damage to property or dwellings, including equipment, has been incurred as a result of an emergency. Based on this application, the municipality shall, in cooperation with the relevant District Office, assess the extent of the damage and the social situation of the applicant. Citizens are indemnified by commercial insurance companies, of course, provided they have taken out insurance. Insurance companies keep own damage records and use the information to build own maps of risk areas [15].

As mentioned above, the Sendai Framework warrants some consideration here as the key international framework for action to prevent new and reduce existing disaster risks, based on seven targets, four priorities for action with supporting rationale, and 13 guiding principles. Although a global framework, there are particular strategies outlined under the four priorities that target local authorities. The four priorities are⁴:

Priority 1: Understanding disaster risk

Priority 2: Strengthening disaster risk governance to manage disaster risk

Priority 3: Investing in disaster risk reduction for resilience

Priority 4: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction

At local level, very few plans and strategies addressing disaster risk reduction were identified by the authors of this report, suggesting that there are gaps in the management of disaster risk by the municipality. It was, however, noted that the Bratislava municipality is involved in assessment of damage, and in determination of needs for State-administered financial support, and in coordinating the involvement of volunteers in recovery efforts. The latter in particular is encouraged by the Sendai Framework (Part V: Role of Stakeholders) which notes that:

⁴ See <https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030>

States should encourage the following actions on the part of all public and private stakeholders: Civil society, volunteers, organized voluntary work organizations and community-based organizations to participate, in collaboration with public institutions, to, inter alia, provide specific knowledge and pragmatic guidance in the context of the development and implementation of normative frameworks, standards and plans for disaster risk reduction⁵;

However, mention of inaccuracies in damage reports suggests that further training, supervision and/or support of voluntary groups may be needed. Given municipal responsibility for damage assessment, Priority 4 seems particularly relevant, and especially the following strategy, which emphasises the importance of the recovery phase for improving future disaster preparedness:

To promote the incorporation of disaster risk management into post-disaster recovery and rehabilitation processes, facilitate the link between relief, rehabilitation and development, use opportunities during the recovery phase to develop capacities that reduce disaster risk in the short, medium and long term, including through the development of measures, such as land-use planning, structural standards improvement and the sharing of expertise, knowledge, post-disaster reviews and lessons learned and integrate post-disaster reconstruction into the economic and social sustainable development of affected areas. This should also apply to temporary settlements for persons displaced by disasters⁶;

The absence of a detailed database of historical damage suggests that Priority 1, with its emphasis on data collection and management, also warrants attention, and in particular strategies:

To promote the collection, analysis, management and use of relevant data and practical information and ensure its dissemination, taking into account the needs of different categories of users, as appropriate;

To systematically evaluate, record, share and publicly account for disaster losses and understand the economic, social, health, education, environmental and cultural heritage impacts, as appropriate, in the context of event-specific hazard-exposure and vulnerability information⁷;

⁵ See <https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030>

⁶ Ibid.

⁷ Ibid.

5. Governance framework for climate change adaptation

This section looks at the governance framework for climate change adaptation of relevance to the City of Bratislava. It identifies the relevant policies, strategies, visions and action plans for climate change adaptation in Bratislava at the different governance levels. It concludes with a reflection on the extent to which local governance of climate change adaptation takes into consideration key international governance instrument the 2015 Paris Agreement (see Part 5.1).

As Bratislava is a signatory of “Mayors Adapt” and the “Covenant of Mayors” the priority was to conduct a city level risk-based vulnerability assessment within two years of signing.

With support from the Horizon 2020 project RESIN, Bratislava City was able to elaborate on the results of the risk-based vulnerability assessment into a comprehensive Atlas of climate change impacts on Bratislava City. The document focuses on the impacts and risks of climate change to the City’s population and critical infrastructure (road infrastructure and built-up areas). Leading the working group for this assessment was the Office of the Chief City Architect. The group of experts included the Department of Landscape Ecology at the Faculty of Natural Sciences, the University of Comenius in Bratislava, Fraunhofer institute IAIS, different departments of the City Council (such as the Environmental and Spatial planning departments), Bratislava self-governing region, Bratislava Water Company, pilot city boroughs and many others.

The vulnerability and impact chain assessments were done in 2018, and the data from 2016 up to 2018, depending on availability. The method utilized the IVAVIA tool (IVAVIA – Impact and Vulnerability Analysis of Vital Infrastructures and Built-up Areas) which enables stakeholders to participate in the qualitative phase of the assessment for developing impact chains (see Figure 5.1.). Several stakeholder workshops were conducted throughout the qualitative phase (the first workshop focused on heatwaves, whereas the second focused on pluvial flooding, the third on droughts, and the last workshop focused on the weighting of indicators), where the most relevant impacts of climate change, drivers (also stressors not related to climate change), attributes of coping capacity and sensitivity were identified by the participants.

Before starting the indicator identification and data acquisition process in the quantitative phase, the various identified attributes nominated in the stakeholder workshops underwent a thorough review to filter out unsuitable and duplicated attributes, re-categorize attributes to correct for misunderstandings during the workshop (e.g. low awareness: the participants listed “low implementation of building-level adaptation measures for reducing the impacts of rainfall” as a sensitivity indicator although it is a rather general observation with no specific spatial data supporting this claim), and reducing the number of attributes to a more manageable number in order to facilitate result validation. Following this process, initial indicators for each attribute and the required data were defined and identified, so that the final vulnerabilities and risks could be calculated. Furthermore, the assessment also included non-climatic stressors; however, these were not included in the qualitative part of the assessment done with the IVAVIA tool.

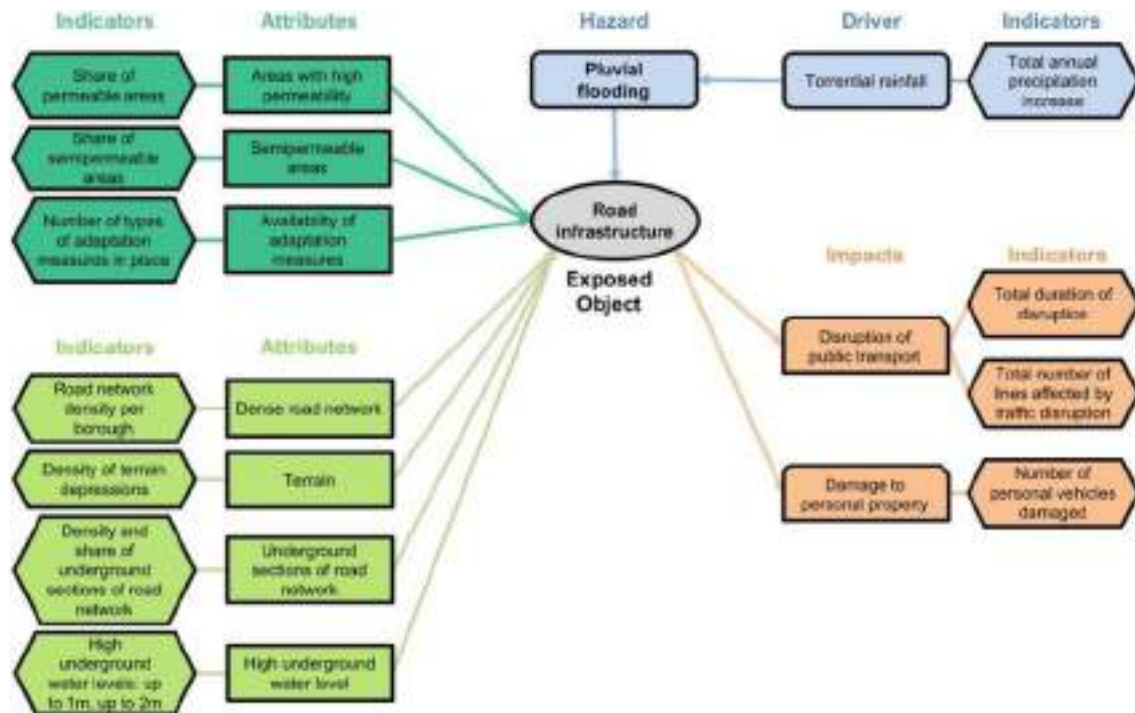


Figure 5.1. Simplified impact chain for the hazard-exposure combination “pluvial flooding on road infrastructure” in the city of Bratislava. Hazards and drivers in blue, exposed object in grey, coping capacity in green-blue, sensitivity in green, and impacts in orange. Rectangles: Attributes; Hexagons: indicators [26].

Several obstacles were identified in the process of conducting the vulnerability assessment, the most relevant being the availability (or lack) of data, as well as the capacity to conduct such assessment (both skill- and resource-wise). As the assessment focused mostly on vulnerable population and infrastructures, no specific attention was paid to cultural heritage, and the assessment did not differentiate between buildings in terms of their cultural or historical importance.

5.1. International

Under the **United Nations Framework Convention on Climate Change (1992)**, 197 Parties to the Convention promised to take joint action to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous anthropogenic interference with the Earth's climate system. In accordance with Article 4 of the Convention, the signatory countries have also committed themselves to make every effort to develop adaptation strategies and to support climate change research and its consequences.

In 2013, the European Commission published the “**EU Strategy for Adaptation to Climate Change**”, along with several accompanying documents. The strategy was approved by the EU Environment Council on 18 June 2013. The strategy outlines a framework and mechanisms to increase EU preparedness to the impacts of climate change and to improve the coordination of adaptation activities. At the same time, it represents a long-term strategy to increase the

EU's resilience to the adverse effects of climate change at all levels and in line with the Europe 2020 objectives. In 2018, the European Commission's Directorate-General for Climate Action evaluated the implementation of the European adaptation strategy based on input from the Member States. The implementation evaluation report, together with the Member States' fact sheets, was published on the Commission's website, which will serve as a foundation for updating the strategy expected in 2020.

Regulation of European Parliament and of the Council 2018/1999 of the Energy Union and Climate Action. This Regulation sets out the necessary legislative foundation for reliable, inclusive, cost-efficient, transparent and predictable governance of the Energy Union and Climate Action (governance mechanism), which ensures the achievement of the 2030 and long-term objectives and targets of the Energy Union in line with the 2015 Paris Agreement on climate change following the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (the 'Paris Agreement'), through complementary, coherent and ambitious efforts by the Union and its Member States, while limiting administrative complexity. The goal of a resilient Energy Union with an ambitious climate policy at its core is to give Union consumers, including households and businesses, secure, sustainable, competitive and affordable energy, and to foster research and innovation by means of attracting investment, which requires a fundamental transformation of Europe's energy system. Such a transformation is also closely linked to the need to preserve, protect and improve the quality of the environment and to promote the prudent and rational utilisation of natural resources through the promotion of energy efficiency and energy savings and the development of new and renewable forms of energy.

5.2. National

The resolution of the Government of the Slovak Republic no. 148/2014 required the submission of an update of the national adaptation strategy to the Government's deliberations in light of the latest scientific knowledge in the field of climate change. In 2017, the Slovak Republic's Ministry of Environment started preparing a strategy update aimed at assessing the current state of adaptation and planned activities in key areas and sectors, defining a general vision for the adaptation of the selected areas and sectors and updating the set of adaptation measures and the framework for their implementation. The **Strategy of adaptation of the Slovak Republic to climate change – update** was approved on 17 October 2018 by the Government Resolution no. 478/2018 [27]. A vulnerability assessment is available on a national level from 2011 and needs to be updated [28].

The main objective of the updated adaptation strategy is to „increase resilience and improve the readiness of the Slovak Republic to face the adverse effects of climate change and to establish an institutional framework and coordination mechanism to ensure effective implementation of adaptation measures at all levels and in all areas“. This is to be achieved by implementing partial objectives such as: implementing adaptation measures and monitoring their effectiveness, strengthening the trickle-down of objectives and recommendations of the adaptation strategy into other levels of governance, provision of incentives for entrepreneurship oriented at climate change adaptation/mitigation, promoting synergies between adaptation and mitigation measures while reflecting the objectives of the 2030

Agenda for Sustainable Development, the UN Framework Convention on Climate Change and the Paris Agreement.

The objectives of the Strategy should be put in practice by the forthcoming **Action Plan for adaptation**, which is to be submitted to the Government of the Slovak Republic by 31.12.2020 for approval. The preparation of the National **Adaptation Action Plan** began in 2018, with a public participation process where also municipalities were largely involved, and Bratislava participated in all its stages. The plan will include short-term measures for the period 2020-2022 and medium-term for the period 2022-2025 with a view to 2028 will be identified. The measures will be prioritized according to the importance, feasibility and availability of financial resources. The Action Plan should contribute to better translating adaptation measures into sectoral policies of the relevant sectors. It should also include a proposal for a monitoring system for vulnerability, a proposal for a system of the mid-term evaluation of the adaptation process in the Slovak Republic, including the monitoring of cost-benefit links, and a platform for publishing and sharing positive experiences [29].

Referring to the multi governance system in the Slovak Republic, it is mainly the cities and city boroughs which are responsible for implementing the objectives of the National Strategy on Adaptation in practice. However, there are currently still many obstacles preventing this, such as: inconsistencies in the legislature (the Strategy supports the implementation of sustainable urban drainage, but the legislation on water management prevents this), discrepancies between the permissions (and guidelines they contain) on this legislature to different investment activities (construction, reconstruction, etc.). These permissions are issued by the municipality as the competent authority in the first phase (to get what is called territorial permission – meaning the investment project is in-line with the current masterplan) and the city boroughs in the second stage (building permission) and heavy dependence on external funding for implementation of adaptation/ mitigation measures.

Another relevant policy for linking health and with climate change impacts is the Action Plan for the Environment and Health of the Population of the Slovak Republic no. V [30]. It reports that climate change is also likely to affect the spread of diseases in the future. In the Slovak Republic, we are increasingly confronted with restrictions on drinking water supplies due to droughts, torrential rains or floods. With increasing levels of knowledge about the presence of new contaminants and their potential health effects, new chemicals need to be included in the monitoring, and their implications for human health should be investigated.

A WHO / EURO questionnaire study [31] involving member states of the European region showed that countries consider the increase in temperature, heatwaves and prolongation of the pollen season by approximately 10-11 days as the greatest risk in terms of climate change. The results have shown that the most vulnerable groups, as perceived by EU countries in the poll, are the elderly, chronically ill and socially isolated and the urban population in general. In terms of health impacts, vector and rodent-borne diseases, water and food-borne diseases, as well as cardiovascular and respiratory diseases, were the most common (see Figure 5.2).

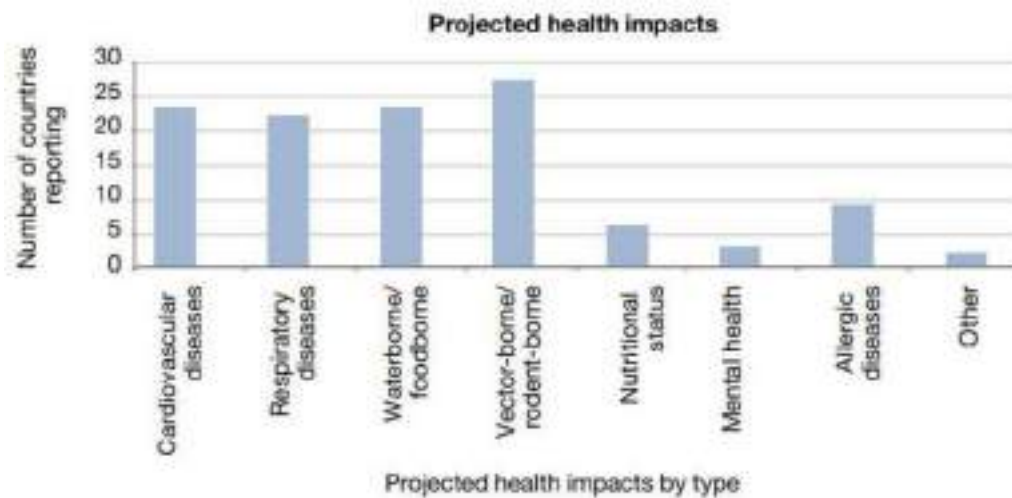


Figure 5.2. Results of the international questionnaire study by WHO – Projected health impact [36]

Another partially linked document to climate change adaptation is the „**Greener Slovakia**“ - a **Strategy for Environmental Policy of the Slovak Republic until 2030** [32]. Adopted in 2019 with the Resolution no. 87/2019, this strategy paper defines a vision for 2030 considering possible, likely and desired future developments. The document identifies the underlying systemic problems, sets targets for 2030, proposes framework measures to improve the current situation, and also includes basic outcome indicators that allow the results to be verified. The basic vision is to achieve better environmental quality and a sustainable circular economy based on the consistent protection of environmental components, using as few non-renewable natural resources and hazardous substances as possible, leading to improved public health.

Action Plan for solving the consequences of drought and water scarcity [33] aims to prevent drought through preventive measures, eliminating the negative effects of climate change. Drought is a natural phenomenon; however, water shortage is strongly conditioned by anthropogenic activity. The Action Plan is a separate document that builds on Act No. 364/2004 Coll. on Waters, as amended. Drought and water scarcity is part of the update of the Water Plan of the Slovak Republic; although it is not currently classified as a significant impact that may have an impact on the status of surface and groundwater bodies. A separate chapter on drought is in the Greener Slovakia report (Strategy of Environmental Policy of the Slovak Republic 2030). **Slovak Water Policy Framework for 2015-2021** [34] does not include solutions to the impacts of climate change. This document represents a standard strategy, which was later replaced by the framework document **Orientation, Principles and Priorities of the Slovak Republic Water Management Policy by 2027** [35], see text below. Water policy currently applied in the Slovak Republic is based on Directive 2000/60 / EC of the European Parliament and of the Council of 23 October 2000, which established a framework for Community action in the field of water policy transposed into law no. 364/2004 Coll. on Waters, as amended. The water management policy of the Slovak Republic is drawn as a set of principles, priorities and instruments for the determination of effective measures, the correct application of which will lead to the achievement of environmental objectives for ensuring the

protection of water and its sustainable use by 2021, or by 2027. Another key document is the **Water plan of Slovakia** (update 2015) [36].

Regarding climate mitigation, the Slovak Republic submitted a proposal of the **Integrated National Energy and Climate Plan 2021-2030** [37] to the European Commission, where the country proposed a contribution of 19.2% to the renewable energy target. The Ministry of Economy of the Slovak Republic will take all available steps to further accelerate the development of RES, especially in heat production, between 2021 and 2030, and in 2030 the Slovak Republic is to approach a higher share of the use of renewable energy sources.

5.3. Regional

River basin management plans, including programs of measures, are a tool to achieve the objectives set out in the national water policy. On a regional level, the water policy for Bratislava is implemented by the **Management Plan of the Danube River Basin** [38] with milestones for implementation by 2021, or by 2027 elaborated as part of the Water plan of Slovakia [36].

The framework document “Orientation, principles and priorities of the Slovak Republic water management policy by 2027” identified the need for creating a so-called **Timetable and factual and communication plan for the 3rd cycle of river basins’ management plan preparation** [39]. It is the key current document of water policy implementation in Bratislava.

Urban-landscape study for protection against torrential rain in the Small Carpathian region [40] deals with the issue of torrential rainfall in the Bratislava self-governing region. The document maps available adaptation measures and proposes the further implementation of measures based on the manifestations of climate change based on torrential rainfall and precipitation data from the Small Carpathian region. The study is the basis for territorial development and decision-making processes at the regional level.

Framework for protection and use of surface and groundwater sources in Bratislava self-governing region, 2017 [41] deals with issues of groundwater resources management and their pollution within the Bratislava self-governing region. The concept also marginally addresses the issue of climate change manifestations in relation to threats affecting the quantity and quality of groundwater resources. The concept is the basis for territorial development and decision-making processes at the regional level.

5.4. Local

Land-use plan for Bratislava, capital of the Slovak Republic (2007) and later amendments no.1-7. The aim of the land-use plan is to systematically and comprehensively address the spatial arrangement and functional use of land and lay down its principles. It proposes the material and chronological coordination of activities, which influence the environment, ecological stability, and cultural-historical values of land, land development and landscape in accordance with the principles of sustainable development [42].

Program of Economic and Social Development of the capital city Bratislava for the years 2010-2020 (2009, a binding document approved by the City Council Regulation No. 1020/2010

in July /2010). The city of Bratislava is committed to addressing the issue of climate change and related appropriate adaptation measures since 2010 in the approved Program of Economic and Social Development for the years 2010-2020 (City Hall of Bratislava, 2009). In 2015, the programme was updated in terms of its financial aspects in 2015 and a binding document approved by the City Council Regulation no. 351/2015 on 10 December 2015). Several measures approved in the financial part relate or directly support adaptation and mitigation measures to adverse effects of climate change as well as protection and enhancement of cultural heritage [43].

Strategy of Adaptation to Adverse Impacts of Climate Change on the territory of Bratislava, capital of Slovak Republic (elaborated by the members of the project Steering Committee, City Hall, 2014). The strategy was elaborated by a Project Steering Committee. It consisted of a chairman, (the chief architect), and a number of other members, who are employees of Bratislava City Hall, i.e. representatives from the departments of strategy project management and financial resources, the environment, territorial system coordination, social affairs, transport, infrastructure etc., as well as representatives of scientific organizations (i.e. Geographical Institute of the Slovak Academy of Sciences and Comenius University in Bratislava) and non-governmental organizations [44].

The Strategy of Adaptation summarises potential risks and gives guidance for the prevention/mitigation of the consequences of climate change risks. It was approved by the deputies of the City Assembly in Bratislava in September 2014. The objective of the Strategy of Adaptation is to ensure appropriate mechanisms are available for the city to counter the increased risk of climate change impacts, reduce vulnerability by appropriate adaptation measures within individual sectors (areas), and provide the necessary information and tools to facilitate the process of decision making and management. It was complemented by the **Action Plan for adaptation to adverse impacts to climate change in Bratislava (2017)**, which contains 27 adaptation measures that are to be implemented and monitored in the period between 2017-2020 to support the implementation of the vision and goals of the Strategy for adaptation to climate change in Bratislava. It defines competent departments, organisations of the city, boroughs, as well as competencies, timelines and available/estimated financial resources. The different sectors are: health and wellbeing, social care, green and blue infrastructure, rainwater and drinking water resources, transport, urbanised areas, and energy [45]. Cultural heritage is not highlighted in the document; therefore, the new Action Plan for adaptation and mitigation should also for the first time put more focus on increasing the resilience of cultural heritage in addition to other sectors.

The existence of the strategy for adaptation since 2014 and action plan since 2017 indicates the municipality's established commitment to addressing climate impacts systematically. Given that the action plan concerns an implementation period until 2020, evaluation of its effectiveness and development of a new, follow-on plan should be a primary concern at present. A complementary exercise is the current work underway to update the City's existing Sustainable Energy Action Plan (SEAP) to a SECAP, incorporating priority adaptation actions with those for climate mitigation. Development of these new plans presents an opportunity to introduce cultural heritage as an area for explicit attention, which has not been the case so far.

The Paris Agreement sets out a framework of fundamental international significance for climate action at all levels of government, and hence warrants some reflection in terms of its relevance

at local level. It primarily targets climate mitigation, and directly addresses nation states, with a focus on nationally-determined contributions to emissions reduction by parties to the agreement. Article 7 and 8 of the agreement, however, deal explicitly with climate adaptation, and with the loss and damage associated with climate impacts.

Article 7 notes the following areas of cooperation between parties:

- (a) Sharing information, good practices, experiences and lessons learned, including, as appropriate, as these relate to science, planning, policies and implementation in relation to adaptation actions;*
- (b) Strengthening institutional arrangements, including those under the Convention that serve this Agreement, to support the synthesis of relevant information and knowledge, and the provision of technical support and guidance to Parties;*
- (c) Strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making;*
- (d) Assisting developing country Parties in identifying effective adaptation practices, adaptation needs, priorities, support provided and received for adaptation actions and efforts, and challenges and gaps, in a manner consistent with encouraging good practices; and*
- (e) Improving the effectiveness and durability of adaptation actions.*

Article 8 notes that ‘areas of cooperation and facilitation to enhance understanding, action and support may include:

- (a) Early warning systems;*
- (b) Emergency preparedness;*
- (c) Slow onset events;*
- (d) Events that may involve irreversible and permanent loss and damage;*
- (e) Comprehensive risk assessment and management;*
- (f) Risk insurance facilities, climate risk pooling and other insurance solutions;*
- (g) Non-economic losses; and*
- (h) Resilience of communities, livelihoods and ecosystems.*

The above fields of action can be understood as a framework in which all nations that are party to the Paris Agreement are expected to take action. In that sense, they are of limited

use as an implementation guide for local governments, however it can be assumed that such national governments are working to establish national policy frameworks for action that will in turn demand regional and local levels of government to implement complementary strategies. This current report was prepared at a time that the new Slovakian adaptation action plan was still under development, hence regard for the detail of this new forthcoming action plan will be of importance to local ongoing work to update vulnerability assessments and adaptation actions – in order to ensure that local objectives and strategies both serve and are supported by national ones.

6. Expected impacts of climate change-related and natural hazards

The purpose of this section is to report and review the preliminary collection of relevant information about hazards, exposed elements, as well as impacts provided by ARCH city partners in collaboration with their local research partners, in order to offer an initial overview on the risks that might affect the selected historic areas and their communities. This section is structured as follows: a description of the methodology is provided, followed by a Risk Profile Table, outlining hazards, exposed elements, impacts, and corresponding resilience-building measures already planned or implemented to date. Next follows a review, interpretation, and validation of the information provided in the Risk Profile Table. Finally, an outlook is provided concerning further risk analysis work in the context of the ARCH project.

6.1. Methodology

In order to elicit relevant information for risk analyses from city partners, ENEA, Fraunhofer, ICLEI, and Tecnia developed a Risk Profile Table template (see Part 6.2 below) based on the central risk components identified in the 5th Assessment Report of the Intergovernmental Panel on Climate Change: hazards, exposed elements, impacts (physical, societal, functional, economic, and intangible), as well as corresponding resilience-building measures already planned or implemented to date. This template was filled out by city partners and provides a starting point from which to conduct more detailed risk analyses. Furthermore, it serves as a starting point for the data, models, methods, and tools to be developed during the project.

The information provided in the Risk Profile Table was reviewed and harmonised by ENEA in order to provide a comparable description across all city cases and ensure relevance to (and validity for) similar on-going⁸ and/or future initiatives and projects in the field of disaster risk reduction, climate change adaptation, and cultural heritage preservation.

The following standards, reference material, and tools were identified as most suitable for this exercise:

⁸ E.g. United Nations Office for Disaster Risk Reduction: *Words into Action guidelines: National disaster risk assessment*. UNDRR, 2017. Online: <https://www.undrr.org/publication/words-action-guidelines-national-disaster-risk-assessment>

- The City Climate Hazard Taxonomy⁹ for classification of hazards;
- The UNDRR QRE Tool¹⁰ and ISO standard 37120 for the classification of exposed elements and impacts; and
- The ICOMOS CCHWG¹¹ classification and INSPIRE¹² directive for the classification of heritage assets.

Based on the harmonised information, initial proposals for risk analysis focus actions (e.g. which methods and tools to apply for which part/issue of a historic area) were formulated by ENEA. The initial proposals will be further defined during the co-creation process and in exchange with the relevant local stakeholders.

⁹ <https://www.c40.org/researches/city-climate-hazard-taxonomy>

¹⁰ <https://www.unisdr.org/campaign/resilientcities/toolkit/article/quick-risk-estimation-qre>

¹¹ https://adobeindd.com/view/publications/a9a551e3-3b23-4127-99fd-a7a80d91a29e/g18m/publication-web-resources/pdf/CCHWG_final_print.pdf

¹² INSPIRE, Infrastructure for Spatial Information in Europe D2.8.III.2 Data Specification on Buildings – Technical Guidelines (5.3.1.1.4. Classification of buildings, pages 43-45).

6.2. Risk profile table

Heritage site (historical area)	Hazard ¹³	Exposed element ¹⁴	Impacts					Corresponding resilience-building measure	Notes/Evidence
			Physical	Societal	Functional	Economic	Intangible	Description (please indicate specific S or general G)	
Monument preservation reserve (location: area in the historical city centre)	Pluvial flooding	Buildings (and architecture) and other tangible cultural heritage	Damage to buildings caused by flooding, moisture (especially underground levels)	Loss of access to services such as transport	Disruption to services, e.g. transport services or sewage system	Loss of tourism revenue due to a decrease in visitors	Loss of cultural heritage value resulting from physical damage	Action plan for adaptation to climate change in Bratislava – in place. (S and G)	[7] [46] [47] [48]
	Drought								
	Heatwave	Citizens and visitors	Increased morbidity of trees (drought/heatwave)	Need to shorten working hours due to unsuitable working conditions inside (heatwave)	Disruption to the operation of institutions,	Loss of business income due to damaged premises	Loss of heritage integrity of the area	Manual for public space – currently being developed at by MIB (Metropolitan Institute of Bratislava) (S and G)	
		Road network				Loss of income due to shortened working hours			
Celtic acropolis with roman architecture (location: Bratislava Castle area)	Pluvial flooding	Tangible cultural heritage – archaeological remains of the Celtic acropolis <i>in situ</i>	Damage to the archaeological remains	-	-	Disruption of tourism service provided on- site	Loss of cultural heritage value resulting from physical damage	limit the number of visitors allowed inside (to address humidity and resulting fungus growth caused by the breathing of many people)	[49] [50] [51]
	Drought								
	Heatwave								
Celtic kiln (location: in monumental reserve, underground)	Pluvial flooding – moisture entry and resulting fungal growth (interior)	Tangible cultural heritage (archaeological remains <i>in situ</i>)	Moisture/fungal damage to the kiln	-	-	Loss of tourism service provided on- site	Loss of cultural heritage value resulting from physical damage	Replacement of pavement on the courtyard above the kiln with a waterproof pavement with better spillway channels	[52] [53]

¹³ Note: the UN Office for Disaster Risk Reduction (UNDRR)'s Resilience Scorecard defines 'hazard' as 'a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation'. Of these, the ARCH project is addressing natural and climatic hazards.

¹⁴ Note: the UN Office for Disaster Risk Reduction's Resilience Scorecard defines 'exposure' as 'the situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas'.

Heritage site (historical area)	Hazard ¹³	Exposed element ¹⁴	Impacts					Corresponding resilience-building measure	Notes/Evidence
			Physical	Societal	Functional	Economic	Intangible	Description (please indicate specific S or general G)	
Devín Castle (in Devín city borough – not the city centre)	Pluvial flooding Drought Heatwave Slope movements & landslides Erosion NW winds	Buildings (and architecture), excavations, finds of objects and other tangible cultural heritage Citizens and visitors Local natural habitats	Erosion of dolomite cliff threatening loss of the upper castle Erosion of dolomite cliff combined with extreme rain and heat worsen the erosion of the castle walls	-	Damage to castle walls, underground caves and expositions Dolomite cliff disruptions (fissures and cracks) Loss of biodiversity Disruption of tourism service provided on-site Disruption of archaeological research	Loss and disruption of tourism service provided on- site	Loss of cultural heritage value resulting from the fall of the cliff	Controls introduced on amount of visitors allowed Conservation of damaged masonry Protection against humidity, wind and deterioration	[54]
St. James's chapel	Pluvial flooding – moisture entry (interior),	Tangible cultural heritage (archaeological remains <i>in situ</i>)	Moisture/fungal damage to the archaeological remains	-	-	-	Loss of cultural heritage value resulting from physical damage	Planned conservation activities after finishing archaeological research	[55] [56]
Celtic Metal casting and coin minting workshop, Panská Street 19	Pluvial flooding – moisture entry (interior),	Tangible cultural heritage (archaeological remains <i>in situ</i>)	Moisture/fungal damage to archaeological remains	The exhibition will be closed if there will be fungus	-	Disruption of tourism service provided on- site	Loss of cultural heritage value resulting from physical damage	Renovation of the wall plaster caused by the humidity- in the basement spaces, disinfection against fungus Planned activities from Bratislava City Gallery for the 2020 year, such as the reconstruction of the underground levels of buildings where the Celtic mint is being stored.	[57]
Fisherman's gate	Pluvial flooding and underground water – moisture entry (interior),	Tangible cultural heritage (archaeological remains <i>in situ</i>)	Moisture/fungal damage to archaeological remains of fortification walls and tower can cause erosion	The site was designed Europa Nostra heritage 2003	Possible damage to upper layers of the pedestrian zone, loss of tourist sight	Disruption of tourism service provided on- site	Loss of cultural heritage value resulting from physical damage	Protection against humidity and deterioration, Functional protection, planning of yearly management control from the site of the Old City Borough	[58]

6.3. Preliminary classification of hazards, exposed elements and impacts

The purpose of this section is to review, interpret, validate, and harmonise the information provided in the Risk Profile Table as a sound basis for the project to address Bratislava's risks to cultural heritage induced by climate change and other hazards. The section provides a preliminary, qualitative screening of:

- a) hazards;
- b) elements exposed to those hazard; and
- c) main impacts that the identified hazards might cause on the identified exposed elements.

The Risk Profile (Part 6.2 above) supported the identification of the elements mentioned above for different cultural heritage areas selected by Bratislava as a focus for the ARCH project, in two different boroughs, i.e. the **Old town city borough** and the **Devín city borough**.

Within the two selected boroughs, Bratislava City has a special interest in different cultural heritage areas, cultural landscapes, buildings and structures, as reported in Table 6.1 below:

Table 6.1. Cultural heritage areas, cultural landscapes, buildings and structures identified by Bratislava City as a focus for the ARCH project.

Old town city borough	Location
Monument preservation zone	Wider historical city centre, Old Town borough
Monument preservation reserve	Historical city centre, Old Town borough
Celtic acropolis with roman architecture	Bratislava Castle, Old Town borough
Celtic kiln	Monumental reserve, Old Town borough
St. James's chapel and charnel house	Monument preservation zone, Old Town borough
Celtic Metal casting and coin minting workshop	Monumental reserve, Old Town borough
Fisherman's Gate	Monument preservation zone. Old Town borough
Devin city borough	Location
Devín Castle	Devin borough

6.3.1. Hazards

Bratislava City is well aware of the hazards that are affecting the selected sites. Within the "Risk Profile Table" *pluvial flooding, droughts and heatwaves*, have been identified as the hazards affecting all the cultural heritage areas and elements of interest listed in Table 6.1 above.

The aforementioned extreme meteorological conditions are causing moisture to enter the buildings of interest (i.e. St. James's chapel and the Celtic Metal casting and coin minting workshop). This can be regarded as an induced-hazard. Further than *pluvial flooding, droughts*

and heatwaves, the Devín Castle is affected by slope movements and landslides, erosion and wind.

The hazard clusters identified in Bratislava, for the cultural heritage sites of interest include: ***Meteorological, Geophysical, Biological*** (see Table 6.2 below). Although not specifically reported within the Risk Profile Table, human-induced pollution is also included in Table 6.2 as a possible hazard that Bratislava might like to consider (this possibility was mentioned by the City of Bratislava during the ARCH project 1st General Assembly in June 2019).

Table 6.2. Hazard clusters and manifestations identified in Bratislava. Italic characters are used to identify hazards that, although not included in the Risk Profile Table, Bratislava might be interested to analyse.

Hazard Cluster	Hazards	Manifestations
Meteorological	Extreme precipitation	Pluvial flooding, heavy rain, heavy snow, monsoons, blizzards, hail
	Wind	Tornados, cyclones, severe winds
	Extreme heat	Heatwaves, droughts
Geophysical	Mass movements	Landslides, avalanches, rockfalls, subsidence
Biological	Pests and plagues	Moths, mites
	Fungi action	Moisture, mould
Human-induced	Pollution	Soil pollution, water pollution, air pollution

6.3.2. Exposed Elements

The exposed elements identified by Bratislava City within the Risk Profile Table are herein reorganised according to the following categories:

- Natural Environment;
- Built Environment: critical Infrastructures and Buildings;
- Cultural heritage;
- Services (essential or basics and productive);
- Human and social aspects.

In Table 6.3, the cultural heritage category subsumes all exposed elements that are in themselves heritage, i.e. exposed elements declared as heritage are only categories as such and not as any of the other categories.

Table 6.3. Exposed elements identified in Bratislava.

Exposed Element Categories	Exposed Element Types
Natural Environment	Ecosystem
	Urban greenery
Built Environment	Buildings and architecture
	Road, railroad and other critical infrastructures
Cultural Heritage	Tangible cultural heritage
	Intangible elements
	Archaeological remains
Services, essential and productive	Essential and basics services
	Productive services
Human and Social Aspects	External people (e.g. tourists,)
	Local people

Table 6.4 reports in further detail the exposed elements categorised as cultural heritage. Here, reference has been made to the six categories identified by the ICOMOS Climate Change and Cultural Heritage Working Group, CCHWG (2019). In Bratislava, exposed cultural heritage elements include: archaeological resources, such as archaeological finds and archaeological sites (i.e. Celtic acropolis with Roman architecture, Celtic Metal casting and coin minting workshop, Celtic kiln); buildings and architectural structures (i.e. Devín Castle, St. James's chapel) and groups of separate or connected buildings (i.e. Monument preservation zone); cultural landscapes, such as combined works of nature and humankind (i.e. Monument preservation reserve). Intangible heritage is also mentioned in the Risk Profile Table, however, the kinds of intangible heritage are not specified (see Table 6.4 for possible kinds).

Table 6.4. Exposed cultural heritage elements identified in Bratislava (highlighted in bold), and further cultural heritage categories and types identified in the ARCH project, that Bratislava City might like to consider.

Exposed Cultural Heritage Categories	Exposed Cultural Heritage Types
Moveable heritage	works of monumental sculpture and painting
Archaeological resources	archaeological finds
	archeological materials
	archaeological sites
	archeological monuments
	stratigraphic tests
	stratigraphic finds
Buildings and structures	architecture (castle, chapel, workshop)
	groups of separate or connected buildings
	historical nuclei
Cultural landscapes	parks/gardens
	combined works of nature and humankind
Associated and traditional communities	
Intangible heritage	oral traditions
	performing arts

	social practices
	rituals
	festive events
	knowledge and skills to produce traditional crafts
	knowledge and practices concerning nature and universe

6.3.3. Impacts

The identification of impacts in the Risk Profile Table for Bratislava is quite exhaustive.

Table 6.5 below reports, in a concise way, the different impacts identified for the five categories of impacts, included in the Risk Profile Table (i.e. Physical, Functional, Societal, Economic and Intangible) for the different exposed elements categorised according to the classification reported in Table 6.3.

Table 6.5. Physical, Functional, Societal, Economic and Intangible impacts identified in Bratislava for the different exposed elements.

Exposed Element		Physical	Functional	Societal	Economic	Intangible
Natural Environment	Ecosystem	Loss of biodiversity				
	Urban greenery	Increased morbidity of trees	Loss of protection against erosions			
Built Environment	Buildings and architecture	Damage to buildings due to flooding (especially underground levels)			Loss of business income due to damaged premises	
	Road and other critical infrastructures	Flooding of urban road and paths	Outage of critical services			
Cultural Heritage	Tangible cultural heritage	Moisture and fungus cause damage			Loss of tourism revenue due to decrease in visitors	Loss of cultural Values
	Archaeological remains					
	Intangible elements					
Services, essential and productive	Essential and basics services			Reduced /Loss of access to critical services		
	Productive services					
Human and Social Aspects	External people (e.g. tourists,)					
	Local people		Non-suitable	Fewer working hours due	Loss of income due to	

Exposed Element	Physical	Functional	Societal	Economic	Intangible
		working conditions in office and working buildings due to heatwaves	to not suitable working conditions	shortened working hours	

6.4. Outlook and implications for future ARCH work

As stated in Chapter 5 of this report, the “new action plan to adverse climate change-induced impacts in Bratislava” will put more focus on increasing the resilience of cultural heritage. The on-going and planned work within the ARCH project can provide critical and operative inputs to inform and support the implementation of such an action plan.

Towards that and following up on the information provided in the Risk Profile Table at Part 6.2 above, ARCH work for Bratislava City is envisaged to be conducted at different levels of analysis for the different exposed elements identified in Bratislava.

Table 6.6 below provides initial ideas of possible examples of the work that can be undertaken as part of the ARCH project. What is proposed in Table 6.6 will need, of course, to be discussed and agreed with Bratislava City and ARCH research partners; and will be subject to data availability¹⁵.

Table 6.6. Possible analysis and possible tools to be implemented for ARCH work in Bratislava City.

Boundaries of Study Areas	Possible Analysis	Possible Tools
Bratislava City & Suburbs (including Old Town City, Devín city boroughs).	Impact Chain Analysis Thematic maps	IVAVIA impact chain creator (Adapted for ARCH) ARCH DSS (i.e. CIPCast)
Old Town City borough	Scenario simulations	ARCH DSS
<ul style="list-style-type: none"> - Monument preservation zone - Monument preservation reserve - Celtic acropolis with roman architecture 	Scenario simulations with dynamic data integration from sensors and satellite images	ARCH DSS Satellite Images and Sensors

¹⁵ In regard to the latter, some preliminary information has already been provided by Bratislava City, in response to a questionnaire developed by scientific partner INGV and distributed to all ARCH city partners in October 2019.

Boundaries of Study Areas	Possible Analysis	Possible Tools
<ul style="list-style-type: none"> - St. James's Chapel, - Devín Castle - Celtic Kiln - Fisherman's Gate 	3D Building model with identified damage pattern and dynamic monitoring of damage Finite element analysis of the buildings to support retrofitting interventions	Sensors Photogrammetry 3D models

As for a large-scale territorial analysis (i.e. covering the whole Bratislava City & city boroughs), it may be possible to build on previous data collected as part of an earlier project RESIN¹⁶, where Bratislava conducted risk analysis supported by ARCH consortium partner Fraunhofer, as well as to make use of the indexes defined in RESIN, which have been summarised for Bratislava into an ad-hoc Atlas. Also, starting from the Bratislava case study, that already used it, it would be great to adapt the IVAVIA risk-based vulnerability assessment methodology¹⁷ that was conceived and defined as part of the RESIN project, to the proposed objectives of ARCH.

Towards that, it would be necessary to expand the hazards and the exposed elements that, currently, IVAVIA considers. As an example, for the implementation of IVAVIA in Bratislava mainly meteorological hazards were considered with special focus on precipitation and temperature; as far as the exposed elements and possible induced impact on them, main focus was on critical infrastructures and on vulnerable people.

For its use in Bratislava and more generally in the whole ARCH project, the possibility to analyse the impacts induced by further hazards (i.e. geophysical, biological and human-induced hazards as far as Bratislava is concerned) would need to be embedded into IVAVIA as well as the possibility to have a special focus on:

- further exposed elements and especially on cultural heritage exposed elements (both tangible and intangible, listed in Table 6.4) and
- direct and indirect/cascading impacts (both tangible and intangible) that climate change and other hazards might induce on cultural heritage exposed elements.

As a first step, of the adaptation process of IVAVIA to ARCH, a possibility could be to use Table 6.5 of this report as a reference to support a co-creation discussion with Bratislava stakeholders to expand on the possible expected impacts; information in several cells in Table 6.5 is still missing.

¹⁶ See more at <https://resin-cities.eu/home/>

¹⁷ See more at <https://resin-cities.eu/resources/ivavia/>

7. Preliminary resilience assessment

The following resilience assessment was developed using the preliminary version of the UNDRR Disaster Resilience Scorecard for Cities. The preliminary assessment was conducted within the framework of a webinar between the municipality of Bratislava, MÚOP, and Fraunhofer on January 28, 2020. As the original Scorecard is aimed at city-level, not all questions were immediately applicable on the level of historic areas or single heritage assets. Wherever possible, answers were provided for the historic areas under examination (e.g. with regard to hazard scenarios). For all other questions, answers were provided on city-level (e.g. with regard to city masterplans). The results give a first indication of the overall resilience of the city with some – but not exclusive – focus on the historic areas examined by ARCH. In addition, the application of the Scorecard will be used as input for the development of the ARCH Resilience Assessment Framework specifically focused on historic areas. Lastly, the preliminary resilience assessment results presented in the baseline reports should not be employed to develop resilience action plans, as not all necessary stakeholder groups were involved in the assessment process.

7.1. Essential 01: Organize for resilience

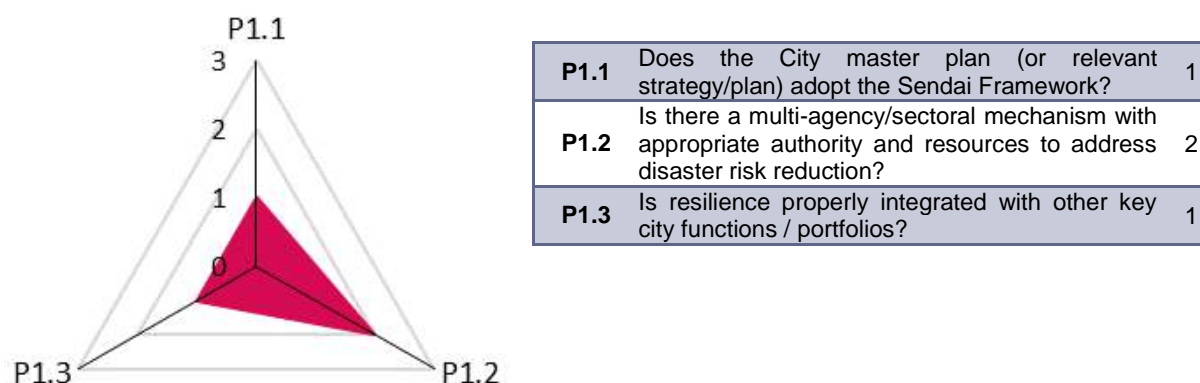


Figure 7.1. Results Essential 01.

Regarding Essential 01, Bratislava achieves a resilience score of 3/9. While the city has a master plan, it is not compliant with the Sendai Framework. Instead, there is an additional regional DRR plan for Bratislava consisting of emergency instructions, which is - as all Slovak Republic DRM plans - compliant with Decision No. 1313/2013/EU of the European Parliament (score of 1 for P1.1). Organisation and coordination for DRR is well addressed; all lead agency teams are well established, properly resourced and with authority to act, but there is no consistency in the resourcing of the main DRR stages (score of 2 for P1.2). Lastly, resilience is only integrated into other key city functions on an ad hoc basis during or after a disastrous event (score of 1 for P1.3).

7.2. Essential 02: Identify, understand and use current and future risk scenarios

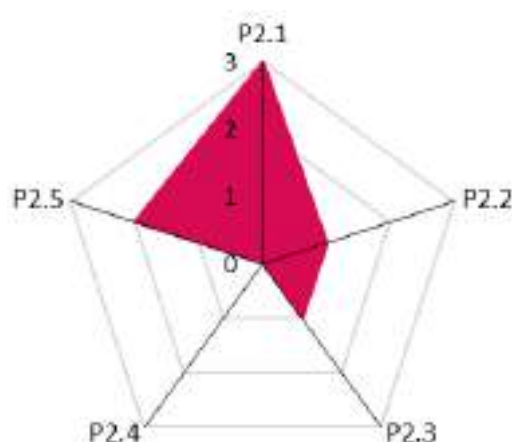


Figure 7.2. Results Essential 02.

P2.1	Does the city have knowledge of the key hazards that the city faces, and their likelihood of occurrence?	3
P2.2	Is there a shared understanding of risks between the city and various utility providers and other regional and national agencies that have a role in managing infrastructure such as power, water, roads and trains, of the points of stress on the system and city scale risks?	1
P2.3	Are their agreed scenarios setting out city-wide exposure and vulnerability from each hazard, or groups of hazards (see above)?	1
P2.4	Is there a collective understanding of potentially cascading failures between different city and infrastructure systems, under different scenarios?	0
P2.5	Do clear hazard maps and data on risk exist? Are these regularly updated?	2

For Essential 02, Bratislava achieves a resilience score of 7/15. The city understands its main hazards and has a well-established monitoring network. Depending on the hazard, related data are periodically updated and maintained by related industries / stakeholders. For example, the city's air pollution data is monitored every hour. The data is monitored and published by the Slovak Hydrometeorological Institute, and large and medium-sized polluters, like oil refinery and car manufactures, regularly share their pollution data with the city. Furthermore, climate change impact data will be available this year (score of 3 for P2.1). Individual system risks are known by the respective utility providers, but not systematically shared in a forum among relevant stakeholder groups in order to understand cascading effects. Furthermore, risks are not defined for heritage sites (score of 1 for P2.2). Due to the application of the IVAVIA assessment in the H2020 RESIN project, single disaster scenario information are available for some hazards. In general, for heritage sites, Slovak Republic recommends procedures in case of emergencies (score of 1 for P2.3). There is no general analysis and understanding of cascading effects and impacts (score of 0 for P2.4). Hazard maps will be published in a risk atlas and shall be updated regularly afterwards (score of 2 for P2.5).

7.3. Essential 03: Strengthen financial capacity for resilience

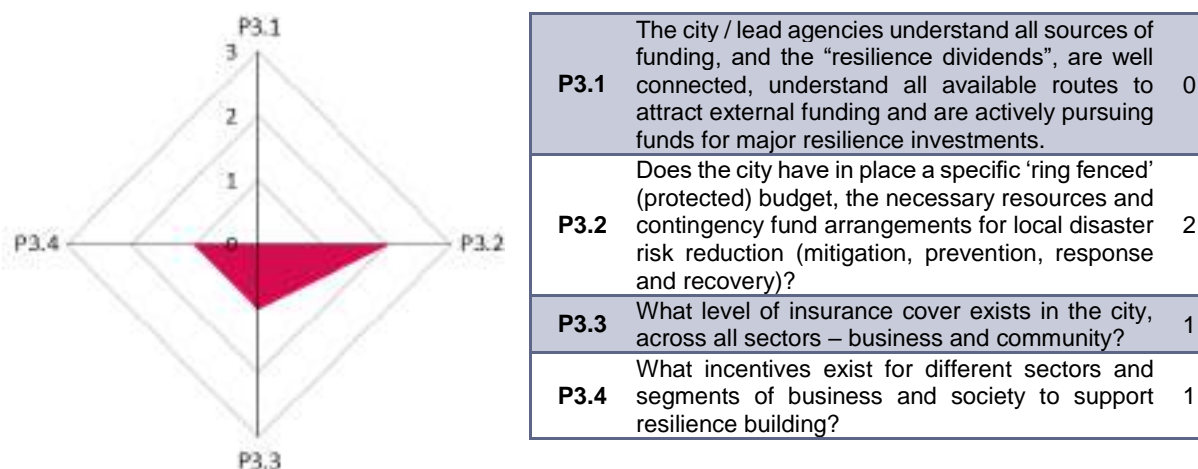


Figure 7.3. Results Essential 03.

For Essential 03 Bratislava achieves a resilience score of 4/12, which indicates room for improvement. Currently, there is little knowledge about available funding approaches for resilience measures. While there is a multi-level DRM structure (national, regional, and municipal), any resources for funding are usually only pursued on the national level with the local agencies having only a limited awareness of additional funding opportunities (score of 0 for P3.1). The city financial plan allows for DRR activities. Enough budget is available for civil protection and crisis management coordination, supported by finance measures of the state for reconstruction (score of 2 for P3.2). The level of insurance coverage varies significantly by sector (score of 1 for P3.3). Only a limited number of incentives for the support of resilience-building exist, such as small grants for sustainable drainage systems for private households (up to 1000 € per applicant) or the environmental grant programmes of the Bratislava regional authority (up to 12 000€ per application) (score of 1 for P3.4).

7.4. Essential 04: Pursue resilient urban development

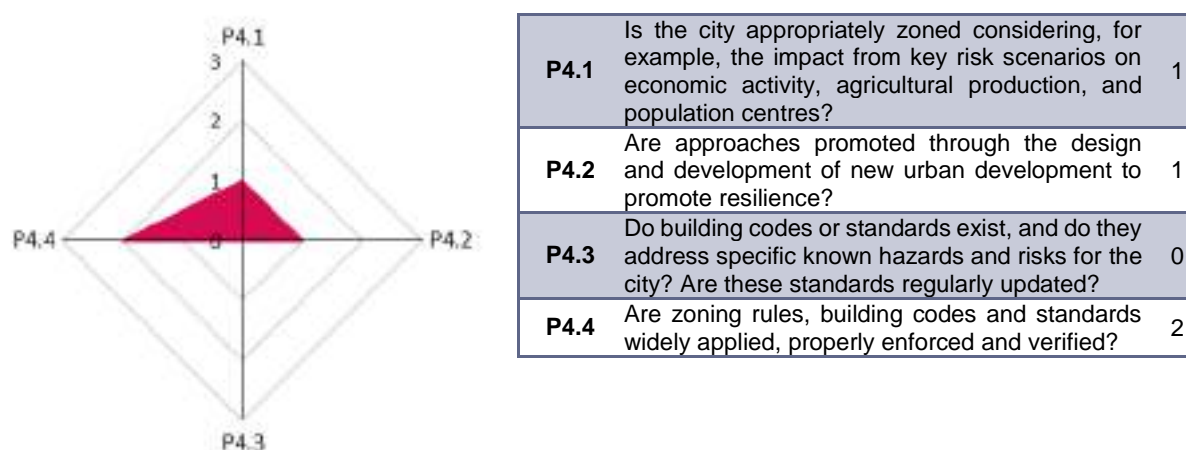


Figure 7.4. Results Essential 04.

Regarding Essential 04, Bratislava achieves a resilience score of 4/12, which leaves room for improvement. Zoning plans exist for the city and the boroughs; hazard and risk analysis is conducted by the Ministry of Interior as well as regional authorities for the municipalities. However, a more detailed and small-scale land-use zoning plan is needed for the heritage sites (score of 1 for P4.1). Resilience approaches for new urban developments are promoted, but only in an inconsistent way. Since the law on building codes does not support actions for resilience against climate change, the city is only able to give recommendations for appropriate urban development approaches. For the development of heritage sites, a different law, the law of heritage protection is applied (Act 49/2002 Coll. By the National Council of the Slovak Republic) (score of 1 for P4.2). There are no relevant building codes and standards that address any specific hazards of the city, which is furthermore a state-wide problem (score of 0 for P4.3). Zoning rules and building codes and standards are applied and enforced in more than half of the occurring cases in the city, but these are often not properly enforced (score of 2 for P4.4).

7.5. Essential 05: Safeguard natural buffers to enhance the protective functions offered by natural ecosystems

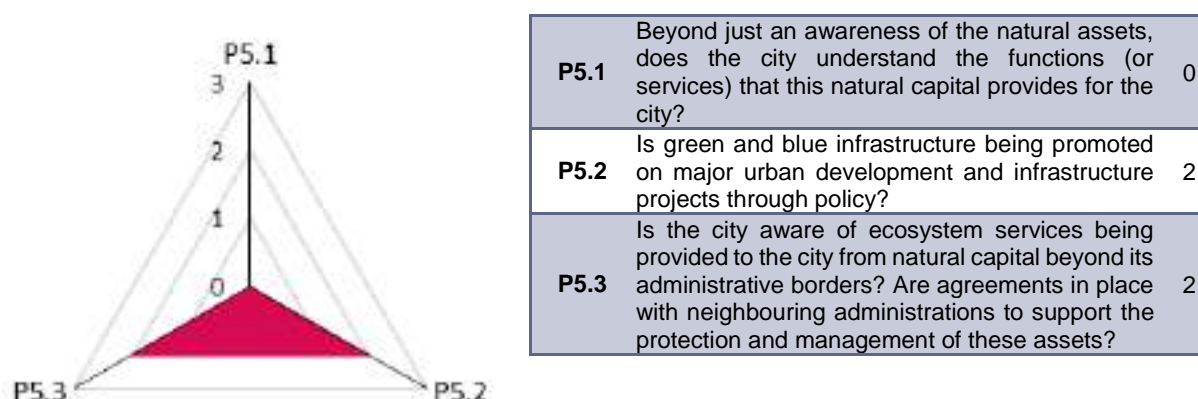


Figure 7.5. Results Essential 05.

For Essential 05 Bratislava reaches a score of 4/9. The city has showcased until recently little awareness and understanding of the functions and services that natural capital provides for it (score of 0 for P5.1), amongst topics such as mobility and development. However, green and blue infrastructure are getting more and more integrated and promoted through city policy for the past two years; for example, a report on urban greenery was developed, and a manual for greenery is currently under development as well as an Action plan for adaptation to climate change was adopted in 2017 (score of 2 for P5.2). The city is aware of the functions provided by natural capital beyond the city administrative border, and it cooperates well with neighbouring administrations such as the Bratislava regional authority, regional office of state nature conservancy and the transboundary national park protection (SK-AT-HU) (score of 2 for P5.3).

7.6. Essential 06: Strengthen institutional capacity for resilience

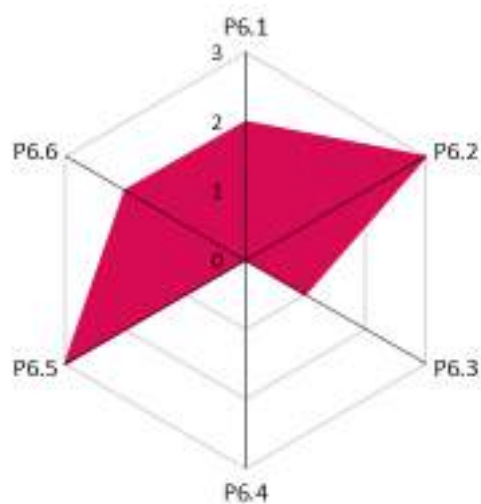


Figure 7.6. Results Essential 06.

P6.1	Does the city have clear access to all the skills and experience it believes it would need to respond to reduce risks and respond to identified disaster scenarios?	2
P6.2	Does a co-ordinated public relations and education campaign exist, with structured messaging and channels to ensure hazard, risk and disaster information (that can be understood and used) are properly disseminated to the public?	3
P6.3	Extent to which data on the city's resilience context is shared with other organizations involved with the city's resilience.	1
P6.4	Are there training courses covering risk and resilience issues offered to all sectors of the city including government, business, NGOs and community?	0
P6.5	Are training materials available in the majority of languages in common use in the city?	3
P6.6	Is the city proactively seeking to exchange knowledge and learn from other cities facing similar challenges?	2

Regarding Essential 06, Bratislava achieves a score of 11/18. The city can quickly access most of the skills required to identify and respond to identified disaster scenarios. In general, the coordination and organisation of risk responses is designed in a multi-level governance fashion; from state ministries and regional authorities to municipalities and city boroughs (score of 2 for P6.1). This also ensures proper dissemination of hazard, risk, and disaster information via fully co-ordinated campaigns (score of 3 for P6.2). Up to now, some of the city's data layers are shared, e.g. via the risk atlas. A department for data management & policy was created mid-2019 and is in charge of creating a data portal and providing interpretations (score of 1 for P6.3). Training materials are available in the common language Slovak for all city hall employees (score of 3 for P6.5). Bratislava understands the importance of sharing knowledge with other cities and is involved in regional networks (score of 2 for P6.6).

7.7. Essential 07: Understand and strengthen societal capacity for resilience

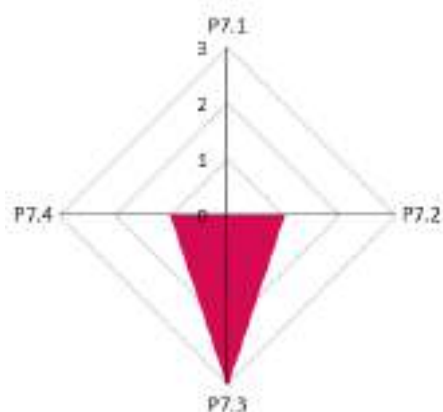


Figure 7.7. Results Essential 07.

P7.1	Are "grassroots" or community organizations participating in risk reduction and post-event response for each neighbourhood in the city?	0
P7.2	Are there regular training programmes provided to the most vulnerable populations in the city?	1
P7.3	What proportion of businesses have a documented business continuity plan that has been reviewed within the last 18 months?	3
P7.4	How effective is the city at citizen engagement and communications in relation to DRR?	1

Bratislava achieves a score of 5/12 for Essential 07, which partly offers space for improvement. There is very little involvement from grassroots organisations in the city for risk reduction and post-event responses due to the low number of severe disasters in the last years (score of 0 for P7.1). However, there are NGOs taking care of climate change adaptation and decarbonisation. There are no training programs provided to the most vulnerable populations in the city (score of 1 for P7.2). A large share (60 – 100%) of mostly larger corporations and businesses have documented and usually very comprehensive business continuity plans (score 3 for P7.3). The city engages citizens and communicates DRR via some channels such as the National Integrated Rescue System (IRS), which provides information in the event of threats to life, property, or the environment (score of 1 for P7.4).

7.8. Essential 08: Increase infrastructure resilience



Figure 7.8. Results Essential 08.

P8.1	Is critical infrastructure resilience a city priority, does the city own and implement a critical infrastructure plan or strategy?	1
P8.2	Is existing protective infrastructure well-designed and well-built based on risk information?	0
P8.3	Would a significant loss of service for these two essential services be expected for a significant proportion of the city under the agreed disaster scenarios?	-
P8.4	Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would energy infrastructure corridors remain safe (i.e. free from risk of leaks, electrocution hazards etc.)?	1
P8.5	Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would transport infrastructure corridors remain safe (i.e. free from risk of flood, shocks etc.) and passable?	1
P8.6	Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event?	3
P8.7	Would there be sufficient acute healthcare capabilities to deal with expected major injuries in 'worst case' scenario?	3
P8.8	% of education structures at risk of damage from "most probable" and "most severe" scenarios	3
P8.9	Will there be sufficient first responder equipment, with military or civilian back up as required?	0

For Essential 08, Bratislava reached a score of 10/27 leaving major room for improvement. The city understands the risks for some major infrastructure types; however, CI operators use only their forums to exchange on risks and cascading effects (score of 1 for P8.1). Significant parts of the city are unprotected from known risks and hazards, e.g. there is no protection from pluvial flooding (score of 0 for P8.2).

For the preliminary assessment, there was no available information with regard to loss of service for the water (potable and sanitation) infrastructure (score of - for P8.3) and only very

limited information with regard to the loss of service for the energy infrastructure (score of 1 for P8.4). These areas will need to be revisited during a more detailed assessment.

From the most probable scenario, pluvial flooding, some loss of service would be expected for the transport infrastructure (score of 1 for P8.5), but no loss of service for communication infrastructure (score of 3 for P8.6). The healthcare and education systems of Bratislava are well-positioned to deal with the hazards faced by the municipality as more than 90% of major injuries can be treated within six hours under the “most severe” scenario (score of 3 for P8.7), and no teaching facilities would be at risk under the “most probable” scenario (score of 2 for P8.8). Lastly, Bratislava’s first responders are not well equipped to deal with the “most probable” scenario (score of 0 for P8.9). This is contrary to the national rescue system that is very well prepared and equipped.

7.9. Essential 09: Ensure effective disaster response

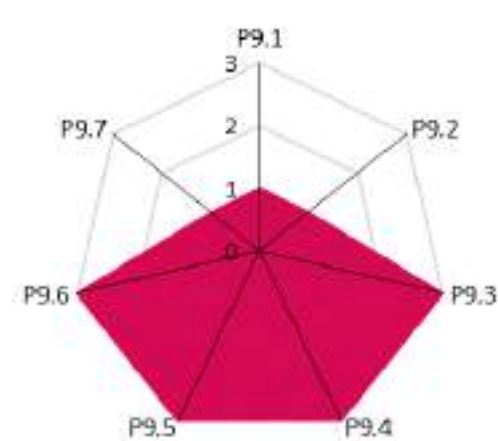


Figure 7.9. Results Essential 09.

P9.1	Does the city have a plan or standard operating procedure to act on early warnings and forecasts? What proportion of the population is reachable by early warning system?	1
P9.2	Is there a disaster management / preparedness / emergency response plan outlining city mitigation, preparedness and response to local emergencies?	1
P9.3	Does the responsible disaster management authority have sufficient staffing capacity to support first responder duties in surge event scenario?	3
P9.4	Are equipment and supply needs, as well as the availability of equipment, clearly defined?	3
P9.5	Would the city be able to continue to feed and shelter its population post-event?	3
P9.6	Is there an emergency operation centre, with participation from all agencies, automating standard operating procedures specifically designed to deal with “most probable” and “most severe” scenarios?	3
P9.7	Do practices and drills involve both the public and professionals?	1

For Essential 09 Bratislava achieves a resilience score of 15/21. The early warning systems of the city can reach over half of the population via different channels such as sirens, smartphone applications, radio stations, TV, websites (score of 1 for P9.1). The Slovak state legislation provides acts on, e.g. protection of civilians, management of the state in conflicts etc. Furthermore, the Ministry of Interior of the Slovak Republic provides an emergency response handbook. However, the acts and plans are not joined up (score of 1 for P9.2). The responsible disaster management authorities have sufficient staffing capacity, on the national as well as the regional level (score of 3 for P9.3). In addition, the equipment and relief supply needs are clearly defined (score of 3 for P9.4), and the necessary supplies of food and basic relief items exceeds estimated needs under the “most severe” scenario. These are provided by city boroughs – via general and special shelters – which are coordinated on city level (score of 3 for P9.5). The city boroughs are coordinated by city crisis committees that are able to deal with the “most severe” scenario (score of 3 for P9.6). Lastly, according to Act 42/1994, several practices and drills are designed and performed for a few scenarios (score of 1 for P9.7).

7.10. Essential 10: Expedite recovery and build back better

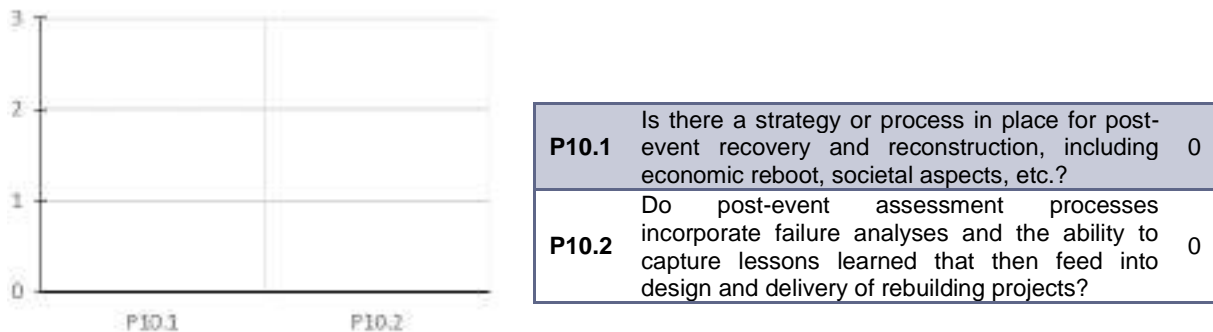


Figure 7.10. Results Essential 10.

For Essential 10, Bratislava achieves a score of 0/6 leaving a lot of room for improvement. There are no processes or strategies in place for post-event recovery and reconstruction; solutions and lessons-learned are unplanned and are usually on an ad-hoc basis (score 0 for P10.1 and P10.2).

7.11. Overall resilience of Bratislava



Figure 7.11. Combined results for Essential 01-10 for Bratislava.

Overall, Bratislava achieves a resilience score of 66/141 with significant room for improvement in all Essentials, except for Essential 06 and Essential 09.

Bratislava has good institutional capacity for supporting in case of emergencies. Due to the national and regional institutional structures, an emergency response is provided in a fast manner and with sufficient resources. However, there is potential for using available data for planning future scenarios and evaluating cascading effects. There are several legislative acts for disaster response and existing emergency plans, but these could be combined to plan and structure emergency responses in a more comprehensive way. There is room for further evaluation and application of resilience

actions for the city and its infrastructure. Especially for the heritage sites, there is a great potential for defining, planning and incorporating resilience actions.

8. Conclusions

The tangible and intangible heritage of Bratislava covers architectural, monumental, archaeological, and natural heritage. It is characterized by complex settlement arrangements with a high density of cultural monuments, which are mainly at risk from pluvial flooding, erosion, heatwaves and other extreme weather events. For the ARCH project, Bratislava City has proposed the following study sites: the medieval town centre which gained the status of monument preservation reserve in 1995, the unique Devin Castle on the dolomite cliff above the Danube River, and Celto-Roman structures on the Bratislava Castle hill. Findings from the research that will be undertaken at the monument preservation reserve (protecting the wider city core since 1992) and findings from the Devin Castle can be transferred to other outdoor tangible heritage sites such as the antique Gerulata castellum. The research sites are impacted by different hazards and represent different categories of exposed objects (not only in terms of size): Natural Environment, Built Environment: critical Infrastructures and Buildings; Cultural heritage; Services (essential or basics and productive); local population and visitors to Bratislava.

The historical monument preservation reserve is greatly threatened by pluvial flooding, as the majority of objects are preserved in situ. Additional threats come from moisture and humidity, and there is a risk of closing the sights to the public as it could pose danger visitors in addition to the monuments. At Devin castle, it is unknown how much time is left for the cliff to finally erode to the extent that the castle will have to be closed for visitors. The remaining castle walls are also threatened by the cliff movement as well as by the rapidly changing temperatures. It would be useful for the Bratislava City Museum, Bratislava City, and the Devín city borough to know the trends of rock erosion and how they may be affected by different climate change scenarios. This helps the stakeholders determine which adaptation measures are most suitable and to what extent they need to be implemented. Therefore, developing adaptation pathways for the mitigation of the currently non-ideal situation at the historical monument reserve and the mitigation of erosion at the Devin Castle are priorities for the City and its stakeholders. (Municipal Monument Preservation Institute, Bratislava City Gallery and Bratislava City Museum).

After carrying out a first vulnerability assessment in 2018 to prioritise the most vulnerable sectors and population groups, a second risk-oriented vulnerability assessment was undertaken as part of a previous Horizon 2020 project (RESIN), which analysed the impacts of recent heatwaves and pluvial flooding on the population and selected critical infrastructure. Bratislava would like to take a further step and focus on additional sectors, such as cultural heritage protection, to be able to adapt the historical centre and other valuable tangible cultural heritage sites to the impacts of future scenarios of climate change. The current Action Plan for Climate Change Adaptation reaches the end of its term in 2020, and a new Action Plan is already under preparation. The preparation phase of the Action Plan provides a good opportunity for testing and co-creating the tools of the ARCH project.

This report has identified gaps between the governance frameworks reviewed, such as the absence of direct links between cultural heritage and climate change adaptation. The updated national strategy for adaptation to climate change and the forthcoming Action Plan for adaptation raise the topic of cultural heritage protection as well as the absence of relevant

legal tools for enforcing adaptation measures by local authorities. One possible solution to this would be a new act on climate change adaptation and the mitigation of impacts. This would also, to a certain extent, amend existing legislation on building and construction, spatial planning, cultural heritage protection and others.

As Bratislava has been growing along the banks of the Danube River for centuries, it has sometimes had a “troubled relationship” with this international river. The City has often been threatened by floods from the Danube, which led to the fortification of flooding barriers against a 100-year flood in Devin city borough and against a 1000-year flood in the historical centre. The overall topic of fluvial flooding and the resulting disaster risk management is very well elaborated in the existing governance frameworks on all levels of governance (also including compensation mechanisms). However, similar policies should be developed to help prevent and deal with other hazards caused by climate change – especially pluvial flooding from intensive rainfall and heatwaves. There is room for further evaluation and application of resilience actions for the city, its population, cultural heritage and infrastructure.

In the field of adaptation to negative impacts of climate change, the first meetings with local stakeholders launched under the umbrella of the ARCH project identified a future need for a paradigm shift in cultural heritage protection. This is because adaptation measures need to be implemented in order to ensure and make historical centres places worth living, working and visiting even during very hot days and nights. Suitable adaptation measures can also help preserve cultural heritage and increase its resilience to climate change impacts of greater intensity in the future.

Bratislava City, together with its municipal organisations and its local stakeholders, have a reasonable amount of knowledge, experience and data that can be provided to facilitate the process of evaluating the cascading effects of climate change impacts on (not only) cultural heritage sites, planning adaptation pathways and choosing the appropriate resilience actions.

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10. Annex

10.1. Key documents governing cultural heritage management (See Chapter 3)

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future revision/update	Link (if available)	Summary of content
Convention for the Protection of the Architectural Heritage of Europe	Agreement	International	Binding	Council of Europe	1987		https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/121	Legally binding instrument which sets the framework for an accurate conservation approach within Europe. The main purpose of the Convention is to reinforce and promote policies for the conservation and enhancement of Europe's heritage.
European Landscape Convention	Agreement	International	Binding	Council of Europe	2000		https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/143	Promotes the protection, management and planning of the landscapes and organizes international co-operation on landscape issues. Aware that the landscape contributes to the formation of local cultures and that it is a basic component of the European natural and cultural heritage, contributing to human well-being and consolidation of the European identity

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future revision/update	Link (if available)	Summary of content
European Convention on the Protection of the Archaeological Heritage (Revised)	Agreement	International	Binding	Council of Europe	1995		https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/143	This revised Convention updates the provisions of a previous Convention adopted by the Council of Europe in 1969. The new text makes the conservation and enhancement of the archaeological heritage one of the goals of urban and regional planning policies. It is concerned in particular with arrangements to be made for co-operation among archaeologists and town and regional planners in order to ensure optimum conservation of archaeological heritage.
Convention on the Protection of the Underwater Cultural Heritage	Agreement	International	Binding	UNESCO	2001		https://unesdoc.unesco.org/ark:/48223/pf0000126065	Intended to enable States to better protect their submerged cultural heritage. provides widely recognised practical rules for the treatment and research of underwater cultural heritage.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future revision/update	Link (if available)	Summary of content
Convention Concerning the Protection of the World Cultural and Natural Heritage	Agreement	International	Binding	UNESCO	1972		https://whc.unesco.org/en/conventiontext/	Provides a permanent framework – legal, administrative and financial – for international cooperation in safeguarding humankind’s cultural and natural heritage and introduces the specific notion of a “world heritage” whose importance transcends all political and geographic boundaries.
Convention for the Safeguarding of the Intangible Cultural Heritage	Agreement	International	Non-binding	UNESCO	2003		https://ich.unesco.org/en/convention	Considers the importance of intangible cultural heritage as a mainspring of cultural diversity and a guarantee of sustainable development. It recognizes that the processes of globalization and social transformation, alongside the conditions they create for renewed dialogue among communities, also give rise to grave threats of deterioration, disappearance and destruction of the intangible cultural heritage, in particular owing to a lack of resources for safeguarding such heritage

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future revision/update	Link (if available)	Summary of content
Declaration of the National Council of the Slovak Republic on the protection of cultural heritage	Policy/regulation	National	Binding	The National Council of the Slovak Republic	2001		https://www.nrsr.sk/web/?sid=nrsr/dokumenty/vyhlasenia	Recognizes that cultural values created by previous generations are threatened by natural causes of deterioration and decay, changes in lifestyle, transformation of social and economic conditions, decline and disappearance of traditional crafts and techniques, and the application of technologies which are often incompatible with the nature of these cultural assets.
Strategy for the Conservation of Monuments	strategy	national	binding	Ministry of Culture of the Slovak Republic	2017	2023	http://www.culture.gov.sk/extdoc/7244/Strategia_ochrany_pamiatkoveho_fondu_2017-2022	aims to create such conditions and tools for the protection of monuments, which will guarantee their authenticity and integrity under current conditions, and which will contribute to improving the construction and technical condition of the heritage fund. In the area of territorial protection, it mainly promotes cultural heritage protection interests through spatial planning tools.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future revision/update	Link (if available)	Summary of content
Guideline of the Ministry of Culture of the Slovak Republic on the protection of national cultural monuments in crisis situations	guideline/regulation	national	binding	Ministry of Culture of the Slovak Republic	2008		https://www.pamiatky.sk/Content/Data/Fiile/pamiatkovy_vyskum/MK-30102008-1011546.pdf	Regulates the procedure of legal entities and natural persons responsible for the special protection of movable national cultural monuments in the context of preparation for crisis situations; and during crisis situations.
Strategy for Development of Local and Regional Culture and Culture of National Minorities of the Slovak Republic by 2030	strategy/policy	regional	binding	Ministry of Culture of the Slovak Republic	2019	2030	https://www.slovlex.sk/legislativne-procesy/SK/LP/2019/471	The main priorities include improving the quality of public libraries, creating a legislative framework to ensure the support of cultures of national minorities, creating tools for coordinating and optimizing the performance of professional activities of regional cultural institutions, expanding regional activities of departmental organizations and intensifying the heritage.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future revision/update	Link (if available)	Summary of content
Development Strategy for Culture in the Bratislava self-governing region for years 2015-2020	strategy	regional	binding	The Bratislava self-governing region	2015	2020	https://portal.egov.r egion- bsk.sk/c/document_l ibrary/get_file?groupId=20182&fileEntryId=94896	
Framework for development of culture in Bratislava	strategy/policy	local	non-binding	Bratislava	2016			
Cultural policy concept of Bratislava-Staré Mesto	strategy/policy	local	binding	Bratislava-Staré Mesto	2016	2020	https://www.stare mesto.sk/data/MediaLibrary/32/32119/Koncepcia_kultura_2016.pdf	Cultural policy concept of Bratislava-Staré Mesto document emphasises support for the socio-economic use of cultural potential of the Old Town as well as for public and cultural activities and better involvement and cooperation among individual departments of the Office district and city district organizations.

10.2. Key documents governing climate adaptation (See Chapter 5)

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/up date	Link (if available)	Summary of content
Paris Agreement	Agreement	International	Binding	UNFCCC	2015-2016		https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement	The Paris Agreement builds upon the Convention and for the first time brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. As such, it charts a new course in the global climate effort.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
United Nations Framework Convention on Climate Change	Agreement	international	binding	The United Nations	1992		https://unfccc.int/process-and-meetings/the-convention/what-is-the-united-nations-framework-convention-on-climate-change	The ultimate objective of the Convention is to stabilize greenhouse gas concentrations at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system. It states that such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner.
EU Climate Change Adaptation Strategy	Strategy	International (Europe)	Non-binding	European Commission	2013	Framework and mechanisms for improving the EU's preparedness for current and future climate impacts.	Last evaluated in 2018. Update likely 2021.	https://ec.europa.eu/clima/policies/adaptation/what_en#tab-0-1

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Evaluation of the EU strategy on adaptation to climate change	Report	European Community	Non-binding	European Commission	2018		https://ec.europa.eu/clima/policies/adaptation/what_en#tab-0-1	This report examines the process and the results of the evaluation of the strategy COM/2018/738, including the lessons learned from its implementation.
Vulnerability and impact chain assessments	guideline	local	non-binding	The Office of the Chief City Architect	2018			The vulnerability and impact chain assessments is based on a qualitative as well as a quantitative analysis and assessment. It focuses mainly on the topics of extremely hot days and nights, heatwaves, extreme precipitation and periods of drought. The assessment also included non-climatic stressors
Resolution of the Government of the Slovak Republic no. 148/2014	regulation	national	binding	The Slovak Republic's Ministry of Environment	2014		https://rokovania.gov.sk/download.dat?id=D20E6A6330264DAC9318C4430DFD570B-9788FA292E5DD18CE9C181288B0A8535	The resolution of the Government of the Slovak Republic no. 148/2014 required the submission of an update of the national adaptation strategy to the Government's deliberations in light of the latest scientific knowledge in the field of climate change.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Strategy of adaptation of the Slovak Republic to climate change	strategy/policy	national	binding	The Slovak Republic's Ministry of Environment	2018		https://www.minzp.sk/files/odbor-politiky-zmeny-klimy/strategia-adaptacie-sr-zmenu-klimy-aktualizacia.pdf	The main objectives of The Strategy of adaptation of the Slovak Republic to climate change – update is to „increase resilience and improve the readiness of the Slovak Republic to face the adverse effects of climate change and to establish an institutional framework and coordination mechanism to ensure effective implementation of adaptation measures at all levels and in all areas“. This is to be achieved by implementing partial objectives.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
National Action Plan for adaptation	strategy/policy	national	binding	The Slovak Republic's Ministry of Environment	2022	2026	https://www.minzp.sk/klima/politika-zmeny-klimy/adaptacia-zmenu-klimy/	The National Action Plan for adaptation should contribute to better translating adaptation measures into sectoral policies of the relevant sectors. It should also include a proposal for a monitoring system for vulnerability, a proposal for a system of mid-term evaluation of the adaptation process in the Slovak Republic, including the monitoring of cost-benefit links, and a platform for publishing and sharing positive experiences.
Conception of the Slovak Water Policy for 2015	strategy	national	binding	Ministry of the Environment of the Slovak Republic	2006	2015	https://www.minzp.sk/voda/koncepcne-aplanovacie-dokumenty/koncepcia-vodohospodarskej-politiky-slovenskej-republiky-do-roku-2015.html	

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/up date	Link (if available)	Summary of content
Proposal of Orientation, Principles and Priorities of the Slovak Water Policy until 2027	policy	national	binding	Ministry of the Environment of the Slovak Republic	2015	2027	https://www.minzp.sk/files/sekcia-vod/orientacia-zasady-priority-vodohosp-politiky-sr-do-r-2027_po-oprave-tlacovej-chyby.pdf	
Integrated National Energy and Climate Plan 2021-2030 (2019)	strategy	national	binding	Ministry of Economy of the Slovak Republic	2019	2030	https://www.economy.gov.sk/uploads/files/ljkPMQAc.pdf	
Greener Slovakia: Strategy for Environmental Policy of the Slovak Republic until 2030	Strategy	national	binding	Ministry of the Environment of the Slovak Republic	2019	2030	https://www.minzp.sk/files/iep/03_vlastny_material_envirostrategia2030_povlade.pdf	

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Action Plan for solving the consequences of drought and water scarcity	strategy	national	binding	Ministry of Economy SR	2018		https://www.minzp.sk/voda/koncepcne-aplanovacie-dokumenty/h2odnota-je-voda-akcny-plan-riesenie-dosledkov-sucha-nedostatku-vody.html	
Water Plan of the Slovak Republic for 2022-2027	Strategy	national	binding	Ministry of the Environment of the Slovak Republic	2015	2027	https://www.minzp.sk/voda/koncepcne-aplanovacie-dokumenty/vodny-plan-slovenska-aktualizacia-2015.html	
Timetable and factual and communication plan for the 3rd cycle of river basins management plan	Guideline	national	binding	Ministry of the Environment of the Slovak Republic	2019	2027	https://www.minzp.sk/files/oblasti/voda/koncepcne-a-planovacie-dokumenty/casovy-vecny-harmonogram.pdf	

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Action Plan for the Environment and Health of the Population of the Slovak Republic V	Strategy	national	binding	Ministry of the Environment of the SR, Ministry of Agriculture and Rural Development of the SR, Ministry of Economy of the SR, Ministry of Transport and Construction of the SR, Ministry of Education, Science, Research and Sport of the SR	2019		http://www.uvzs.sk/docs/org/ohzp/ap_sr_4.pdf	

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Concept of protection and utilization of surface and ground water sources in Bratislava self - governing region	guideline	regional	non-binding	Bratislava self - governing region	2017	-	http://www.region-bsk.sk/uzemne-planovanie-a-zivotne-prostredie-koncepcne-materialy.aspx	
Land-use plan for Bratislava, capital of the Slovak Republic	strategy/policy/regulation	local	binding	City Hall of Bratislava	2007		https://bratislava.sk/sk/uzemny-plan	The aim of The Land-use plan for Bratislava, capital of the Slovak Republic is to systematically and comprehensively address the spatial arrangement and functional use of land and lay down its principles.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/up date	Link (if available)	Summary of content
Program of Economic and Social Development of the capital city Bratislava for the years 2010-2020	strategy/policy	local	binding	City Hall of Bratislava	2010	2021	https://bratislava.blob.core.windows.net/media/Default/Dokumenty/Str%C3%A1nky/Chcem%20vediet/Strategick%C3%A9%20dokumenty/Program%20hospod%C3%A1rskeho%20a%20soci%C3%A1lneho%20rozvoja.pdf	Program of Economic and Social Development of the capital city Bratislava for the years 2010-2020 creates an organizationally and financially viable development program with the maximum support of all interested partners, including municipalities of each city districts.
Strategy of Adaptation to Adverse Impacts of Climate Change on the territory of Bratislava	strategy/policy	local	binding	City Hall of Bratislava	2014		https://bratislava.blob.core.windows.net/media/Default/Dokumenty/Str%C3%A1nky/Chcem%20vediet/064_Adaptacne%20strategie.pdf	Strategy of Adaptation to Adverse Impacts of Climate Change on the territory of Bratislava summarises potential risks and gives guidance for the prevention/mitigation of the consequences of climate change risks.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Action for adaptation to adverse impacts to climate change in Bratislava	strategy	local	binding	City Hall of Bratislava	2017	2021	https://zastupitelstvo.bratislava.sk/data/att/14595.pdf	Action for adaptation to adverse impacts to climate change in Bratislava (2017), which contains 27 adaptation measures that are to be implemented and monitored in the period between 2017-2020 to support the implementation of the vision and goals of the Strategy for adaptation to climate change in Bratislava.

10.3. Key documents governing disaster risk reduction (See Chapter 4)

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Sendai Framework	Agreement	International	Non-binding	United Nations Office for Disaster Risk Reduction (UNDRR)	2015	Valid until 2030. UNDRR is in charge of follow-up and review of the Sendai Framework by preparing periodic reviews on progress, among other actions.	http://www.unisdr.org/we/inform/publications/43291	Establishment of a global framework for action to prevent new and reduce existing disaster risks, based on 7 targets, 4 priorities for action with supporting rationale and 13 guiding principles.
EU law (Decision 1313/2013/EU)	Law	International (Europe)	Binding	European Parliament	2013		https://eur-lex.europa.eu/homepage.html	Decision No 1313/2013/EU of the European Parliament and of the Council on a Union Civil Protection Mechanism. It defines the activities to assist with the response to immediate adverse consequences of a disaster inside or outside the Union.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
EU law (Decision 420/2019/EU)	Law	International (Europe)	Binding	European Parliament	2019		https://eur-lex.europa.eu/homepage.html	This decision defines an effective and coherent approach to the prevention of and preparedness for disasters and to promote the exchange of best practices within the Union Mechanism.
Directive 2007/60/EU	Guideline	International (Europe)	Binding	The European Parliament and The Council of The European Union	2007		https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32007L0060	The purpose of this Directive is to establish a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods in the Community. It should be read together with Act no. 7/2010 Coll. on flood protection,

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Instruction of the Director General of the Crisis Management Section of the Ministry of the Interior of the Slovak Republic	regulation	national	binding	Ministry of the Interior of the Slovak Republic	2007		https://www.minv.sk/?Dokumenty_na_stiahnutie_CO	Instruction of the Director General of the Crisis Management Section of the Ministry of the Interior of the Slovak Republic
Act No. 42/1994 Coll. on civil protection of the population	law	national	binding	The National Council of the Slovak Republic	1994		https://ec.europa.eu/echo/sites/echo-site/files/42-1994_civil_protection_act.pdf	Act No. 42/1994 Coll. on civil protection of the population define a natural disaster, analysis and identifies vulnerable areas as well as regulates the structure and content of the Territorial Analyses document in terms of possible extraordinary events of the Slovak Republic. The introductory part of the analysis focuses on geographical, demographic and economic characteristics of the territory.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Concept of sustainable exploitation of rock environment.	strategy	national	binding	Ministry of the Environment	2017	2020	https://www.minzp.sk/files/sekcia-geologie-prirodných-zdrojov/koncepcia-geologickeho-vyskumu-geologickeho-prieskumu.pdf	The aim is to predict impending disasters. Summary of measures from engineering geological survey, monitoring of geological factors of the environment and remediation of geological environment to avert, mitigate or eliminate the consequences of natural disasters, including emergency landslides.
Landslides and slope deformations", Partial monitoring system "Geological factors", Subsystem 01 – Landslides and other slope deformations.	policy	national	non-binding	Ministry of the Environment	Every year from 1993	2020	https://apl.geology.sk/geofond/zosuvy/	The aim is to identify slope deformation and to predict impending disasters.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Prevention program of landslide risk management (2014-2020) – updating	strategy	national	non-binding	Ministry of the Environment	2014	2020	https://www.minzp.sk/files/sekcia-geologie-prirodných-zdrojov/program-prevencie-manazmentu-zosuvných-rizík-2014-2020-aktualizácia.pdf	
National Climate Program of the Slovak Republic	policy	national	non-binding	Ministry of the Environment SR, Slovak Hydrometeorological Institute	2019		-	
Preliminary flood risk assessment in the Slovak Republic – update 2018	policy	national	non-binding	Ministry of the Environment SR, Slovak	2018		http://www.minzp.sk/sekcie/temy-oblasti/voda/ochrana-pred-povodňami/manazmentpovodňových-rizik/predbezne-hodnotenie-povodňového-rizika-2011.html	

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Slope deformation and slope deformation susceptibility maps	guideline	national	non-binding	The State Geological Institute of Dionýz Štúr	2006		https://www.geology.sk/2018/03/01/zosuvy-na-slovensku/	These are maps showing areas where there is a risk of slope deformation, but there is no indication of the risk. However, the timeliness of the available data on slope deformations is critical, as the information in question has not been updated regularly since 2013.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Analysis of the territory of Bratislava Region	guideline	regional	non-binding	City Hall of Bratislava				Analysis of the territory of Bratislava Region assesses the territory in terms of possible risks of emergencies, exposure to exceptional weather and climatic events, areas of possible danger of slope deformations and seismic activity, areas of potential flood risk, areas of potential risk in case of water structure violation (including tailings ponds), areas of potential fire and explosion hazard, areas of potential danger to all modes of transport and areas of the potential risk of leakage of hazardous substance resulting from the characteristics of hazardous substances.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Urban-landscape study to protect against storm rainfall in the Small Carpathian region	guideline	regional	non-binding	Bratislava self - governing region	2014	-	http://www.region- bsk.sk/urbanisticko-krajinarska-studia-na-ochranu-pred-privalovymi-dazdami-v-malokarp-oblasti.aspx	
Atlas of climate change impacts on Bratislava City	guideline	local	non-binding	The Office of the Chief City Architect				Atlas of climate change impacts on Bratislava City focuses on impacts and risks of climate change to the City's population and critical infrastructure (road infrastructure and built-up areas).



ARCH D3.3 City baseline report - Camerino

17 December 2021



Deliverable No.	D3.3
Work Package	WP3
Dissemination Level	PU
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Due date	2020-03-31
Actual submission date	2021-12-17
Status	For submission
Revision	3.0 (2021-12-17)
Reviewed by (if applicable)	Eleanor Chapman, Iryna Novak (ICLEI), Saskia Maresch (DIN), Vittorio Rosato, Ludovica Giordano (ENEA)

This document has been prepared in the framework of the European project ARCH – Advancing Resilience of Historic Areas against Climate-related and other Hazards. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 820999.

The sole responsibility for the content of this publication lies with the authors. It does not necessarily represent the opinion of the European Union. Neither the REA nor the European Commission are responsible for any use that may be made of the information contained therein.

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement no. 820999.

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1. City profile

The municipality of Camerino (Figure 1) has a total surface area of 128km² with the Old Town accounting for 0.15km². The municipality is located at an altitude of 661 m and dominates the surrounding hilly landscape. It includes a hospital and the headquarters of the University of Camerino which are considered important institutions for the inner areas of the Marche Region between the Apennines (Italian mountains) and the coastal areas near the Adriatic Sea.

After the seismic sequence that struck Central Italy from August to October 2016, the entire population of the Camerino's Old Town was temporarily displaced as a consequence of housing and other property lost or rendered uninhabitable. Some people were relocated to housing in other towns with national funds allocated to support the payment of residential rent. Others were temporarily re-housed in pre-cast buildings located in emergency reception areas.

The Old Town is the focus for the ARCH project. This area is situated at the top of a hilly ridge and enclosed within the city's medieval defensive walls. The Old Town of Camerino contains a very large number of historic buildings, churches and artworks, with considerable artistic, architectural and historical value, which could benefit from methods and tools to improve their management and preservation. Thus, the overall aim for the ARCH project is to mitigate the impact of natural hazards on the Old Town by developing knowledge and tools for monitoring and preserving these significant cultural heritage assets.

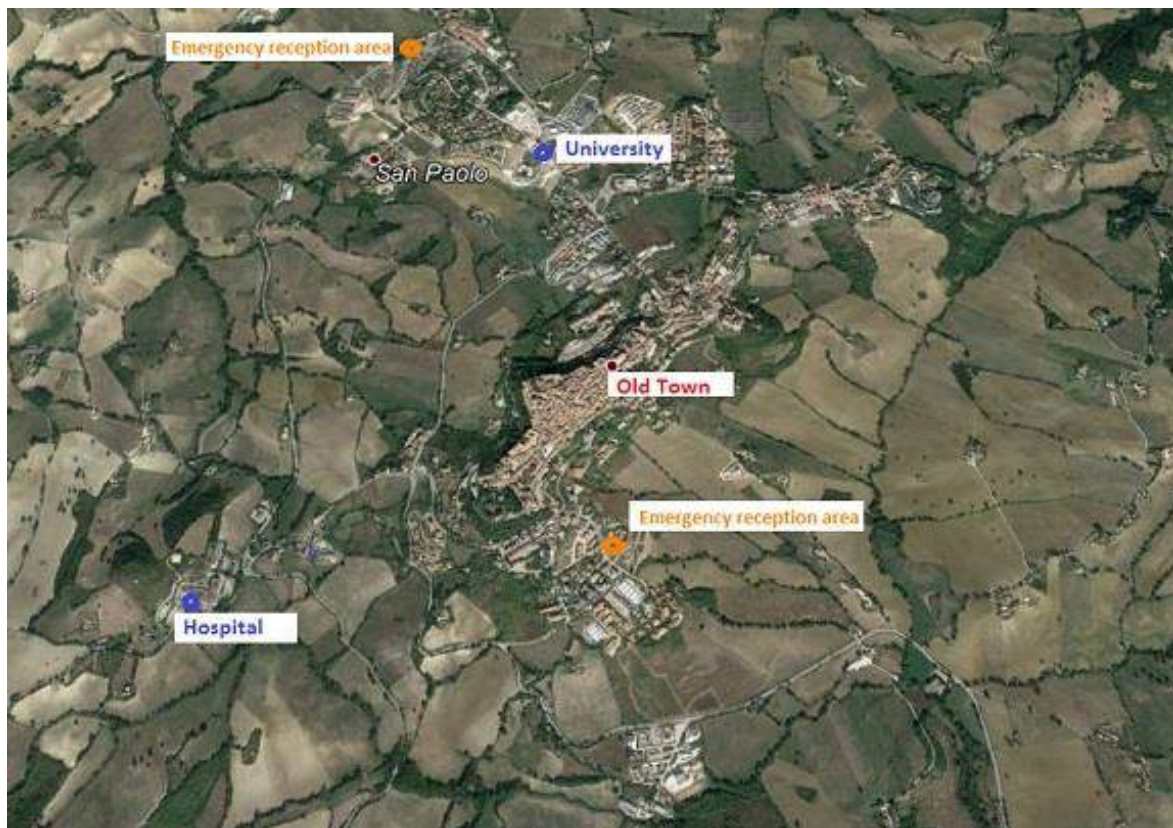


Figure 1. Camerino municipality area [1].

1.1. Demographic features

The population of Camerino's municipality stands at 6,852 (2018) with similar numbers of male and female inhabitants (Table 1). The Old Town had a total of 760 inhabitants up to the last seismic event in 2016. Camerino's population trends are reflected in Table 2. The municipality has noted a population decline, especially after the seismic events that occurred in 2016 (Figure 2).

Gender	Before Earthquake (September 2016)	After Earthquake (November 2016)	2018
Male	-	-	3,360
Female	-	-	3,492
Total	7,016	6,991	6,852

Table 1. Data of population (Camerino) after the last seismic events that occurred in 2016 (2018) [2].

Year	Population
1971	8,499
1981	7,975
1991	7,320
2001	6,858
2011	6,897

Table 2. Demographic development of Camerino from 1971 to 2011 (2018) [2].

The demographic development of the municipality of Camerino was impacted by a depopulation trend, related to a mass relocation process from the internal areas of the Marche Region to coastal areas and to other bigger cities (Figure 3). In general, due to economic and social reasons, the population growth rate can be considered negative for the municipality. In fact, several migrant flows can be identified both for Camerino and the area near the Apennines. The first occurred during the first decades of the twentieth century as a result of economic conditions in the rural areas. The second migration flow happened after the Second

World War; away from the rural areas and towards the valleys, the industrialised areas of the big towns and the coastal areas that offer greater job opportunities and better services.

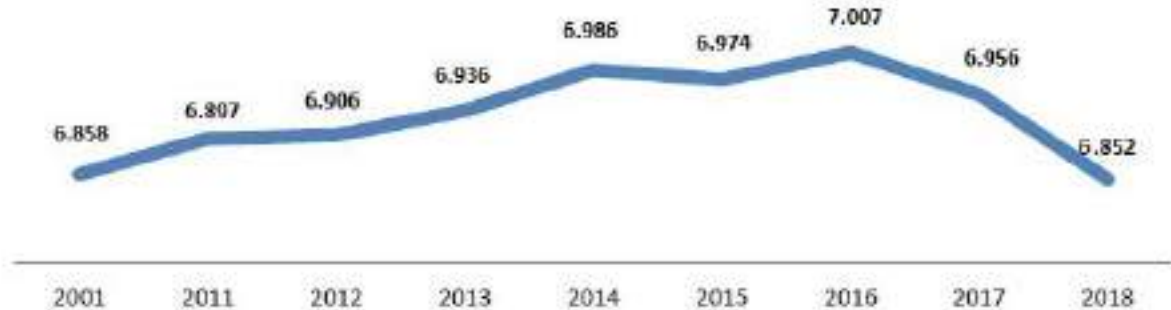


Figure 2. Population trend of Camerino (2001-2018) [3].

These phenomena resulted in a progressive aging of the population; a phenomenon reflected both in Camerino and the Apennine area of the Marche Region. The data concerning population density for the Marche Region (Figure 3) highlights the high density (orange and red colour) for the biggest cities in the coastal areas and for the industrialised zones; low population density characterises the internal zones (pink and yellow colour).

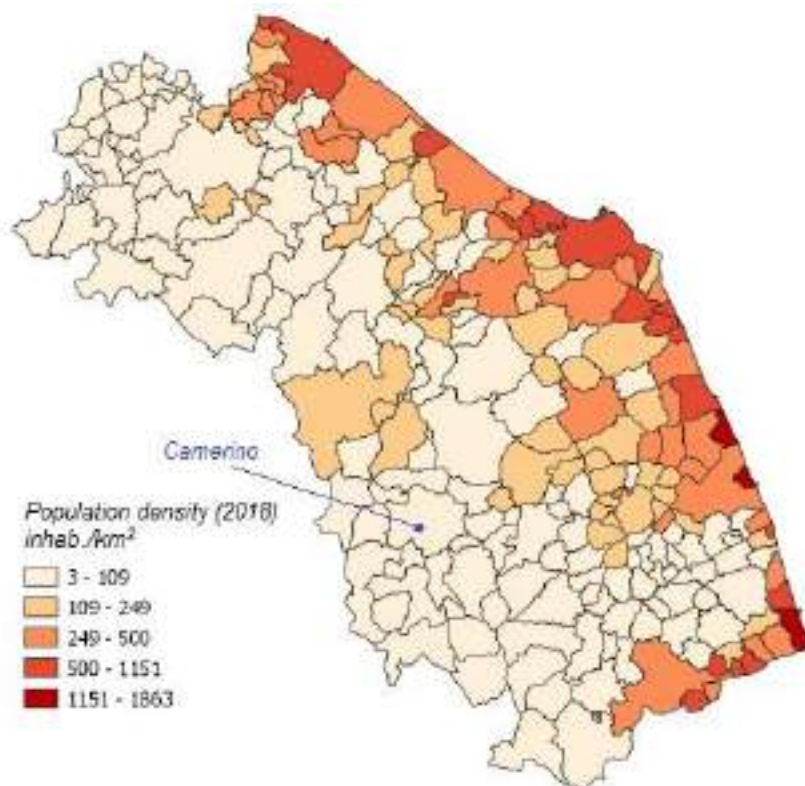


Figure 3. Population density (2018) of Marche Region [4].

After the Central-Italy seismic sequence (2016), the entire population of the Old Town was temporarily displaced due to property/housing lost or rendered uninhabitable.

An analysis conducted on 25th September 2019 [5] highlights that a large number of people, approximately equal to 2,242 inhabitants, had obtained funds to support rental payments in temporary residences. As previously mentioned, approximately 1,179 inhabitants were relocated to other towns with national funds to support residential rent, whereas others were temporarily relocated to emergency reception areas. The result has been a low population density in the municipalities inside the areas that were interested by the seismic events in 2016 (Figure 4).

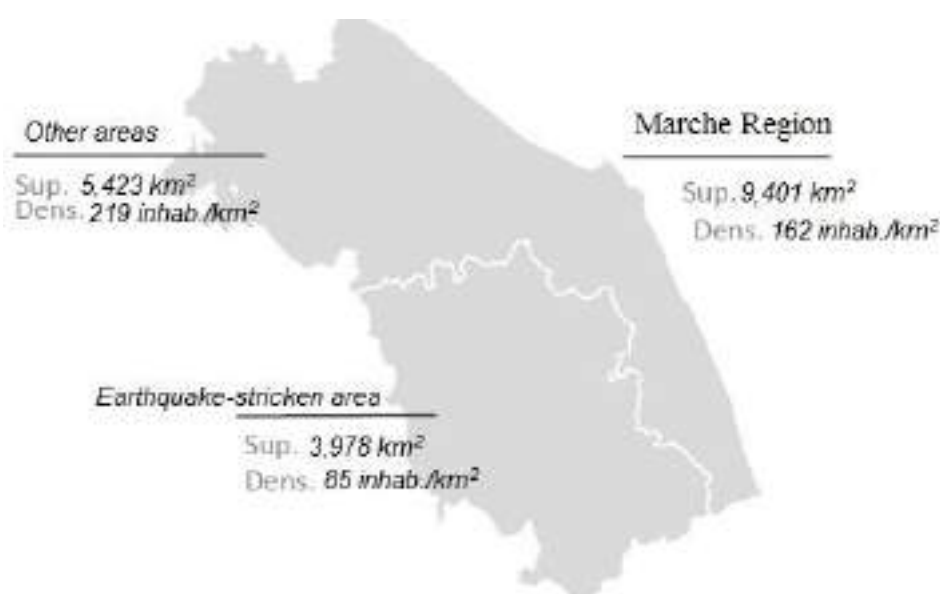


Figure 4. Population density (2018) of Marche Region [3].

The natural growth rate of Camerino's population (Table 3) is negative (-8.10%) and it is lower than the average value of the Marche Region; the internal migration rate is negative (-11.6%) principally due to the economic and social effects of the last seismic events in 2016.

Growth rate	Municipality of Camerino	Marche Region
Natural growth rate (‰)	-8.1	-4.6
Internal migrant rate (‰)	-11.6	-0.1
Foreign migrant rate (‰)	6.8	2.4
Total growth rate (‰)	-15.1	-4.2

Table 3. Population growth rate (2018) of Camerino and of Marche Region [3].

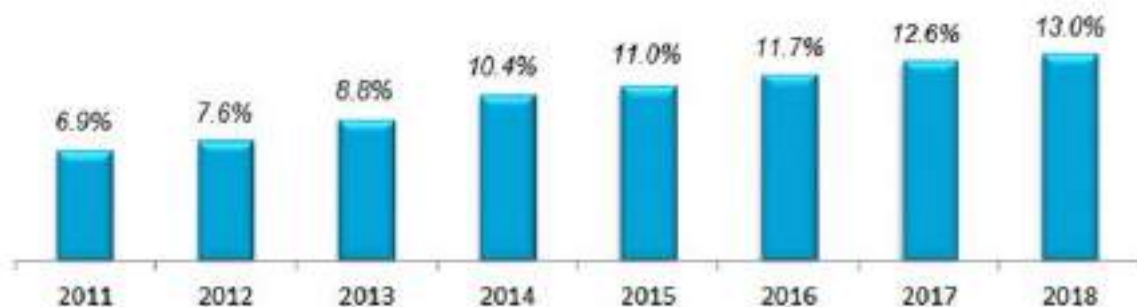


Figure 5. Foreign inhabitants (2018) of Camerino [3].

The collected data (Figure 5) highlights the increment of foreign inhabitants in Camerino who principally come from Europe, Africa and Asia (Table 4). The total growth rate of Camerino's population is negative (Table 3) and it is higher than the average value for the Marche Region.

Approximately, half of the population is in the age range 45-84 with a life expectancy of about 83 years (see Table 5). The percentage of inhabitants in the age range (0-14) is equivalent to 9.7% (Figure 6). The old age indicator is equal to 280.1 (Figure 7): a high value that is similar to other municipalities of the areas that were struck by the seismic sequence (2016) in the southern part of the Marche Region. Additional data on Camerino's population is shown in Figure 8.

Native land	Municipality of Camerino	Marche Region
Europe	41.1%	53.7%
Africa	24.6%	19.9%
Asia	30.0%	20.9%
America	4.0%	5.5%
Oceania and stateless persons	0.22%	0.04%

Table 4. Native land of foreign inhabitants (2018) of Camerino [3].

Age Range	Number of people	Percentage
0-5	232	3.41 %
6-17	609	8.97%
18-24	358	5.27%
25-34	957	14.10%
35-44	839	12.36%
45-64	1,921	28.31%
65-84	1,526	22.49%
+ 85	342	5.04%

Table 5. Average age distribution, excluding university students (2020) [2].

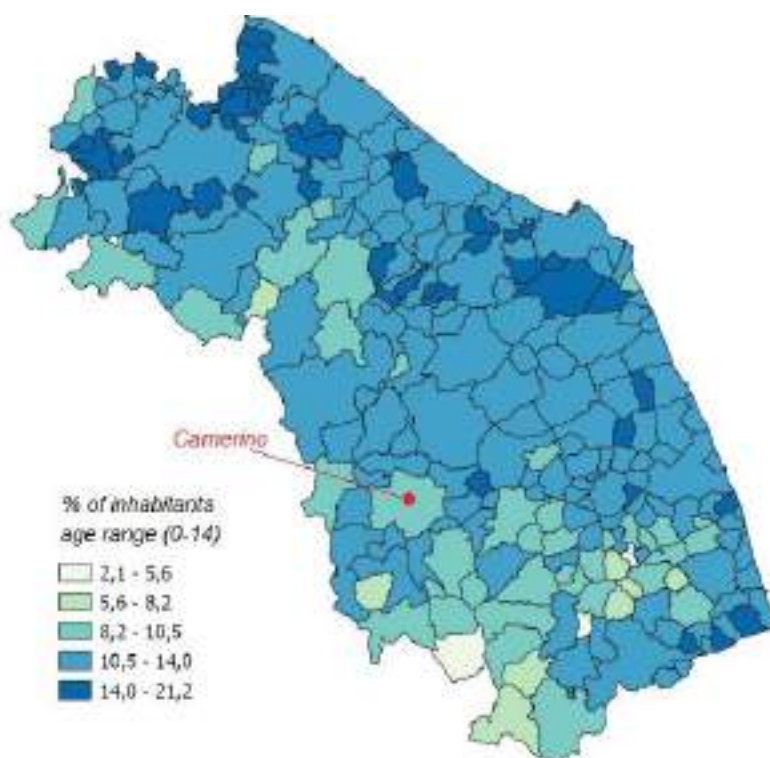


Figure 6. Percentages of inhabitants of Marche Region (2019) for the age range (0-14) [4].

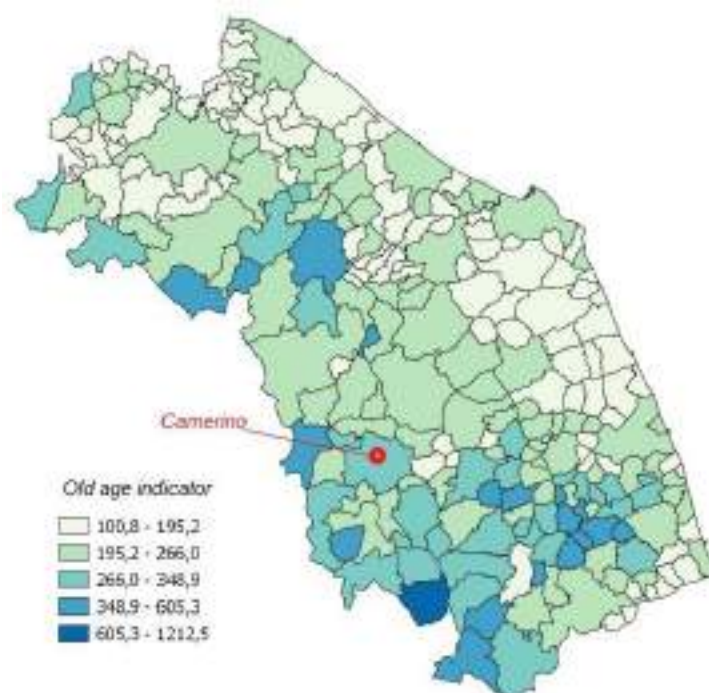


Figure 7. Old age indicators of Marche Region (2019). This indicator is equal to the number of inhabitants with age higher than 65 years respect to 100 inhabitants of age lower than 14 years [4].

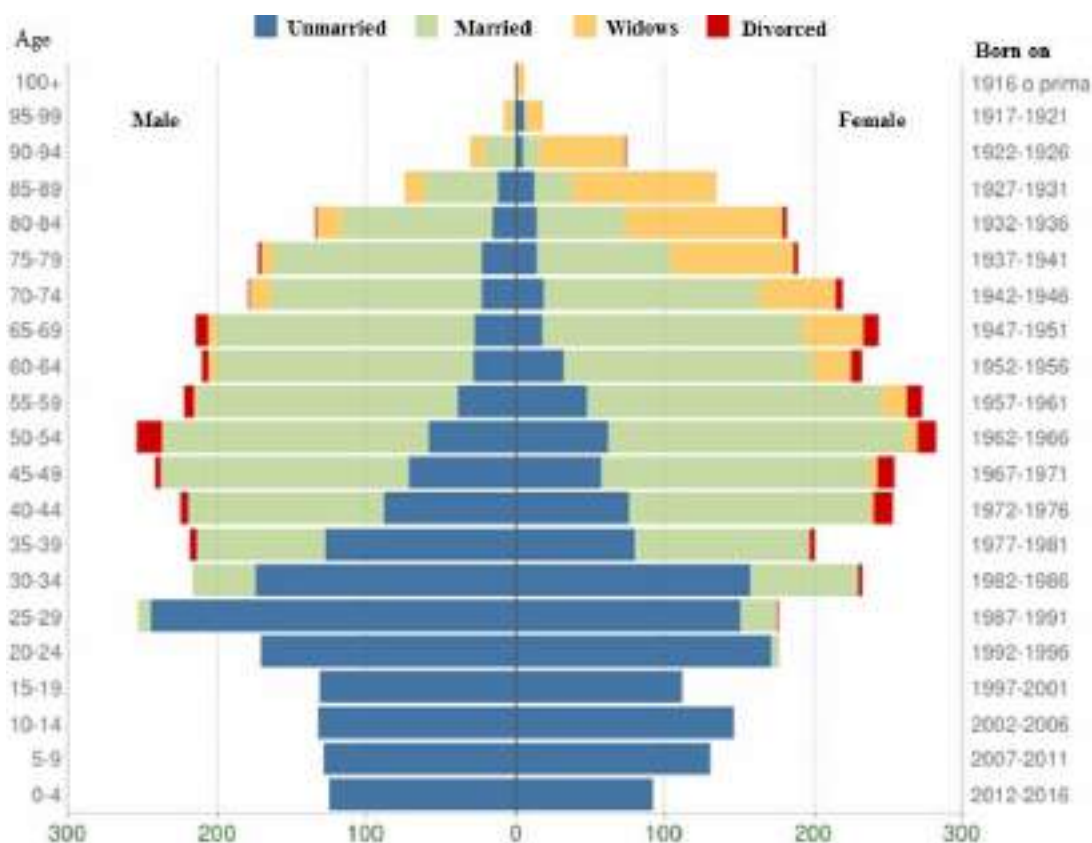


Figure 8. Population of Camerino (2016) divided for age, male and female, unmarried, married, widows and divorced [6].

1.2. Economic features

Figures 9 and 10 below show the development of enterprises and the corresponding sectors in Camerino. The number of enterprises reflected a light decrease since 2010 (Figure 9) both due to the international financial crisis (2008) and to local reasons. Small companies, often family-run, are responsible for most commercial activity in Camerino. Following the 2016 seismic event, several stores located in the Old Town closed and were relocated to new sites financed by national funds. According to statistics, the most prevalent service sectors in Camerino's municipality in 2018 were agriculture and silviculture, followed by commerce, construction, and lodging and food services (Figure 10). The size of the rural area is a significant determinant of the rate of activities in agriculture and forestry. The increment of the average age of the farmers employed in this sector is due to both demographic and cultural reasons. The economic vitality of the urban area is closely linked to the University: the presence of numerous students is very important for local economic activities. Tourism is a developing sector that is focused both on cultural heritage from the Renaissance period, and on the preservation of the natural landscape. The industrial sector, comprising only a few small companies, is very modest. On the other hand, the number of handcraft enterprises (manufacturing activities in Figure 10) is relevant. The distribution of Camerino's enterprises has a similar trend to those of other areas of the Marche Region that were struck by the last seismic sequence (Figure 11).

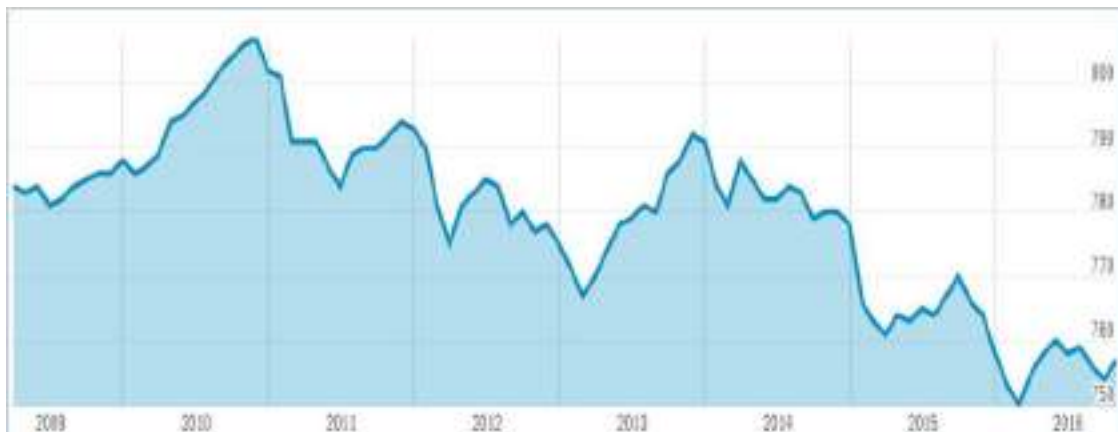


Figure 9. Number of enterprises from 2009 to 2016 for the municipality of Camerino [7].

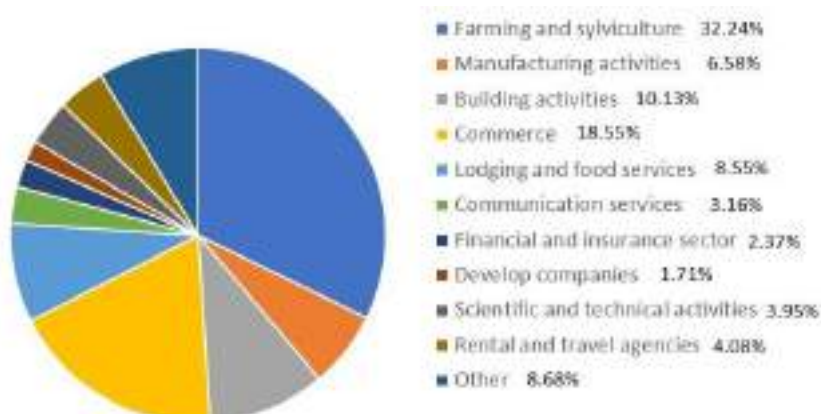


Figure 10. Distribution of Camerino's enterprises (2018) [3].

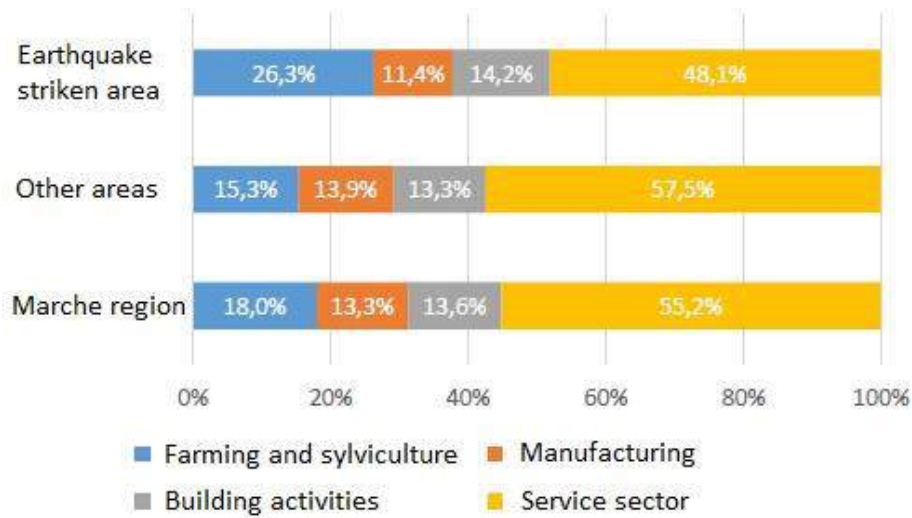


Figure 11. Distribution of enterprises of the Marche Region (2018) [3].

After the decrease in the number of enterprises due to the seismic sequence that occurred in 2016, the growth rate (Figure 12) displays a substantial equilibrium for the year 2018. Commercial and manufacturing centres have been built with national financial funds in order to allow the relocation of some activities. The taxable income of Camerino (Table 6) includes activities related to the tertiary sector, as a direct result of the presence of the local University which is important for a small municipality like Camerino.

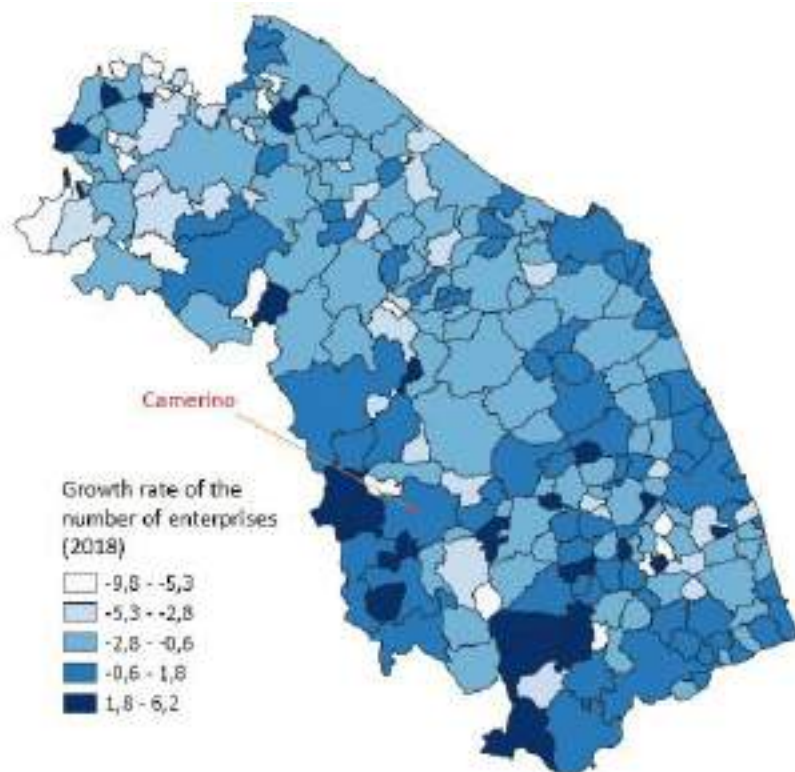


Figure 12. Growth rate (%) concerning the number of enterprises for the Marche Region (2018) [4].

Taxable income for contributor	Taxable income for inhabitants
21,502 €	14,621 €

Table 6. Taxable income (2017) for the municipality of Camerino [3].

1.3. Vulnerabilities and risks

The municipality of Camerino identifies the elderly as the most socially vulnerable population group (adults over 65). Prior to the seismic sequence that struck Central Italy from August to October 2016, many such elderly people lived in Camerino's historical centre, and were hence part of the relocation to temporary housing or to other towns mentioned earlier. Older adults may be the most vulnerable to natural disasters and emergency events, such as the seismic events in Central-Italy (2016). Since then, the municipality of Camerino has supported initiatives to improve the psychological health of inhabitants, especially for younger persons. Furthermore, the local University has provided funds to support students through online courses. There is not a significant number of homeless people due to the limited parameters of the urban area; furthermore, access to the Old Town has been prohibited since the last seismic sequence (2016). Inhabitants with economic difficulties are supported by municipal and ecclesiastical institutions, while families and small companies that were relocated after the 2016 seismic events are supported by national funds (as mentioned earlier). However, a spatial mapping/analysis of vulnerable population groups/areas in the municipality currently does not exist.

In terms of the built fabric of Camerino, many buildings located in Camerino's historic centre pre-date 1974 (Table 7) when seismic standards became obligatory. The time needed to complete the post-earthquake rebuilding process will influence the future possibility of people returning to Camerino's urban area. This issue will also influence the social and economic profile of Camerino in coming years.

In response to the risk of seismic activity, the municipality of Camerino has mapped the following:

- Emergency response procedures and responsibilities in the city;
- Preliminary cultural heritage protection strategies and key legislation.

Additional mapping activities that could be useful to the municipality in building its resilience include the mapping of:

- a) existing cultural heritage protection measures, strategies and key legislation in the city;
- b) existing databases on natural risk information for the city; and
- c) decision-making structures in the city regarding cultural heritage protection.

Construction age	% of residential buildings
< 1918	43.0%
1919-1945	13.4%
1946-1960	6.2%
1961-1970	6.7%
1971-1980	9.2%
1981-1990	6.5%
1991-2000	7.6%
2001-2005	3.7%
> 2006	3.7%

Table 7. Construction age of residential building (2011) of Camerino [3].

2. Target historic areas identified for ARCH

2.1. Overview

The municipality of Camerino's territory (Province of Macerata, Marche Region, Italy) is centrally located between the rivers Potenza and Chienti (Figure 13). The territory of Camerino is characterised by large areas with high naturalistic and environmental value.



Figure 13. Camerino's geographic location [1].

For the purposes of the ARCH project, the city case of Camerino will focus on the entire Old Town (Figure 14). The Old Town is well defined by its physical area; it is situated at the top of a hilly ridge and enclosed within the ancient walls which represent the town's medieval defensive perimeter. The old town of Camerino is a historical urban centre (300 B.C.) that was expanded during the Roman Age. The current road network design is essentially based on the medieval pattern. The urban morphology of the Old Town features a compact and continuous urban context, characterised by a high building density and irregular, jagged road network of medieval origin. The Old Town has a surface area of 150,000 m² and contains a very large number of buildings, churches and monuments, some of them of considerable artistic, architectural and historical value. Figure 15 illustrates the location of key buildings within the

Old Town, among them the Ducal Palace and Santa Maria in Via Church, which are discussed in detail later in this chapter.



Figure 14. Urban centre of Camerino (MC, Italy) [8].



Figure 15. City map of the old town, showing locations of key buildings St. Maria in Via's Church and the Ducal Palace [1, 9, 10, 11].

2.2. Key stakeholders

Local stakeholders relevant to the ARCH project's focus on cultural heritage, disaster risk reduction and climate adaptation have been separately mapped, and more information can be found in related ARCH deliverable D3.2: local partnership and work plan. Table 8 below

presents the different entities involved in the management and maintenance of cultural heritage, as well as civil protection and disaster recovery in the municipality of Camerino.

No.	Institution	Description
1	Civil Protection Office of Camerino (COC) [8]	First authority that organises, under the supervision of the mayor, disaster or emergency response, before the successive and possible interventions of the regional and national civil protection departments. The COC is divided into nine offices that have several supportive tasks: <ul style="list-style-type: none"> a. Technical and planning tasks; b. Health and veterinary assistance; c. Local voluntary organisations; d. Material resources and logistics; e. Main networks (electric, hydric, etc.) and school services; f. Preliminary damage evaluation; g. Operability of the main roads; h. Telecommunication networks; i. Preliminary assistance to population.
2	Civil Protection Office of Marche Region [12]	Authority that organises emergency response at regional level concerning health assistance, material resources and logistics, assistance to the population, etc.
3	Episcopate (diocese) of Camerino [13]	Manages local churches, some artwork museums and local refuges.
4	Superintendence of Architectural and Landscape Heritage of Marche Region [14]	Manages, at regional level, architectural heritage, museums and natural reserves. This authority approves private and public activities that involve cultural heritage.
5	Office for Reconstruction [15]	Manages, at regional level, urban planning and related financing, and authorises technical design and funds for the reconstruction of private and public buildings (as for the last seismic sequence in 2016).
6	Ministry of Cultural Heritage and Activities, and Tourism (MIBACT) [16]	Coordinates the activities of the regional secretariats that supervise the management of cultural heritage. The MIBACT regulates the management of architectural heritage, museums, landscape preservation, etc.

Table 8. Entities that are involved in the management and maintenance of cultural heritage.

Two buildings have been selected as case studies for the ARCH project due to their historical and representative values: the Ducal Palace and Santa Maria in via Church. These are described next.

2.2.1. Ducal Palace

The Ducal Palace (Figure 16) is an example of the evolution of different Italian architectural styles from the 13th to 15th century, and was built in three periods: the Case di Gentile (13th century), the Palazzo di Venanzio (14th to 15th century) and the Case Nove or 'Palazzo di Giulio' (15th century). Camerino's Ducal Palace is among the notable buildings of civil architecture built by the Da Varano family and it is now home to the local University. It has an original section, which was rebuilt in the late fourteenth century, and was extended and completed in the mid-to-late fifteenth century in the Renaissance style. The whole building is centred on a square-portico courtyard (Figure 17) possibly designed by Baccio Pontelli, a Renaissance architect, and can be accessed via several rooms, including the "*Sala degli Stemmi*" a room with coats (Figure 18).



Figure 16. The Ducal Palace [9].



Figure 17. The square-portico courtyard of the Ducal Palace [17].



Figure 18. The “Sala degli Stemmi”, a room with coats inside the Ducal Palace.

With the fall of the duchy (1545), the palace became the seat of the papal governors and, from 1749 onwards, of the University. Some semi-buried tunnels bridge the slope of the hill and emerge onto the main cathedral square. The interior of the Ducal palace is characterised by cellars, dungeons, a monumental spiral staircase, an enormous cistern, rooms dating back to various epochs (some of which are richly frescoed) and a viewing platform. The palace was damaged by the 2016 seismic event (Figure 19).



Figure 19. External (a) and internal (b) damage to and collapse of masonry (Ducal Palace) [9].

2.2.2. Santa Maria in Via Church

The Santa Maria in Via Church (Figure 20) was originally a little chapel, like many others along the pilgrimage's road of Via Romea, offering protection and viaticum to pilgrims who were leaving or passing through. The current church was built between 1639 and 1624 based on a design by Camillo Arcucci da Sigillo, in response to the wish of Cardinal Angelo Giori, secretary of Pope Urbano VIII Barberini. The simple brickwork facade with triangular pediment and two superimposed floors is vertically decorated with pilasters. The perimeter walls of the interior elliptical plant, which draws inspiration from Bernini, are enriched by semi-circular chapels, each of which houses three canvases (17th century). The main altar has the venerated picture of Saint Maria in Via; a canvas in Byzantine style painted on wood from the Umbria and Marche school dating back to the 18th century. Among its most prestigious works, the Church keeps two canvases (vestries) of Valentin de Boulogne who was a 17th century disciple of Caravaggio: they represent Saint Giovanni Battista and Saint Girolamo.



Figure 20. (a) Facade of St. Maria in Via Church and (b) the provisional steel structures that were put up in order to reinforce the remaining structures [9].

An earthquake in 1799 destroyed the brickwork vault, which was then replaced by one made of “camorcanna” (thin vaults usually made by mats of reeds nailed to an upper wooden framework) with historical plasters decorated by Giuseppe Rinaldi. The oratory has preserved a copy of the Sacra Sindone (Holy Shroud) realized in 1658. Due to the seismic sequence in 1997, the church suffered much damage, among which was the detachment of the facade. After careful restoration works, it was opened again to the public in 2007. The latest seismic sequence in 2016 resulted in new, severe damage (Figure 21 and Figure 22).



Figure 21. Collapse of the bell-tower of St. Maria in Via Church [9].



Figure 22. Collapse of the roof and of the decorated thin vault of St. Maria in Via Church [9].

2.3. Particular challenges and climatic hazards affecting the sites

Relevant climatic hazards include the impact of snow precipitation in the winter seasons on the effectiveness of the main networks (electricity, communications, etc.). Furthermore, two major seismic sequence in a little over two decades (most recently in 2016, as already highlighted, but also earlier in 1997) have highlighted the weakness of the urban area and its valuable cultural heritage to seismic hazards, and related geomorphological hazards (e.g. landslides). In order to address these hazards, the municipality of Camerino has developed a preliminary civil emergency plan [19] that roughly defines the general tasks of officials in emergency events and the main reception areas for citizens. In such circumstances, the role of the mayor, within the municipal territory, is as follows:

- assumes the direction and coordination of the assistance services to the population affected by the emergency;
- organises the necessary interventions immediately communicating them to the President of the Regional Council and to the President of the Province and to the Prefect;
- informs the population on the evolution of ongoing events and on the procedures foreseen in the emergency plan.

Municipal staff of Camerino have improved their knowledge of some natural hazards such as seismic hazards and geomorphological hazards (particularly landslides). As an example, a Seismic Microzonation [28] was carried out in 2018 for the historical centre. Despite this progress, some gaps and challenges remain. For example, the Municipality has the need:

- to develop a database with information about relevant hazards in order to inform civil protection strategies;
- to use a system that helps detect the historical buildings or monuments most exposed to risks;
- to prepare a list of priorities for historical buildings and artwork in order to identify repair strategies.

3. Governance framework for cultural heritage management

This section considers the governance framework for cultural heritage relevant the identified sites in Camerino, by illustrating existing policies, strategies and programmes for the management, protection and use of cultural heritage at the different governance levels. It also reflects on the extent to which the local commitments and action plans take into account and align to the key international governance instruments created by UNESCO.

3.1. International¹

At the international level, it is possible to consider the policy decisions and the main directives that are adopted by national laws. The Italian laws are promulgated by the Italian Parliament and they are mandatory. Some international commitments recognised by Italian law include:

- Recommendation concerning the Protection, at national level, of the Cultural and Natural Heritage of the General Conference of UNESCO adopted in 1972 and recognised by the Italian Law No. 184 of 6th April 1977;
- Convention for the Protection of the Architectural Heritage of Europe, European Treaty Series (ETS) No.121, Granada, 3rd October 1985, recognized by the Italian Law No. 93 of 15th February 1989.

There are also European Conventions that are references for archaeological heritage and heritage landscapes:

- European Convention on the Protection of the Archaeological Heritage (Revised) ETS No.143 La Valletta, 16th January 1992;
- European Landscape Convention European Treaty Series (ETS) No.176 Florence, 20th October 2000.

Some principles are reported in the following proceedings of international and European conferences:

- Convention on the Protection and Promotion of the Diversity of Cultural Expressions, General Conference of UNESCO, Paris, 2005;
- Recommendation on the historic urban landscape, General Conference of UNESCO, Paris, 2011;

¹ References (See Annex 11.1):

- Italian Law n. 184 of 6th April 1977, Ratifica ed esecuzione della convenzione sulla protezione del patrimonio culturale e naturale mondiale, firmata a Parigi il 23 novembre 1972 (in Italian);
- Italian Law n. 93 of 15th February 1989, Ratifica ed esecuzione della convenzione europea per la salvaguardia del patrimonio architettonico in Europa, firmata a Granada il 3 ottobre 1985 (in Italian).

- Davos declaration 2018 - Towards a high-quality Baukultur for Europe, Conference of European Ministers of Culture, Davos, 2018.

Finally, general principles for the conservation of cultural heritage are shown in the following International Charters:

- European Charter of Architectural Heritage, Amsterdam, 1975;
- Charter for the conservation of historic towns and urban areas, Washington, 1987;
- The Charter of Krakow - Principle for conservation and restoration of built heritage, Krakow, 2000.

3.2. National²

The *Ministry for Cultural Heritage and Activities, and Tourism* (MIBACT) regulates the management of archaeological and architectural heritage, museums, landscape preservation, etc. Different levels of government (state, regions and municipalities) share responsibilities for cultural heritage, according to the Italian Constitution. Cultural heritage preservation is listed among the cultural responsibilities to be retained by the state, with a few exceptions listed in article 5 of the Cultural Heritage and Landscape Code (Legislative Decree No. 42, issued 22nd January 2004, modified by Legislative Decree No. 62 of 26th March 2008). According to the Cultural Heritage and Landscape Code, MIBACT developed a specific directive in order to manage the protection and safeguarding of cultural heritage in case of disasters. Regions, municipalities and local authorities shall cooperate with the ministry in performing its protection tasks. The ministry has a superintendent role and ensures through its peripheral offices the proper surveillance and inspection of national cultural heritage. The system for landscape protection has been balanced by giving responsibility back to the state, in cooperation with regional authorities, by the Legislative Decree No. 63 of 26th March 2008. Furthermore, there are voluntary technical standards for the management of cultural heritage that are promulgated by UNI (Ente italiano di Normazione) [18]. These apply, for example, to chemical, physical and mechanical analyses of cultural heritage materials, to defining preservation and restoration methods for architectural heritage and artworks, and managing the cultural heritage and recovery area for artworks.

3.3. Regional³

The Council of the Marche Region developed the regional law no. 4 of 09th February 2010 for the preservation of the regional cultural heritage. This law has the objective of regulating

² References (see Annex 11.1):

- Legislative Decree n. 42 of 22nd January, 2004, Cultural Heritage and Landscape Code (in Italian).
- Legislative Decree n. 62 of 26th March 2006, Changes on Legislative Decree n. 42/2004 concerning Cultural Heritage (in Italian).
- Legislative Decree n. 63 of 26th March 2006, Changes on Legislative Decree n. 42/2004 concerning Landscape (in Italian).

³ References (see Annex 11.1):

cultural heritage assets and related activities according to the articles no. 117 and no. 118 of the Italian Constitution and in compliance with the legislative decree no. 42 of 22nd January, 2004. With this law, the Marche Region has the task of carrying out actions to protect cultural heritage in accordance with the Cultural Heritage and Landscape Code (see Section 3.2), and to support and promote the conservation of cultural heritage by restoration, prevention and recovery actions. The superintendence of architectural and landscape heritage of the Marche Region manages, at regional level, architectural heritage and museums, and it approves private and public activities that involve cultural heritage according to national and regional laws. The seismic design of any refurbishment of architectural heritage, that was damaged by the last seismic events in 2016, needs to be approved by the regional office for reconstruction [15]. For religious buildings, the regional episcopate is also involved in management [13].

3.4. Local

Camerino's council has the responsibility for planning, managing and conducting the ordinary maintenance of historical buildings and cultural heritage landscapes. While the municipality can access most of the skills and resources necessary to respond to possible disaster scenarios, gaps still exist. This is especially the case of the pre-disaster planning related to the risk management of the cultural and historical buildings and artwork collections in spite of the various local museums, historical palaces and churches that are sited in its historical urban area. Post-disaster management is mainly entrusted to the Civil Protection Office of the Camerino (COC) [19].

At present, the municipality of Camerino lacks a system that identifies the historical buildings or monuments most exposed to risks. Such a system could help to prioritise historical buildings and artworks to define preservation and intervention strategies and implement them where most needed. Furthermore, it could be useful both to define priorities concerning the evacuation of moveable heritage and to analyse suitable sites for the recovery in case of disasters.

Essential inputs could come from the UNESCO Recommendation on the Historic Urban Landscape⁴, which identifies specific strategies for local authorities to undertake in implementing a more holistic approach to understanding and managing heritage places in connection with the wider urban fabric, such as follows:

- *To consider synergies between the recommendation and policies related to sustainable urban development – i.e. local policies and regulations in place to guide harmonious integration of contemporary interventions into historic urban fabric.*
- *Looking at the relationship between historic urban areas and cultural diversity and social inclusion, to encourage initiatives promoting cultural diversity and/or creativity in historic urban areas.*

• Regional Law n. 4 of 09th February, 2004, Laws concerning cultural heritage and activities (in Italian).

⁴ See <https://whc.unesco.org/en/hul/>

- *To implement ecologically sensitive policies and practices aimed at strengthening sustainability and quality of life, looking at the relationship with natural capital.*
- *To safeguard intangible values of the urban heritage.*
- *To ensure the cooperation of a broad range of stakeholders through participatory processes and community engagement.*
- *To consider the importance of knowledge and planning tools, through mechanisms in place to assess the vulnerability of heritage attributes of urban areas to socio-economic pressures, climate change and disasters.*
- *To conduct assessment through comprehensive surveys and mapping decision-making processes.*
- *To reflect on the use of innovative financial tools and instruments.*
- *To promote capacity building, research, information technology and education.*

4. Governance framework for disaster risk reduction

This section looks at the governance framework for Disaster Risk Reduction (DRR) relevant to the city of Camerino. After a first overview of the international context, it moves forward considering existing policies, strategies and action plans at national, regional and local level. It also reflects on the extent to which existing local commitments in particular are able to take into account and align to key international instrument for guiding disaster risk reduction, the Sendai Framework.

4.1. International⁵

The *Italian Civil Protection Office* works together with the *European Civil Protection Mechanism through the Emergency Response Coordination Centre (ECCR)* that coordinates the delivery of assistance to stricken countries, such as civil protection teams and specialised equipment. The guidelines coming from these activities may be accepted also by the national and local civil protection authorities. The *United Nations Office for Disaster Risk Reduction (UNDRR)* [20] supports coordination mechanisms like the National Platforms for Disaster Risk Reduction and other institutions (e.g. governments, science and technology, civil society). UNDRR [20] supports the implementation of the *Sendai Framework for Disaster Risk Reduction 2015-2030*. The *Sendai Framework* [21] is a tool adopted in order to manage the transition from “disaster management” to “disaster risk management”. The UNDRR [22] and the *Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG ECHO)* [23] define criteria for the disaster management. The DG ECHO is composed of two units: the first has the task of emergency and disaster response based on international collaborations between member states; the second unit develops frameworks in order to prevent disasters and emergency situations (e.g. training courses, exchange of knowledge and expertise, the development of new training solutions, the management of prevention projects, the coordination of public information activities and the financial planning for the two units). This system facilitates cooperation between the European member states and all the activities are based on the principle of subsidiarity, i.e. several actions are undertaken through the supervision of the member state interested by natural disasters.

4.2. National⁶

The *Italian Civil Protection Office* [24] is an agency of the Presidency of the Council of Ministers. The office coordinates responses to natural disasters, draft legislation on risk

⁵ References (see Annex 11.2):

- Decision 1313/2013/EU of the European Parliament and of the Council on a Union Civil Protection Mechanism;
- Decision (EU) 2019/420 of the European Parliament and of the Council of 13 March 2019 amending Decision 1313/2013/EU on a Union Civil Protection Mechanism.

⁶ References (see Annex 11.2):

- Decreto Legislativo n.1 del 02/01/2018 (Italian National Law): Codice della protezione civile (in Italian);
- D.P.C.M. 09/08/2016 (Decree of the President of the Council of Minister): organizzazione del Dipartimento della Protezione Civile (in Italian);

prevention and promotes training projects. The latest modification to the internal organisation of the Civil Protection Office occurred with the Decree of the President of the Council of Minister of August 9, 2016. The functions and services of the offices according to the current organisational chart (see Figure 23 below) have been assigned by Decree of the General Secretary of the Presidency of the Council of Ministers of August 10, 2016. The Office of the Operational Director is divided into different departments: Emergency Planning and Drills, Operational Support in Emergency, Italia Situation Room and Operations Centre for Maritime Emergencies (COEMM), Joint Air Operations Centre (COAU) and Mobility and Essential Services. In particular, the COEMM elaborates models and procedures for the National Civil Protection Service, shares information on emergency situations, evaluates the situation post-disaster, and supports in case of the declaration of a state of emergency. The COEMM department also has the task of coordinating first response activities after disasters, catastrophes or other events which, due to their intensity and extent, must be handled with immediate intervention and with special capacities and means.

With the declaration of a state of national emergency by the Council of Ministers, the Head of the Office of Civil Protection decides on the first intervention activities to implement (see Figure 23). The National Civil Protection Office consists of: State administrations, Provincial councils, Municipalities and local authorities for the management of the mountain areas. Its operating structures include: scientific research groups (including I.N.G.V. and other research institutes), technical services, voluntary organisations, the Italian Fire Brigade, the Armed Forces, the Police Force, the National Forestry Commission, the Italian Red Cross, the structures of the Italian Health Service and the National Mountain Rescue and Speleological Corps (C.N.S.A.S.). In ordinary situations, the operative structures with the departments perform the monitoring, forecasting and risk prevention activities as well as the operative interventions, each with its own specific technical skills. In situations of national emergency or when natural calamities occur, after the declaration of the state of emergency by the Council of Ministers, the Prime Minister may avail of delegated commissioners and operative structures for the necessary interventions. The management of the operative structures is assigned to the Head of the Civil Protection Office. There are national technical standards for buildings and infrastructures also in order to assess vulnerability and to reduce seismic risks [25].

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- Decreto del Segretario Generale della Presidenza del Consiglio dei Ministri del 10/08/2016 (Decree of the General Secretary of the Presidency of the Council of Ministers): organizzazione interna del Dipartimento della Protezione Civile (in Italian);
 - D.P.C.M. 20/02/2012 (Decree of the President of the Council of Minister): componenti del comitato paritetico (in Italian);
 - D.P.C.M. 21/11/2006 (Decree of the President of the Council of Minister): Costituzione e modalita' di funzionamento del Comitato operativo della protezione civile (in Italian);
 - Legge n. 286 del 27/12/2002 (Italian National Law), Conversione in legge, con modificazioni, del D.L. 4 novembre 2002, n. 245, recante interventi urgenti a favore delle popolazioni colpite dalle calamità naturali nelle regioni Molise e Sicilia, nonché ulteriori disposizioni in materia di protezione civile (in Italian)

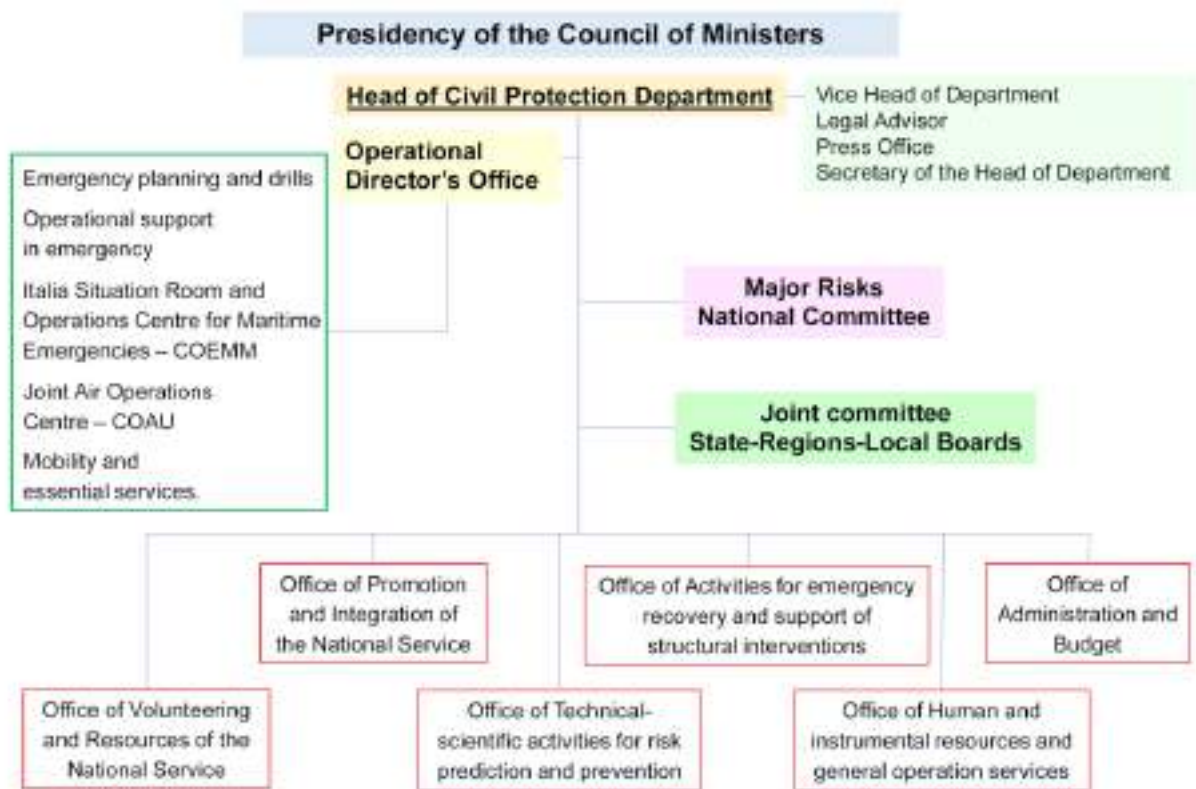


Figure 23. Organisational chart of the Civil Protection Office.

4.3. Regional⁷

The activities of the Civil Protection Office of the Marche Region are regulated by several regional laws and decrees, such as the regional law no. 32/2001 that defines both the tasks of the local authorities and the operative procedures for emergency management. The main tasks of the Civil Protection Office of the Marche Region concern programming of civil protection activities, risk prevention and rescue. Regional skills, concerning local security, are entrusted to the civil protection system. When emergencies occur, the Civil Protection Office of the Marche Region defines the tasks of the local authorities and coordinates their activities. The Civil Protection Office of the Marche Region has three main boards: Multi-risks Office, Regional Operative Office (SOUP) and the Emergency Service Centre (CAPI) (see Figure 24 for organisational structure).

4.3.1. Multi-risks Office

This Office contributes to ensuring the management of the national alert system for weather, geological and hydraulic risk. Its main task is to support the decisions of civil protection

⁷ References (see Annex 11.2):

- Legge Regionale n. 32 del 11/12/2001, Sistema regionale di protezione civile, B.U.R. n. 146 del 20/12/2001, (in Italian).
- Legge Regionale n. 13 del 03/04/2015, Disposizioni per il riordino delle funzioni amministrative esercitate dalle Province, B.U.R. n. 33 del 16/04/2015, (in Italian).
- Decreto del Presidente della Giunta Regionale n° 41 del 01/02/2005, (in Italian).

authorities. The primary functions of the Office are the monitoring and surveillance of events, as well as weather, geological and hydraulic risk assessment.

The monitoring activities of the Office are based on local and national networks, such as the seismic events recorded by the monitoring network of the National Institute of Geophysics and Volcanology (INGV).

4.3.2. Regional Operative Office (SOUP)

The Regional Operative Office (SOUP) consists of officials from the Civil Protection Department, Fire-Department, State Forestry Commission, Italian Red Cross, and the National Health Service. The SOUP holds networks for the remote control of the area (hydrology, seismic) and databases necessary for the management of civil protection emergencies.

4.3.3. Emergency Service Centre (CAPI)

The Emergency Service Centre (CAPI) of the Marche Region is a permanent operating structure that has warehouses for the storage of emergency supplies to be used when calamitous events occur. The main aims of the centre are the acquisition, storage, and protection of supplies and equipment for civil protection.



Figure 24. Organisational chart of the Civil Protection Department at regional level.

The Prefect of Macerata (the province that includes Camerino municipality) has civil protection tasks within the provincial territory. When a calamity occurs, the Prefect – together with different authorities of the Civil Protection Department – guarantees first aid services and emergency management also by firefighters and law enforcement. If the emergency is more complex, a Coordination Centre (CCS) is activated at the Prefecture; this centre is a temporary structure for the duration of the emergency, and aims to coordinate and connect the measures that are adopted by different local authorities. Finally, the Prefect prepares emergency plans for factories susceptible to high risk levels.

Furthermore, in the Marche Region there are eight local authorities that manage the mountain areas. These are institutions made up of some municipalities that share funds for guaranteeing the main social and economic services to the population, managing land use zoning and planning, and preserving landscapes and ecosystems (see Figure 25).

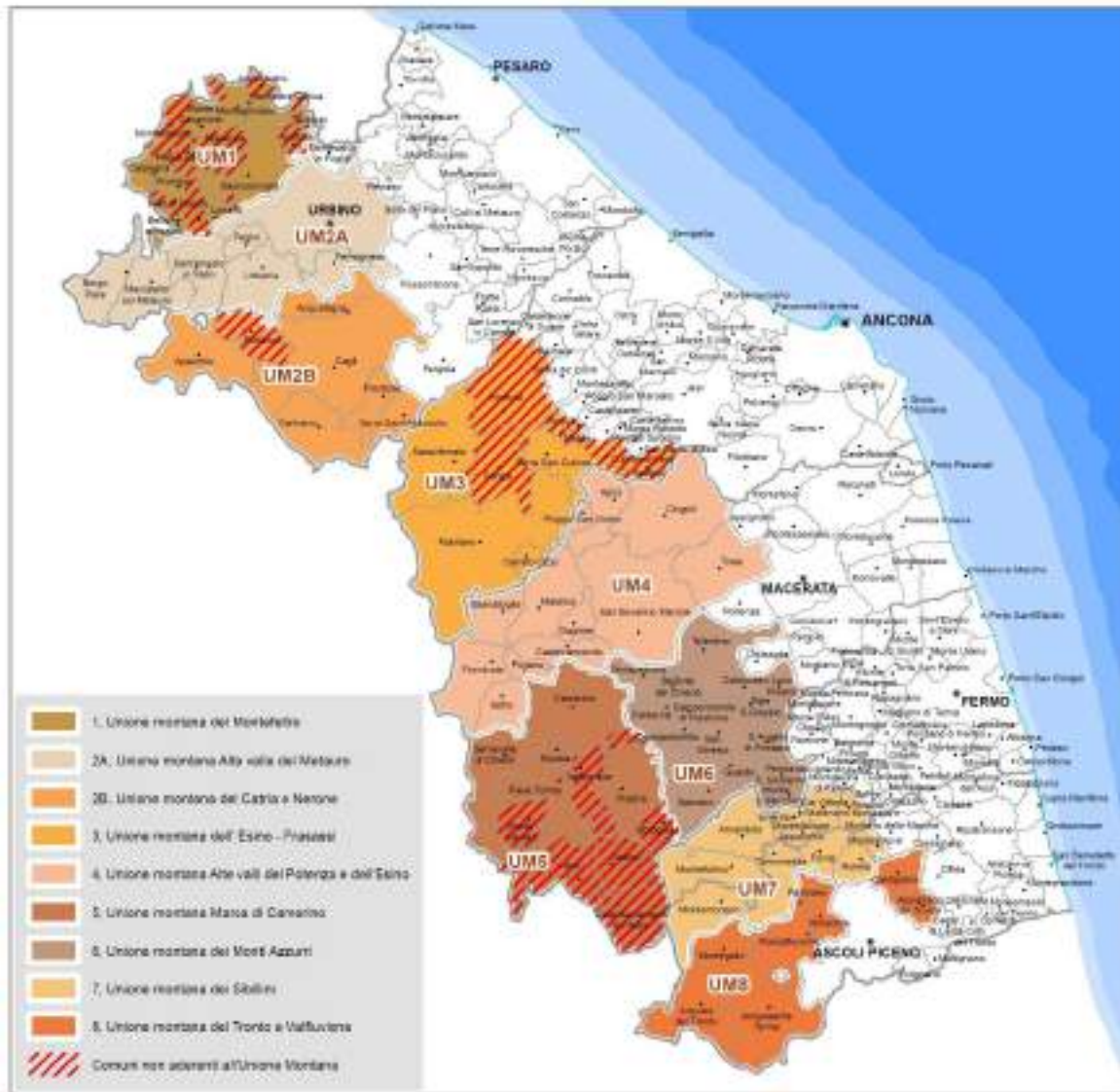


Figure 25. Local authorities for the management of the mountain areas (Marche Region) [26].

4.4. Local⁸

The *Civil Protection Office of Camerino (COC)* is the first authority that organises the response to a disaster or to an emergency, before potential following interventions of regional and

⁸ References (see Annex 11.2):

- Civil protection plan, approved by council's deliberation n. 61 of 22nd December, 2008, according to Italian Law n. 225 of 24th February, 1992.

national civil protection departments. When an emergency occurs, the COC activates the different support operation structures. The mayor is the head of COC within the municipality.

The municipal civil protection plan includes the main baseline information on the territory: natural hazards, with particular reference to seismic hazard, geological and hydraulic hazard, fires, heavy snowfalls and heat waves. Furthermore, the plan lists the objectives to be achieved to guarantee the first ordinary response to emergency interventions, aiming at safeguarding the population and the territory and the intervention model steps, defining roles and responsibilities.

4.5. Gaps and needs

Considering the objectives of the ARCH project, it would be essential to conduct new geological and geophysical surveys in order to more accurately identify hazard scenarios. The same data would then be essential for the construction of a “geological model” of extreme detail, functional also for future studies on the local seismic response and to define a risk map of the Camerino’s Old Town. The municipality has the need to develop a database with this information for its civil protection strategies.

As previously mentioned, the Sendai Framework sets out four main priorities for intervention⁹, with associated desired actions and proposed strategies, some of which target local governments:

Priority 1: Understanding disaster risk

Priority 2: Strengthening disaster risk governance to manage disaster risk

Priority 3: Investing in disaster risk reduction for resilience

Priority 4: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

Overall, some efforts in Camerino can be recognised in relation to the assessment of risks (although lacking of GIS-database of the historical buildings and moveable heritage most exposed to risks) and effective management during the emergency scenario, acting as first responders even before regional and national institutions. Significant further investments and priority could be given to improving mechanisms to foster coordination across institutions, as well as disaster risk reduction strategies and the reconstruction plan for the historical urban area interested by the last seismic events (2016), through community involvement. Thus, it could be useful to develop impact scenarios due to the main hazards, by GIS-based decision support tools, to improve the current knowledge and to define future strategies that could be useful to preserve the cultural heritage from future disasters.

⁹ See <https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030>

5. Governance framework for climate change adaptation

This section looks at the governance framework for climate change adaptation of relevance to the City of Camerino. It elaborates on the relevant policies, strategies, visions and action plans for climate change adaptation at the different governance levels. It concludes with a reflection on the extent to which local governance of climate change adaptation takes into consideration key international governance instrument, the 2015 Paris Agreement.

5.1. International

At the international level, it is possible to highlight some fundamental strategies and visions, which helped drive climate action. These documents are accepted and recognised by Italy, as a member of the United Nations (U.N.) and the European Community. They affect the national level and should be taken into account in local actions as well. Two international levels can be defined: a global level with the Kyoto Protocol, the 2015 Paris Agreement and its successive processes and meetings and a European level with some fundamental directives: EU Directive 2003/87, EU Directive 2012/27, EU Directive 2018/844 and more specific regulations provided by the European Energy Agency like documents relevant to environmental policy in Europe which set out the environmental objectives, targets and reporting obligations with data and indicators. Of particular relevance is the EU Adaptation Strategy (2013). The evaluation package comprises a report on the implementation of the EU Strategy on adaptation to climate change COM (2018)738, the Evaluation of the EU Strategy on adaptation to climate change SWD (2018)461, and the Adaptation preparedness scoreboard Country fiches SWD (2018)460. The evaluation found that the EU Adaptation Strategy has been a reference point to prepare Europe for the climate impacts to come, at all levels. It emphasised that EU policy must seek to create synergies between climate change adaptation, disaster risk reduction efforts and sustainable development to avoid future damage and provide for long-term economic and social welfare in Europe and in partner countries.

5.2. National

In Italy, the protection of the environment, ecosystems and cultural resources is under the exclusive competency of the central government. The *Ministry for Environment, Landscape and Sea* (IMELS) carries out activities on climate change at the national and international level.

The Italian governance framework for adaptation to climate change can be considered as very fragmented with several laws and regulations in which actions, strategies and regulations have been partially provided for different aspects (mobility and transportation, energy use, energy production, waste management, marine cost management, greenhouse gas emissions, etc.) and in different ways without an overall and comprehensive vision. Specifically related to climate change are the Legislative Decree 216/2006 and the National Adaptation Strategy (NAS).

The NAS from 2014 includes the following:

- The state of scientific knowledge on impacts, vulnerability and adaptation to climate change in Italy;
- Analysis of the EU and national legislation relevant to impacts, vulnerability and adaptation to climate change;
- Elements for a National Strategy for Adaptation to Climate Change.

The NAS is a tool for encouraging adaptation actions in planning activities at national, regional and local levels. After approval from the "State-Regions Unified Conference" on 30th October 2014, the NAS was finally adopted in June 2015 by a Directorial Decree of the Climate and Energy General Directorate, establishing specific objectives to be reached by 31st December 2016.

Based on the NAS, the Ministry of Environment started in 2017 to provide an Italian National Adaptation Plan for Climate Change (NAP). The Directorate General for Climate and Energy of IMELS is currently working on the implementation of the NAS through the NAP, developed with the support of the *Euro-Mediterranean Centre on Climate Change* (CMCC). The NAP was drafted in December 2016. During 2017 and the first half of 2018, IMELS carried out a check on the draft NAP by a consultative process involving national, regional and local authorities, universities, research centers and other stakeholders. The approval of the NAP is occurring through an Agreement with the State-Regions Conference. The NAP provides some preliminary institutional guidelines [27] to national and local authorities for the elaboration of regional strategies or plans and for the integration of climate change adaptation within spatial and sectorial planning.

5.3. Regional

For the Marche Region, it is possible to cite two guidelines related to the management of and adaptation to climatic changes: the Regional *Environmental and Energy Plan* from 2016 and the *Regional Plan for Climate* from 2007. The *Regional Environmental Energy Plan* identifies the guidelines for environmental energy policy in the regional territory:

- to respect the "burden sharing" legislation (Ministerial Decree 15th March 2012 and Ministerial Decree 11th May 2015)¹⁰;
- to respect the "ex ante conditionality" for the use of the structural funds - energy sector, as established by the regional operative program (POR)¹¹ and the Rural Development Plan (RDP) 2014-2020.

The *Regional Plan for Climate*, made in 2007 but still in draft, intends to systemise and make more effective the climate change mitigation policies. Targets of the plan are:

¹⁰ These laws implemented the legislation of the European Strategy 20.20.20 on climate and energy and Legislative Decree 28/2011 on the promotion of the use of the energy from renewable sources.

¹¹ <http://www.regione.marche.it/Entra-in-Regione/Fondi-Europei/FESR/Programma-Operativo-Por-FESR>

- energy efficiency to direct the construction market towards the design and construction of zero-emission buildings and favours the use of cogeneration and smart systems in the industrial, civil and tertiary sector;
- renewable sources to improve the biofuels, micro-wind and geothermal sectors applied to the civil sector and the recovery of energy contained in the organic waste fraction biogas;
- sustainable mobility and urban development to reduce the need for travel by private transport and favours the transition from the use of private transport to public transport by supporting mobility plans, surface metros and carpooling;
- efficient use of resources to minimize the consumption of resources and energy per unit of product and service, supporting Life Cycle Analysis (LCA), green public procurement, separate waste collection at home and a green tax reform;
- other measures to increase the knowledge culture and awareness of the importance of individual political choices and behaviours in facing the climate challenge.

5.4. Local

At the local level, although no detailed plan for climate change adaptation is in place, the national and regional laws concerning the energy management and the preservation of the natural and urban landscapes are adopted. The *Office for Environment and Public Works* can be considered as the local public service most suited to manage possible activities about climate change adaptation. Considering the local land use policy and the management of natural areas as part of the governance for climate change adaptation, it is possible to cite the Forest Fire Emergency Plan (2018) through which the municipality of Camerino plans and manages risks from forest fires. It is a local program for protecting the integrity of life, property, settlements and the environment from damage or from dangers resulting from natural disasters, catastrophes and other events. The current Snowfalls Emergency Plan allowed to basic effectiveness of the urban infrastructures, especially those of the Old Town, during the last important heavy snowfalls. The mayor and the city council are able to propose, draft and enforce actions needed within the municipality's territory, as long as they do not contradict regional and national plans and laws.

5.5. Gaps and needs

There are no detailed studies, surveys, and assessments related to climate change impacts for the municipality of Camerino. Existing records about the status and condition of cultural heritage assets, such as historical buildings, monuments, landscapes, ecosystems and environment have to date not considered the impacts and effects of climate change. Reasons for the lack of assessments on climate change impacts could be economic as well as the (possibly related) absence of effective monitoring systems. Otherwise, the civil protection strategies for the post-emergency management (i.e. fires, heavy snowfalls, heavy rainfalls, etc.) are well defined.

The Paris Agreement, addressing crucial areas necessary to combat climate change, largely targets climate mitigation and directly addresses nation states, with a focus on parties to the agreement's nationally-determined contributions to emissions reduction.

Article 7 and 8 of the agreement, however, deal explicitly with climate adaptation, and with the loss and damage associated with climate impacts. Both articles highlight the need of cooperation to enhance understanding (of potential risks and vulnerabilities) and necessary adaptation measures to be implemented.

Article 7 notes the following areas of cooperation between parties:

- (a) Sharing information, good practices, experiences and lessons learned, including, as appropriate, as these relate to science, planning, policies and implementation in relation to adaptation actions;*
- (b) Strengthening institutional arrangements, including those under the Convention that serve this Agreement, to support the synthesis of relevant information and knowledge, and the provision of technical support and guidance to Parties;*
- (c) Strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making;*
- (d) Assisting the institutions in the identifying effective adaptation practices, adaptation needs, priorities, support provided and received for adaptation actions and efforts, and challenges and gaps, in a manner consistent with encouraging good practices; and*
- (e) Improving the effectiveness and durability of adaptation actions.*

Article 8 notes that 'areas of cooperation and facilitation to enhance understanding, action and support may include:

- (a) Early warning systems;*
- (b) Emergency preparedness;*
- (c) Slow onset events;*
- (d) Events that may involve irreversible and permanent loss and damage;*
- (e) Comprehensive risk assessment and management;*
- (f) Risk insurance facilities, climate risk pooling and other insurance solutions;*
- (g) Non-economic losses; and*
- (h) Resilience of communities, livelihoods and ecosystems.*

The above fields of action can be understood as a framework in which actions at national level are expected to be taken. In that sense, they are of limited use as an implementation guide for local governments. It could be expected that national governments would be working to establish national policy frameworks for action that will in turn demand to implement complementary strategies at regional and local levels. Due to the absence of an official body dealing with climate change established within the local administrative council, the author was not able to identify direct linkages between the National Adaptation Plan (NAP) and potential future adaptation commitments at the municipality level.

6. Expected impacts of climate change-related and natural hazards

The purpose of this section is to report and review the preliminary collection of relevant information about hazards, exposed elements, as well as impacts provided by the municipality of Camerino in collaboration with the University of Camerino as their local research partner, in order to offer an initial overview of the risks that might affect the selected historic areas and their communities. It should be noted that the content in this section is not exhaustive, but rather should be understood as a departure point to serve as a basis for future work.

This section is structured as follows: a description of the methodology is provided, followed by a Risk Profile Table, outlining hazards, exposed elements, impacts, and corresponding resilience-building measures already planned or implemented to date. Next follows a review, interpretation, and validation of the information provided in the Risk Profile Table. Finally, an outlook is provided concerning further risk analysis work in the context of the ARCH project.

6.1. Methodology

In order to elicit relevant information for risk analyses from the municipality of Camerino, ENEA, Fraunhofer, ICLEI, and Tecalia developed a Risk Profile Table template (see Section 6.2) based on the central risk components identified in the 5th Assessment Report of the Intergovernmental Panel on Climate Change: hazards, exposed elements, impacts (physical, societal, functional, economic, and intangible), as well as corresponding resilience-building measures already planned or implemented to date.

This template was filled out by the Camerino city partners and it provides a starting point from which to conduct more detailed risk analyses. Furthermore, it allows to provide a useful starting point for the data, models, methods, and tools to be developed during the ARCH project. The information provided in the Risk Profile Table was reviewed and harmonised by ENEA in order to provide a comparable description across all city cases and ensure relevance to (and validity for) similar on-going and/or future initiatives¹² and projects in the field of disaster risk reduction, climate change adaptation, and cultural heritage preservation.

The following standards, reference material, and tools were identified as most suitable for this exercise:

- The City Climate Hazard Taxonomy¹³ for classification of hazards;
- The UNDRR QRE Tool¹⁴ and ISO standard 37120¹⁵ for the classification of exposed elements and impacts;

¹³ <https://www.c40.org/researches/city-climate-hazard-taxonomy>

¹⁴ <https://www.unisdr.org/campaign/resilientcities/toolkit/article/quick-risk-estimation-qre>

¹⁵ <https://www.iso.org/standard/68498.html>

- The ICOMOS CCHWG¹⁶ classification and INSPIRE¹⁷ directive for the classification of heritage assets.

Based on the harmonised information, initial proposals for risk analysis focus actions (e.g. which methods and tools to apply for which part/issue of a historic area) were formulated by ENEA. The initial proposals will be further defined during the co-creation process and in exchange with the relevant local stakeholders.

¹⁶ https://adobeindd.com/view/publications/a9a551e3-3b23-4127-99fd-a7a80d91a29e/g18m/publication-web-resources/pdf/CCHWG_final_print.pdf

¹⁷ INSPIRE, Infrastructure for Spatial Information in Europe D2.8.III.2 Data Specification on Buildings – Technical Guidelines (5.3.1.1.4. Classification of buildings, pages 43-45).

6.2. Risk Profile Table for Camerino

Heritage site (historic area)	Hazard ¹⁸	Exposed element ¹⁹	Impacts					Corresponding resilience- building measure undertaken	Notes/Evidence
			Physical	Societal	Functional	Economic	Intangible		
Old town (Camerino)	Seismic hazards	<p>Cultural heritage (churches, historical buildings, palaces etc.).</p> <p>Intangible cultural heritage.</p> <p>Private and public buildings.</p> <p>People.</p> <p>Transportation systems (road and railroad networks).</p> <p>Infrastructure systems (electrical, gas, and waterworks networks etc.).</p> <p>Natural environment (groundwater level and earthquake-induced landslides).</p>	<p>Damage to cultural heritage assets (churches, historical buildings, palaces etc.) and private buildings.</p> <p>Damage to transportation systems (road and railroad networks).</p> <p>Damage to infrastructure systems (electrical, gas, and waterworks networks etc.).</p> <p>Degradation of natural environment.</p>	<p>Injury and death.</p> <p>Possible effects on mental health (depression due to lifestyle modification).</p> <p>Loss of personal effects.</p> <p>Loss of access to key services.</p>	<p>Functionality loss of transportation systems (road and railroad networks).</p> <p>Functionality loss of infrastructure systems (electrical, gas, and waterworks networks etc.).</p> <p>Reduced functionality of school and other public services.</p>	<p>Loss of tourism revenue due to service disruptions.</p> <p>Interruption of commerce and tertiary sector.</p>	<p>Loss of cultural and artistic values and traditions (also related to loss of artworks and cultural heritage).</p>	<p>Civil emergency management plan (G).</p> <p>Seismic Microzonation (S).</p> <p>Funding for retrofit and seismic upgrade of buildings (G).</p>	[19], [28], [29]
Old town (Camerino)	Geomorphological hazards	Natural environment.	Loss of natural environment.	Loss of access to key services.	Damage to ecosystems.	Loss of tourism revenue due to	Damage or loss of area with cultural value	Land use zoning plan (S).	[30], [31]

¹⁸ Note: the UN Office for Disaster Risk Reduction (UNDRR)'s Resilience Scorecard defines 'hazard' as 'a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation'. Of these, the ARCH project is addressing natural and climatic hazards.

¹⁹ Note: the UN Office for Disaster Risk Reduction's Resilience Scorecard defines 'exposure' as 'the situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas'.

Heritage site (historic area)	Hazard ¹⁸	Exposed element ¹⁹	Impacts					Corresponding resilience- building measure undertaken	Notes/Evidence
			Physical	Societal	Functional	Economic	Intangible	Description (please indicate specific S or general G)	
		<p>Cultural heritage (churches, historical buildings, palaces etc.).</p> <p>Intangible cultural heritage.</p> <p>Private buildings.</p> <p>People.</p> <p>Transportation systems (road and railroad networks).</p> <p>Infrastructure systems (electrical, gas, and waterworks networks etc.).</p>	<p>Damage to cultural heritage (churches, historical buildings, palaces etc.) and private buildings.</p> <p>Transportation systems (road and railroad networks).</p> <p>Infrastructure systems (electrical, gas, and waterworks networks etc.).</p>		<p>Functionality loss of transportation systems (road and railroad networks).</p> <p>Functionality loss of infrastructure systems (electrical, gas, and waterworks networks etc.).</p> <p>Damage and flooding of sewerage systems.</p>	decrease in visitors.	<p>(also related to loss of artworks and cultural heritage).</p> <p>Damage to natural environment.</p>	<p>Geological map at regional level (S).</p> <p>Protective infrastructure in place for landslides that are well maintained and monitored (S).</p>	
Old town (Camerino)	Heavy snowfalls	<p>Cultural heritage (churches, historical buildings, palaces etc.).</p> <p>Infrastructure systems (electrical, gas, and waterworks networks etc.).</p>	<p>Damage to cultural heritage (churches, historical buildings, palaces etc.) and private buildings.</p> <p>Infrastructure systems (electrical, gas, and waterworks networks etc.).</p> <p>Damage to public green areas (breaking old trees).</p>	Loss of access to key services.	<p>Reduction functionality of transportation systems (road and railroad networks).</p> <p>Reduction functionality of infrastructure systems (electrical, gas, and waterworks networks etc.).</p>	Loss of tourism revenue due to service disruption.	Loss of cultural and artistic values (also related to loss of artworks and cultural heritage).	Civil emergency management plan (G).	[19]

6.3. Preliminary classification of hazards, exposed elements and impacts

The purpose of this section is to review, interpret, validate, and harmonise the information provided in the Risk Profile Table (part 6.2) as a sound basis for the project to address Camerino's risks to cultural heritage induced by climate change and other hazards. This preliminary analysis covers:

- a) hazards;
- b) elements exposed to those hazards; and
- c) main impacts that the identified hazards might cause on the identified exposed elements.

6.3.1. Hazards

The identified hazards for the municipality of Camerino are recorded in Table 9 below and have been identified based on the hazard classification C40 *City Climate Hazard Taxonomy*²⁰ which is broken down into main hazard types and hazard subtypes. These are also highlighted in the preliminary resilience assessment presented in Section 7 of this report. According to this classification system, two main hazard clusters were identified in Camerino, namely: meteorological and geophysical (Table 9). As far as meteorological events are concerned, heavy snow was identified by the city as one of the main hazards in Camerino. Whereas for geophysical hazards, the seismic events are the main concern, followed by mass movements of different nature, such as landslides and rock falls (see Table 9).

Hazard categories	Hazard types	Hazard sub-type
Meteorological	Extreme precipitation	Heavy rain, heavy snow, monsoon, blizzard, hail
	Storm surges	Convective storms, (Thunderstorm, rainstorm)
Geophysical	Mass movements	Landslide, avalanche, rockfall, subsidence
	Tectonic activity	Earthquakes, <i>earthquake-induced landslides, rockfalls and subsidence</i>

Table 9. Hazard categories, types and sub-types identified for Camerino based on the city Risk Profile Table; in italics earthquake-induced hazard sub-types, not included in the C40 "City Climate Hazard Taxonomy".

²⁰ <https://www.c40.org/researches/city-climate-hazard-taxonomy>

Mass movements can also be induced by tectonic activity (as also observed in Camerino after the 2016-2017, Central-Italy seismic sequence) therefore hazard sub-types such as earthquake-induced landslides, rockfalls and subsidence have been included in Table 9.

6.3.2. Exposed elements

The elements exposed to the hazards and identified in the Risk Profile Table (part 6.2 above) for Camerino have been reorganised in Table 10 below.

Exposed Element Categories	Exposed Element Types
Natural Environment	Ecosystem
	Agricultural soil
	Natural parks and public green areas
Built Environment	Private and public buildings
	Transportation system
	Further critical infrastructure systems (electrical, gas, and waterworks networks etc.).
Cultural Heritage	Tangible and intangible elements (see Table 11)
Services	Tertiary sector (education and university)
	Agriculture
	Commerce
	Tourism
Human and Social Aspects	External people (e.g. tourists)
	Local people

Table 10. Exposed elements identified in Camerino.

The cultural heritage category subsumes all exposed elements (Table 10) that are in themselves heritage, i.e. exposed elements declared as heritage are only categories as such

and not as any of the other categories. Table 11 reports the exposed elements categorised as cultural heritage. Here, reference has been made to the six categories identified by the *Climate Change and Cultural Heritage Working Group* (CCHWG) in 2019. Thanks to data provided by the *Italian Ministry of Cultural Heritage, Cultural Activities and Tourism* (MIBACT), cultural heritage assets were identified in Camerino for all the six typologies identified by CCHWG²¹, as reported in Table 12. However, among the six CCHWG categories the following three are of particular relevance for Camerino: Movable Heritage, Building and Structures, and Cultural Landscapes. For the aforementioned cultural heritage, categories cultural heritage sub-types have been identified to provide a more detailed picture (Table 11).

Exposed Cultural Heritage Categories	Exposed Cultural Heritage Types
Movable Heritage	Works of monumental sculpture and painting
Archaeological Resources	Archaeological sites
	Archaeological monuments
Buildings and Structures	Architecture: churches, castles, palaces, towers, etc.
	Groups of separate or connected buildings
	Historical nuclei in surrounding villages
Cultural Landscapes	Parks/gardens
Associated and Traditional Communities	Local authorities for the management of the mountain areas and congregations
Intangible Heritage	Oral traditions
	Performing arts
	social practices
	Rituals
	Festive events
	Knowledge and skills to produce traditional crafts

Table 11. Categories and types of the cultural heritage exposed elements identified in Camerino.

²¹ https://adobeindd.com/view/publications/a9a551e3-3b23-4127-99fd-a7a80d91a29e/g18m/publication-web-resources/pdf/CCHWG_final_print.pdf

As far as **Movable Heritage** is concerned, there is a strong interest in Camerino to find viable operational procedures and location (depots) to ensure the preservation and security of the works of monumental sculpture and paintings that were dislocated from the damaged churches and palaces in Camerino following the recent seismic events.

As for **Buildings and Structures**, the interest is both in groups of separate or connected buildings as well as in historical nuclei. For groups of separate buildings, the following sub-categories have so far been identified in Camerino: churches, castles, palaces, triumphal arches, masonry bridges, towers and obelisks. For connected buildings, as far as seismic hazard is concerned, a peculiar analysis (from a strictly technical point of view) needs to be performed. These “building aggregates” are very typical in Italian historical centers. With regard to historical nuclei, in addition to Camerino, small surrounding villages (e.g. Ussita and Visso) will also be investigated.

As concerns **Cultural Landscape**, attention will be placed on natural capital (parks and gardens and on any heritage green and blue infrastructure included there) that go beyond Camerino’s administrative borders and that are governed, as far as their preservation is concerned, by local authorities for the management of the mountain areas.

6.3.3. Impacts

Table 13 reports the different impacts identified in Camerino for the five categories of impacts included in the Risk Profile Table (part 6.2 above) for the different exposed elements categorised according to the classification reported in Table 11 reports in a succinct way.

Exposed Element Categories	Exposed Element Types	Physical	Functional	Societal	Economic	Intangible
Natural Environment	Ecosystem	Damage to ecosystems			Loss of tourism revenue due to decrease in visitors	
	Natural parks and public green areas	Degradation and damage to natural environment				
	Agricultural soil	Damage to old trees				
	Private and public buildings	Damage		Loss of access to residential houses, offices, schools		
	Transportation system	Damage				

Exposed Element Categories	Exposed Element Types	Physical	Functional	Societal	Economic	Intangible
Built environment	Critical infrastructure systems	Damage of sewerage systems		and key services		
Cultural Heritage	Tangible and intangible elements	Damage	Service disruption		Loss of tourism revenue	Loss of cultural values and traditions
Services	Tertiary (education, university)				Loss of revenue	
	Agriculture					
	Commerce					
	Tourism					
Human and Social Aspect	External people (e.g. tourists)					
	Local people	Injury and death		Loss of personal effects		Possible effects on mental health, PTSD ²²

Table 12. Physical, Functional, Societal, Economic and Intangible impacts identified for the different exposed elements in Camerino.

Further to the impacts identified by Camerino in the Risk Profile Table (part 6.2 above), it is suggested to consider additional impacts. In particular, and as far as societal impacts are concerned, it would be important to consider all the people directly and indirectly affected by a disaster (e.g. people whose livelihoods and/or family and traditional craft businesses were

²² *Post-traumatic stress disorder (PTSD), e.g. in Camerino due to the experienced trauma, lifestyle modifications, lack of reference points including loss of access to houses, personal effects and religious and cultural heritage buildings.

disrupted or destroyed) as well as long-term effects (e.g. the sudden post-disaster increase in depopulation of the territory already in act since a long time in all the rural territories of central Italy). Furthermore, Camerino's Risk Profile Table currently encompasses only indirect economic losses (i.e. loss of revenue), whereas direct economic losses should also be accounted for (e.g. direct economic losses resulting from damaged or destroyed buildings, cultural heritage and critical infrastructures). Additionally, as far as loss of revenue is concerned, it would be important to further disaggregate them by economic sector, according to the standard classification adopted in Italy (ATECO 2007²³).

6.3.4. Outlook and implications for the ARCH project

Based on the information provided in the Risk Profile Table (part 6.2 above) and building on the joint meetings between Camerino and the research partners, ARCH's work for the municipality of Camerino is envisaged to be conducted at different levels of analysis (Table 13).

Study Areas/Buildings	Possible Analysis	Possible Tools
District scale - beyond the municipality's borders	<ul style="list-style-type: none"> Impact chain analysis; Thematic maps. 	<ul style="list-style-type: none"> IVAVIA impact chain creator (adapted for ARCH); ARCH DSS (i.e. CIPCast).
Municipality scale - Camerino's old town	Scenario simulations	<ul style="list-style-type: none"> ARCH DSS; Satellite images and and/or survey supported by drones.
Prototypical building scale - identified within Camerino old town	Scenario simulations with dynamic data integration from sensors and satellite images	<ul style="list-style-type: none"> ARCH DSS; Survey supported by drones; Chemical and mechanical characterisation of constructive materials;

²³ ATECO 2007 classification is the Italian national version of the Nace Rev. 2 (the statistical classification of economic activities in the European community, <https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF>). From 2008, not only the Italian National Institute of Statistics (ISTAT) adopted the so called ATECO 2007, but also multiple institutional governance body (e.g. the Ministry of Economy, business enterprise associations, and internal revenue agencies) .

Study Areas/Buildings	Possible Analysis	Possible Tools
		<ul style="list-style-type: none"> Sensors.
<p>Two buildings of interest (See Section 2):</p> <p>1) Palazzo Ducale;</p> <p>2) Santa Maria in Via Church.</p>	<ul style="list-style-type: none"> 3D building model with identified damage pattern; Dynamic monitoring of damage; Finite element analysis of the buildings to support retrofitting interventions. 	<ul style="list-style-type: none"> Sensors installation of low-cost and traditional structural health monitoring sensors (e.g. MEMS, optic fibre and accelerometers); Chemical and mechanical characterisation of constructive materials; Photogrammetry laser scanner and/or survey supported by drones; 3D models.

Table 13. Possible analysis and possible tools to be implemented for ARCH work in Camerino.

Table 13 provides initial ideas of possible examples for the work that can be undertaken as part of the ARCH project. The proposed content in Table 13 was discussed with the municipality of Camerino and the research partners.

For the different study areas/buildings, identified in Table 13, the idea is to conduct damage and impact assessments, with particular focus on seismic events and heavy snow falls, both at the “status quo” and after the implementation of resilience strategies that might encompass both physical interventions (such as seismic retrofitting of buildings, critical infrastructure and cultural heritage), as well as strategies to improve the current best practices and frameworks for governance and management.

The idea is to allow the municipality to assess the effectiveness of alternative resilience strategies not only in terms of tangible and measurable costs and benefits (e.g. reduction of physical damage to the built environment, including cultural heritage asset, reduction of physical and social impacts on communities, depopulation of the territory, direct and indirect economic losses), but also in terms of reduction of intangible losses related to the loss of cultural and artistic value and to the loss of social practices such as festive events and the know-how for producing traditional crafts.

7. Preliminary resilience assessment

The following resilience assessment was developed using the preliminary version of the *UNDRR Disaster Resilience Scorecard for Cities*. The preliminary assessment was conducted within the framework of a workshop between the municipality of Camerino, the University of Camerino, ENEA, and Fraunhofer on 9th December 2019. As the original Scorecard is aimed at city-level, not all questions were immediately applicable on the level of historic areas or single heritage assets. Wherever possible, answers were provided for the historic areas under examination (e.g. with regard to hazard scenarios). For all other questions, answers were provided on city-level (e.g. with regard to city masterplans). The results give a first indication of the overall resilience of the city with some – but not exclusive – focus on the historic areas examined by ARCH. In addition, the application of the Scorecard will be used as input for the development of the ARCH Resilience Assessment Framework specifically focused on historic areas. Lastly, the preliminary resilience assessment results presented in the baseline reports should not be employed to develop resilience action plans, as not all necessary stakeholder groups were involved in the assessment process.

7.1. Essential 01: Organise for resilience

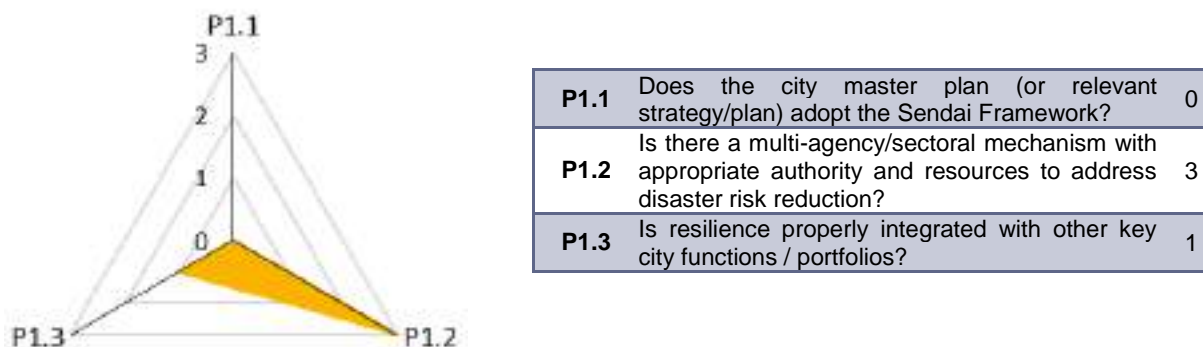


Figure 26. Results Essential 01.

For Essential 01, Camerino achieves an overall resilience score of 4/9, with room for improvements in planning and resilience integration. There exists no city master plan in order to improve resilience, and the *Sendai Framework for Disaster Risk Reduction* is not well known in Camerino (score of 0 for P1.1). Urban planning takes into account the geomorphological features of the municipal area. Camerino's municipality has a preliminary civil emergency plan that roughly defines the general tasks of officials in case of emergency events, and the main reception areas for people. The Civil Protection Office of the Camerino municipality (COC) is the first authority that organizes disaster and emergency response, before the successive and possible interventions of the regional and national civil protection offices. At the same time, the local, regional, and national offices for civil protection are well coordinated and resourced, enabling a multi-agency mechanism for addressing disaster risk reduction to be applied (score of 3 for P1.2). Lastly, disaster resilience is only integrated with key city functions (e.g. planning or community engagement) on an ad hoc basis (score of 1 for P1.3).

7.2. Essential 02: Identify, understand and use current and future risk scenarios

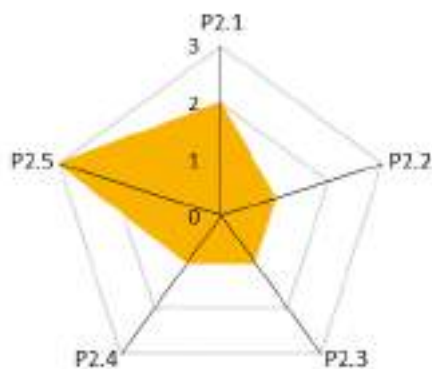


Figure 27. Results Essential 02.

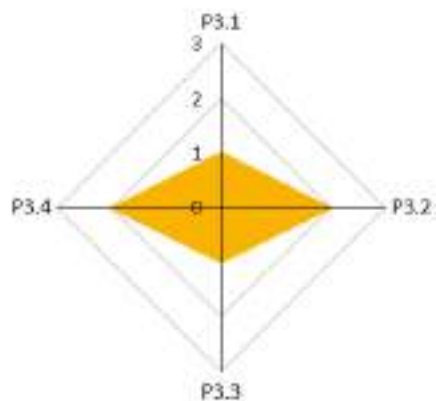
P2.1	Does the city have knowledge of the key hazards that the city faces, and their likelihood of occurrence?	2
P2.2	Is there a shared understanding of risks between the city and various utility providers and other regional and national agencies that have a role in managing infrastructure such as power, water, roads and trains, of the points of stress on the system and city scale risks?	1
P2.3	Are their agreed scenarios setting out city-wide exposure and vulnerability from each hazard, or groups of hazards (see above)?	1
P2.4	Is there a collective understanding of potentially cascading failures between different city and infrastructure systems, under different scenarios?	1
P2.5	Do clear hazard maps and data on risk exist? Are these regularly updated?	3

For Essential 02, Camerino achieves an overall resilience score of 8/15. The municipality understands the main hazards affecting it and there are currently some processes for updating information concerning seismic and landslide hazard maps. Geomorphological features of the municipal area are taken into account in the urban planning choices (land use zoning plan). There are no risk scenarios for the main natural hazards, however some issues are roughly defined in the civil emergency plan (score of 2 for P2.1). At the same time, individual system risks are not shared among utility providers and regional/ national agencies proactively in order to understand cascading effects; these risks are only shared after a hazard occurred as part of post-disaster discussions (score of 1 in P2.2). Specifically, the regional institutions have historical data on the main seismic sequences, but not enough data for other hazard scenarios (score of 1 for P2.3). As a result from P2.2 and P2.3, there is only a limited understanding of cascading impacts under a limited amount of disaster scenarios (score of 1 for P2.4). However, for most hazards (i.e. seismic and hydrogeological risks) there exist regularly updated hazard maps provided by national agencies (score of 3 for P2.5).

7.3. Essential 03: Strengthen financial capacity for resilience

For Essential 03, Camerino achieves an overall resilience score of 5/12. While the municipality employs crowdfunding and participates in national/European (research) projects, not enough information about other funding opportunities is available (score of 1 for P3.1).

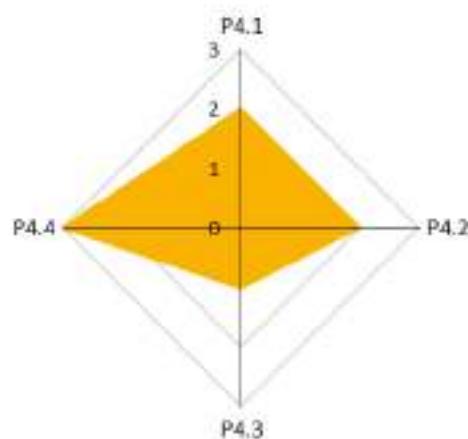
At the same time, the municipality's financial plan allows for DRR activities and the associated budgets are reserved (score of 2 for P3.2). An area where room for improvement exists is insurance coverage, which varies significantly per sector and is not actively promoted by the municipality (score of 1 for P3.4). Whereas public infrastructure is often covered by insurance, cultural heritage assets are not. Lastly, there exists a sufficient number of incentives to support resilience building on national and regional level, with gaps remaining in some sectors (score of 2 for P3.4).



P3.1	The city/ lead agencies understand all sources of funding, and the “resilience dividends”, are well connected, understand all available routes to attract external funding and are actively pursuing funds for major resilience investments.	1
P3.2	Does the city have in place a specific ‘ring fenced’ (protected) budget, the necessary resources and contingency fund arrangements for local disaster risk reduction (mitigation, prevention, response and recovery)?	2
P3.3	What level of insurance cover exists in the city, across all sectors – business and community?	1
P3.4	What incentives exist for different sectors and segments of business and society to support resilience building?	2

Figure 28. Results Essential 03.

7.4. Essential 04: Pursue resilient urban development



P4.1	Is the city appropriately zoned considering, for example, the impact from key risk scenarios on economic activity, agricultural production, and population centres?	2
P4.2	Are approaches promoted through the design and development of new urban development to promote resilience?	2
P4.3	Do building codes or standards exist, and do they address specific known hazards and risks for the city? Are these standards regularly updated?	1
P4.4	Are zoning rules, building codes and standards widely applied, properly enforced and verified?	3

Figure 29. Results Essential 04.

For Essential 04 Camerino achieves a resilience score of 8/12 with minor room for improvement. The municipality employs a land use zoning plan loosely based on known hazards and risks (score of 2 for P4.1) and promotes resilience in new urban developments (guidance for this can be improved) (score of 2 for P4.2). Regulations exist on national level and have to be implemented on local level but in general there is no clear planning for updating the codes (score of 1 for P4.3). Most importantly, where zoning plans and building codes are available these are enforced, although not always verified (score of 3 in P4.4).

7.5. Essential 05: Safeguard natural buffers to enhance the protective functions offered by natural ecosystems

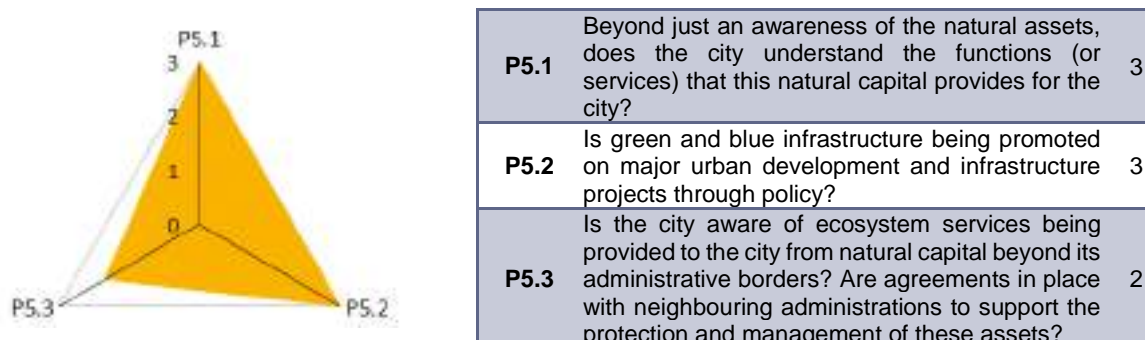


Figure 30. Results Essential 05.

For Essential 05, Camerino achieves a high resilience score of 8/9. Both the municipality and key stakeholders are familiar with the term ecosystem services and understand the economic value of all the functions provided by key local natural assets (score of 3 for P5.1).

In addition, green and blue infrastructure is being promoted in major urban development and infrastructure projects through policy and supporting guidance material (score of 3 for P5.2). Lastly, the municipality is aware of the importance of the functions provided by natural capital beyond its administrative borders and there has been some exchange with neighbouring administrators (score of 2 for P5.3). As an example, the municipality is part of an association of mountain communities²⁴ sharing ecosystem services.

In the Marche Region there are eight local authorities for the management of the mountain areas (see Section 7.3); these are local institutions made up of some municipalities which share financial funds in order to guarantee the essential social and economic services to the population and in order to manage the land use zoning and planning, and to preserve landscapes and ecosystems.

7.6. Essential 06: Strengthen institutional capacity for resilience

For Essential 06 Camerino achieves a resilience score of 5/18 with significant room for improvement. While the municipality can access most of the skills and resources necessary to respond to potential disaster scenarios, gaps still exist. This is especially the case for pre-disaster planning as well as coordination with utility providers (score of 1 for P6.1). Through the dissemination activities of schools and the local university on hazards and risks as well as through civil protection meetings, the municipality is able to reach more than 50% of its

²⁴ The local authorities for the management of the mountain areas were established by D.Lgs 267/2000 and L.R. 35/2013 with the aim of supporting and maintaining partnerships between single local municipalities into a wider governance of internal territories, focused on the protection, conservation and the enhancement of the natural environment. The local authorities for the management of the mountain areas are local entities set up for the enhancement and development of mountain areas and for associated functions and services between municipalities. The municipality of Camerino is part of the "Unione Montana Marca di Camerino" with other neighboring municipalities. The "Unione Montana Marca di Camerino" provides a support to plan and develop green and blue infrastructures, forest management, etc. on and beyond the territory of Camerino.

population with targeted education and awareness raising campaigns (score of 2 for P6.2). However, only some of the municipality's data layers about hazards and risks are shared with other organisations, and the information that is shared requires further interpretation due to the raw format of the data (score of 1 for P6.3).

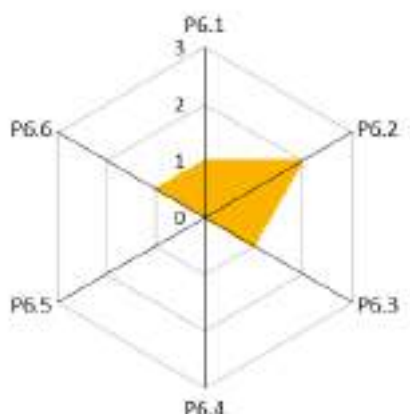


Figure 31. Results Essential 06.

P6.1	Does the city have clear access to all the skills and experience it believes it would need to respond to reduce risks and respond to identified disaster scenarios?	1
P6.2	Does a coordinated public relations and education campaign exist, with structured messaging and channels to ensure hazard, risk and disaster information (that can be understood and used) are properly disseminated to the public?	2
P6.3	Extent to which data on the city's resilience context is shared with other organizations involved with the city's resilience.	1
P6.4	Are there training courses covering risk and resilience issues offered to all sectors of the city including government, business, NGOs and community?	0
P6.5	Are training materials available in the majority of languages in common use in the city?	0
P6.6	Is the city proactively seeking to exchange knowledge and learn from other cities facing similar challenges?	1

While schools and the university disseminate hazard information, there exist no training courses covering risks and resilience issues on the local level, only some civil protection courses on national level exists (score of 0 for P6.4).

Similarly, as no training material exists, it is not translated into other languages. However, if training material would exist, it would be provided in Italian, which is the majority language in Camerino (score of 0 for P6.5). Lastly, knowledge exchange with other municipalities facing similar challenges is limited to local networks and via participation in (research) projects.

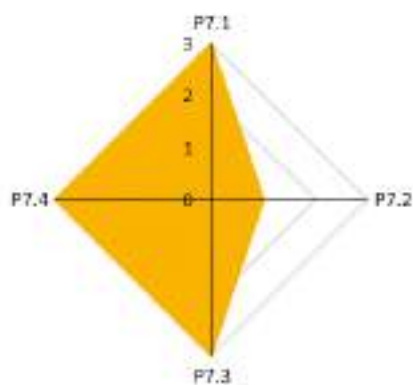
As such, the exchange is more ad hoc than systematic (score of 1 for P6.6). Improving resilience is principally dependent on the availability of financial funds which may be limited for a small town such as Camerino.

7.7. Essential 07: Understand and strengthen societal capacity for resilience

For Essential 07, Camerino achieves a resilience score of 10/12. The municipality actively engages community organizations (e.g. the Concentrico committee – a committee of private citizens) in risk reduction actions and pre-event planning (score of 3 for P7.1).

However, vulnerable population groups do not receive any specific disaster training (score of 1 for P7.2). Of the few businesses in Camerino that employ more than 10 employees – which

are not very many – all have a business continuity plan (score of 3 for P7.3). Lastly, multiple multimedia channels are used for communicating with citizens (score of 3 for P7.4).



P7.1	Are “grassroots” or community organizations participating in risk reduction and post-event response for each neighbourhood in the city?	3
P7.2	Are there regular training programmes provided to the most vulnerable populations in the city?	1
P7.3	What proportion of businesses have a documented business continuity plan that has been reviewed within the last 18 months?	3
P7.4	How effective is the city at citizen engagement and communications in relation to DRR?	3

Figure 32. Results Essential 07.

7.8. Essential 08: Increase infrastructure resilience

For Essential 08, Camerino achieves a resilience score of 16/27. There are no plans or forums to tackle critical infrastructure resilience, as critical infrastructure providers manage these risks on their own (score of 0 for P8.1). For some hazards, such as seismic events and landslides, studies are carried out by the civil protection department or by the Marche Region in order to highlight possible critical issues.

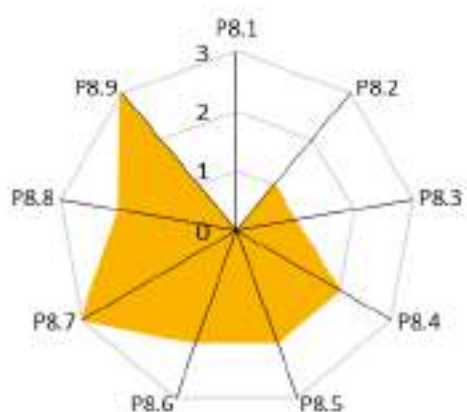


Figure 33. Results Essential 08.

However, the healthcare and education systems of Camerino are well suited to deal with the hazards faced by the municipality as more than 90% of major injuries could be treated within six hours under the “most severe” scenario (score of 3 for P8.7), and no teaching facilities would be at risk under the “most probable” scenario (score of 2 for

P8.1	Is critical infrastructure resilience a city priority, does the city own and implement a critical infrastructure plan or strategy?	0
P8.2	Is existing protective infrastructure well-designed and well-built based on risk information?	1
P8.3	Would a significant loss of service for these two essential services be expected for a significant proportion of the city under the agreed disaster scenarios?	1
P8.4	Would a significant loss of service be expected for a significant proportion of the city in the ‘worst case’ scenario event? In the event of failure would energy infrastructure corridors remain safe (i.e. free from risk of leaks, electrocution hazards etc.)?	2
P8.5	Would a significant loss of service be expected for a significant proportion of the city in the ‘worst case’ scenario event? In the event of failure would transport infrastructure corridors remain safe (i.e. free from risk of flood, shocks etc) and passable?	2
P8.6	Would a significant loss of service be expected for a significant proportion of the city in the ‘worst case’ scenario event?	2
P8.7	Would there be sufficient acute healthcare capabilities to deal with expected major injuries in ‘worst case’ scenario?	3
P8.8	% of education structures at risk of damage from “most probable” and “most severe” scenarios	2
P8.9	Will there be sufficient first responder equipment, with military or civilian back up as required?	3

P8.8). Lastly, first responders in Camerino are well equipped to deal with the “most severe” scenario (score of 3 for P8.9). While there is protective infrastructure in place for landslides that are well maintained and monitored, protective infrastructure for other hazards is missing and the design of existing infrastructure may not be consistent with best practices (score of 1 for P8.2). As for loss of service, there would be some loss of services under the “most severe” scenario (i.e. a seismic events of similar intensity as the ones in 2016) for the energy, transport, and communications systems (scores of 2 for P8.4, P8.5, and P8.6), while some loss of service would be expected for the water system even under the “most probable” scenario (i.e. heavy snowfalls; score of 1 for P8.3).

7.9. Essential 09: Ensure effective disaster response

For Essential 09, Camerino achieves a resilience score of 14/21. The early warning systems can reach more than 75% of the population; however 30% of the population is not reachable, e.g. due to no possession of mobile phone such as is the case for the elderly (score of 2 for P9.1). In addition, Camerino’s municipality has a preliminary civil emergency plan that roughly defines the general tasks of the officials for emergency events and the main reception areas for people (score of 1 for P9.2).



Figure 34. Results Essential 09.

The responsible disaster management authority has enough staff and is able to cover all the neighbourhoods within 24-48 hours in case of an emergency scenario (score of 2 for P9.3). In addition, the equipment and relief supply needs are defined at national level (score of 3 for P9.4) and the necessary supplies of food and basic relief items exceeds estimated needs in the “most severe” scenario (score of 3 for P9.5).

The local civil protection office of Camerino (C.O.C.) is the first authority to organize disaster and emergency response before the successive and possible interventions of the regional and national civil protection departments (score of 3 for P9.6). Lastly, schools, the university and public offices conduct annual drills for disaster response, which are validated by professionals, but are not based on the “most severe” or “most probable” scenario (score of 2 for P9.7).

P9.1	Does the city have a plan or standard operating procedure to act on early warnings and forecasts? What proportion of the population is reachable by early warning system?	2
P9.2	Is there a disaster management / preparedness / emergency response plan outlining city mitigation, preparedness and response to local emergencies?	1
P9.3	Does the responsible disaster management authority have sufficient staffing capacity to support first responder duties in surge event scenario?	2
P9.4	Are equipment and supply needs, as well as the availability of equipment, clearly defined?	3
P9.5	Would the city be able to continue to feed and shelter its population post-event?	3
P9.6	Is there an emergency operations centre, with participation from all agencies, automating standard operating procedures specifically designed to deal with “most probable” and “most severe” scenarios?	0
P9.7	Do practices and drills involve both the public and professionals?	2

7.10. Essential 10: Expedite recovery and build back better

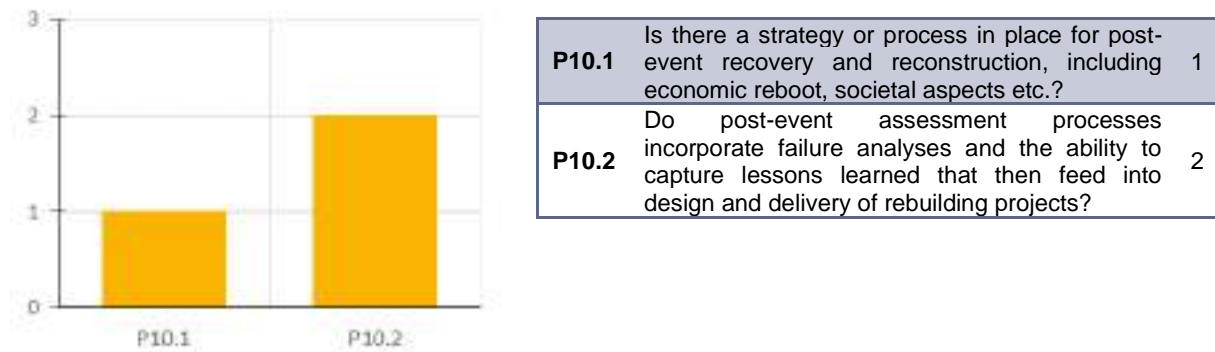


Figure 35. Results Essential 10.

For Essential 10, Camerino achieves a resilience score of 3/6., The current plans for post-event recovery and rebuilding may be improved, especially in terms of economic reboot (score of 1 for P10.1).

The commissioner responsible for rebuilding of the real estate damaged by the last seismic sequence (2016) issues several ordinances that define criteria for the repair and financing of different types of buildings and of cultural. In terms of lessons learnt, there are clear processes in place to capture lessons from previous difficulties for coping post-event, but the mechanism to transfer these lessons into the design and delivery of rebuilding projects needs improvement. Methods, procedures and funds, which are updated and renewed for each new disaster event, do not always allow for addressing the best and more resilient solutions. (score of 2 for P10.2).

A general issue is the need to combine the preservation of the construction and cultural features of the old town area with the retrofitting works in order to ensure a suitable safety level for the population. Furthermore, there are social and economic issues that have to be tackled in order to avoid the depopulation of the old town.

7.11. Overall resilience of Camerino

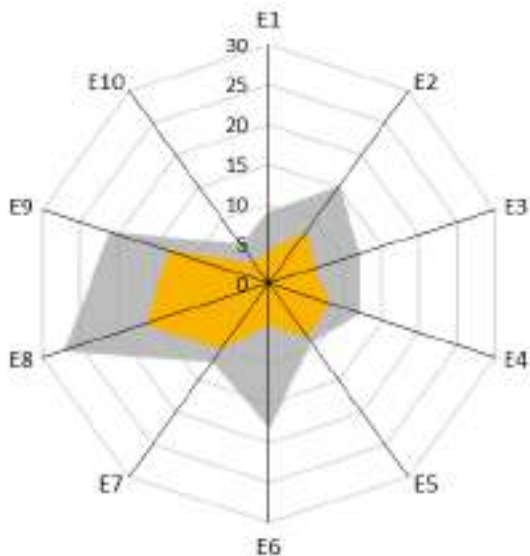


Figure 36. Combined results of Essentials 1 to 10 for Camerino.

Overall, Camerino achieves a resilience score of 81/141.

The highest scores for resilience were achieved for Essentials 02, 04, 05, 07 and 08 and 09. Camerino offers well established warning systems as well as organisations for risk reduction within the population. The city is a member of a local authority for the management of the mountain areas and it gives great value to its surrounding natural ecosystem and its protection. A zoning plan for hazardous areas and building codes for urban development exists. The incorporation of these in the development plan of the city will be improved in the next years.

Most room for improvement of the resilience was found in Essential 01, 03, 06, and 10.

High quality maps and information about hazards, in particular about seismic and geomorphological hazards, are available, but the sharing of these information may be improved and these data are not currently implemented in order to carry out future risk scenarios. The local and regional civil protection offices have defined procedures for post-disaster management. The lack of detailed risk scenarios for emergencies does not currently allow for the development of suitable pre-disaster planning. The critical infrastructure providers do not have a specific agreement with the municipality for resilience improvement, but they support the municipality when disasters occur.

Furthermore, there are minor deficits in the Essentials 01, 03, 10. The Municipality of Camerino employs a general land use zoning plan and it has a civil protection plan for population reception and rebuilding after seismic events. Risk scenarios are not available for the main natural hazards, and thus there is no plan for improving resilience. However, regional and national civil protection services do function well. In contrast to the well-insured public infrastructure, there is no dedicated financial support for resilience and investment actions, different from the ordinary maintenance, for heritage sites. The municipality of Camerino, when disasters occur, establishes a local civil protection office. The emergency warning service and support systems offer sufficient functions. Up to now, there are some difficulties in order to learn from previous events due to financial and social reasons and the need to preserve the original construction features of the old town. For new buildings built in the peripheral areas, after the last seismic events, innovative construction techniques are used such as base-isolated buildings.

8. Conclusion

The preliminary analysis of the main hazards, exposed elements and the possible impacts in section 6 allows an initial assessment of the resilience of different features of the municipality of Camerino. This resulted in the identification of preliminary priorities corresponding to the findings of the baseline review and useful for defining the municipality's detailed needs and objectives within the ARCH project. The main aspects for the improvement of Camerino's resilience (chapter 7) were found to be the identification and use of the risk scenarios, and the planning of institutional strategies to improve the resilience of the urban areas as well as the infrastructure.

Generally, maps and information about seismic and geomorphological hazards are available, but these are currently not utilised to define future risk scenarios. The local civil protection office has defined procedures for post-disaster management, however, pre-disaster planning is hindered by a lack of detailed risk scenarios for future emergencies. Furthermore, critical infrastructure providers currently have no specific agreement with the municipality for resilience improvement, but rather support the municipality on ad-hoc basis when disasters occur. There are also some difficulties in making use of the lessons learned from previous events due to financial and social reasons. Another challenge derives from the need to preserve the historical construction techniques as well as the cultural features of the Old Town despite the necessity for seismic retrofitting.

Based on this, the specific objectives for the ARCH Project for Camerino include:

- 1) to improve the predictive models and risk assessment methods to lead future actions for current post-earthquake reconstruction, mitigate the effects of future events and enhance the preparedness for natural hazards;
- 2) to increase the knowledge base on the geological-structural setting of the "Camerino hill" and the geomorphological processes, thereby determining the hydrogeological hazard scenarios for the historical centre;
- 3) to increase the knowledge of the vulnerability of historical buildings with reference to construction materials and techniques;
- 4) to monitor cultural heritage of significant value in order to provide alerts and real-time information about damage resultant from natural hazards and degradation due to environmental conditions;
- 5) to develop guidelines for managing and securing artefacts and artwork after seismic events.

It is therefore planned to conduct the analyses of the risks due to natural hazards at different urban scales; from the district scale to that of the case study buildings (the Ducal Palace and Santa Maria in Via's Church). Furthermore, extreme precipitation can influence the risk scenario concerning landslides and service networks (communication, electric, etc.). Thus, enacting measures for increasing urban resilience leads to disaster risk reduction.

These strategies can be supported by the assessment of tangible costs and benefits (e.g. reduction of physical damage to the built environment, direct and indirect economic losses),

and intangible losses related to the loss of cultural and artistic value. The planned activities will also allow the definition of risk scenarios via the use of tools [32] that are able to support the planning of resilience improvement and the identification of emergency strategies for the urban area.

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Additional key documents and laws are described in the Annex (part 11).

10. List of abbreviations

Term	Meaning
CAPI	Emergency Service Centre
CCS	Coordination Centre
CCHWG	Climate Change and Cultural Heritage Working Group
CMCC	Euro Mediterranean Centre on Climate Change
CNSAS	National Mountain Rescue and Speleological Corps
COAU	Joint Air Operations Centre
COEMM	Operations Centre for Maritime Emergencies
COM	European Commission documents
DG ECHO	Directorate-General for European Civil Protection and Humanitarian Aid Operations
DSS	Decision support system
ECCR	Emergency Response Coordination Centre
ETS	European Treaty Series
ICOMOS	International Council on Monuments and Sites
IMELS	Italian Ministry for the Environment, Land and Sea
INGV	National Institute of Geophysics and Volcanology
INSPIRE	Infrastructure for Spatial Information in Europe

IVAVIA	Impact and Vulnerability Analysis of Vital Infrastructures and Built-up Areas
LCA	Life Cycle Analysis
MIBACT	Ministry of Cultural Heritage and Activities, and Tourism
MEMS	Micro Electro-Mechanical Systems
NAP	Italian National Adaptation Plan for Climate Change
NAS	National Adaptation Strategy
POR	Regional operative program
PTSD	Post-traumatic stress disorder
RDP	Rural Development Plan
SOUP	Regional Operative Office
SWD	European commission staff working document
UNDRR	United Nations Office for Disaster Risk Reduction

11. Annex

11.1. Key documents governing cultural heritage management (see Section 3)

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future revision/update	Link (if available)	Summary of content
Convention for the Safeguarding of the Intangible Cultural Heritage	Agreement	International	Non-binding	United Nations Educational, Scientific and Cultural Organization (UNESCO)	2003	No relevant timelines for the Convention itself have been identified. The created list of intangible heritage elements is annually updated.	Convention: https://ich.unesco.org/en/convention List of Intangible Cultural Heritage: https://ich.unesco.org/en/00011?type=00002#tabs	The Convention established (Article 16) a Representative List of Intangible Cultural Heritage of Humanity.
European Framework for Action on Cultural Heritage	Commission staff working document	International	Non-binding	European Commission	2018	Implementation of the Framework will be monitored by the Cultural Heritage Forum, an informal Commission expert group meeting at least annually since 2019.	https://ec.europa.eu/culture/content/european-framework-action-cultural-heritage_en	Framework of continued action for Europe's cultural heritage based on a holistic, mainstreaming and integrated approach, multi-stakeholder cooperation.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future revision/update	Link (if available)	Summary of content
Convention for the Protection of the Architectural Heritage of Europe	Agreement	International	Binding	Council of Europe	1987		https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/121	Legally binding instrument which sets the framework for an accurate conservation approach within Europe. Aims to reinforce and promote policies for the conservation and enhancement of Europe's heritage.
European Landscape Convention	Agreement	International	Binding	Council of Europe	2000		https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/143	Promotes the protection, management and planning of the landscapes and organizes international co-operation on landscape issues.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future revision/update	Link (if available)	Summary of content
European Convention on the Protection of the Archaeological Heritage (Revised)	Agreement	International	Binding	Council of Europe	1995		https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/143	This revised Convention updates the provisions of a previous Convention adopted by the Council of Europe in 1969. The new text makes the conservation and enhancement of the archaeological heritage one of the goals of urban and regional planning policies.
Italian law no. 184, 6 th April 1977	Law	National (I)	Binding	Italian Parliament	1977		https://www.gazzettaufficiale.it/	Ratification and implementation of the convention on the protection of the world's cultural and natural heritage, Paris, 23 th November 1972.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future revision/update	Link (if available)	Summary of content
Italian Law no. 93 of 15 th February 1989	Law	National (I)	Binding	Italian Parliament	1989		https://www.gazzettaufficiale.it/	Ratification and execution of the European Convention for the Protection of the Architectural Heritage in Europe, Granada, 3 rd October 1985.
Legislative Decree no. 42, 22 nd January, 2004	Law	National (I)	Binding	Italian Parliament	2004		https://www.gazzettaufficiale.it/	Legislative Decree no. 42, 22/01/2004 (Cultural Heritage and Landscape Code). The Legislative Decree describes the standards for the cultural heritage i.e. architectural heritage, museums, artwork. Furthermore, this code defines the criteria for the planning of protection, use and the enhancement of the cultural heritage. Standards for the landscape planning are shown.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future revision/update	Link (if available)	Summary of content
Legislative Decree no. 62, 26 th March, 2006	Law	National (I)	Binding	Italian Parliament	2006		https://www.gazzettaufficiale.it/	Legislative Decree no. 62, 26/03/2006 (changes on Legislative decree n. 42/2004).
Legislative Decree no. 63, 26 th March, 2006	Law	National (I)	Binding	Italian Parliament	2006		https://www.gazzettaufficiale.it/	Legislative Decree no. 63, 26/03/2006 (changes on Legislative Decree n. 42/2004).
Marche Region Law no. 04, 09/02/2010	Law	Regional	Binding	Regional Council	2010		https://www.consiglio.marche.it/banche_dati_e_documentazione/leggi/	Regional law no. 04, 09/02/2010, Laws on cultural heritage and activities. This law defines the tasks of the Region, of the municipalities and of the local authorities and the types of activities in order to enhance both the cultural heritage and the landscapes.

11.2. Key documents governing disaster risk reduction (see Section 4)

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation /update)	Link (if available)	Summary of content
Sendai Framework	Agreement	International	Non-binding	United Nations Office for Disaster Risk Reduction (UNDRR)	2015	Valid until 2030. UNDRR is in charge of follow-up and review of the Sendai Framework by preparing periodic reviews on progress, among other actions.	http://www.unisdr.org/we/inform/publications/43291	Establishment of a global framework for action to prevent new and reduce existing disaster risks, based on 7 targets, 4 priorities for action with supporting rationale and 13 guiding principles.
EU law (Decision 1313/2013/EU)	Law	International (Europe)	Binding	European Parliament	2013		https://eur-lex.europa.eu/homepage.html	Decision No 1313/2013/EU of the European Parliament and of the Council on a Union Civil Protection Mechanism. It defines the activities to assist with the response to immediate adverse consequences of a disaster inside or outside the Union.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation /update)	Link (if available)	Summary of content
EU law (Decision 420/2019/EU)	Law	International (Europe)	Binding	European Parliament	2019		https://eur-lex.europa.eu/homepage.html	This decision defines an effective and coherent approach to the prevention of and preparedness for disasters and to promote the exchange of best practices within the Union Mechanism.
Directive 2007/60/EU	Guideline	International	Binding	The European Parliament and The Council of The European Union	2007		https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32007L0060	The purpose of this Directive is to establish a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods in the Community. It should be read together with Act no. 7/2010 Coll. on flood protection,

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation /update)	Link (if available)	Summary of content
Italian law. Legislative Decree no. 1, 02/01/2018)	Law	National (I)	Binding	Italian Parliament	2018		https://www.nor.mattiva.it/	Legislative Decree no.1 02/01/2018: Civil Protection Code (in Italian). This law defines the organisation of the National Civil Protection office and the tasks of the offices at regional and local levels. Furthermore, it defines the tasks of the scientific committee and the planning of the activities to prevent disasters and to manage the rebuilding.
Italian law (Decree of the Prime Minister of 09/08/2016)	Law	National (I)	Binding	Italian Parliament	2016		https://www.gazzettaufficiale.it/	Decree of the Prime Minister D.P.C.M. 09/08/2016: this decree describes the organization of the Civil Protection Office (in Italian).

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation /update)	Link (if available)	Summary of content
Italian law (Decree of the General Secretary of the Presidency of the Council of Ministers, 10/08/2016)	Law	National (I)	Binding	Italian Parliament	2016		http://www.protezionecivile.gov.it	Decree of the General Secretary of the Presidency of the Council of Ministers 10/08/2016: this Decree describes some activities concerning the Civil Protection Office (in Italian)
Italian law (Decree of the Prime Minister of 20/02/2012)	Law	National (I)	Binding	Italian Parliament	2012		https://www.gazzettaufficiale.it/	Decree of the Prime Minister D.P.C.M. 20/02/2012: this Decree describes both the components and the tasks of the committee that supports the civil protection office (in Italian)
Italian law (Decree of the Prime Minister of 21/11/2006)	Law	National (I)	Binding	Italian Parliament	2006		https://www.gazzettaufficiale.it/	Decree of the Prime Minister D.P.C.M. 21/11/2006: this Decree shows the activities and the tasks of the Civil Protection Operational Committee (in Italian)

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation /update)	Link (if available)	Summary of content
Italian law no. 286, 27/12/2002	Law	National (I)	Binding	Italian Parliament	2002		https://www.nor.mattiva.it/	Law no. 286 27/12/2002, modification of the Legislative Decree no. 245 04/11/2002, concerning urgent interventions in favour of populations affected by natural disasters in the Molise and Sicily regions, as well as further provisions on civil protection (in Italian).
Marche Region Law no. 32, 11/12/2001	Law	Regional	Binding	Regional Council	2001		https://www.consiglio.marche.it/banche_dati_e_documentazione/leggi/	Regional Law no. 32, 11/12/2001, B.U.R. n. 146 del 20/12/2001, (in Italian). This law defines the tasks of the civil protection offices at regional levels and the organisation of the civil protection authorities.
Marche Region Law no. 13, 03/04/2015	Law	Regional	Binding	Regional Council	2015		https://www.consiglio.marche.it/banche_dati_e_documentazione/leggi/	Regional Law no. 13, 03/04/2015, B.U.R. no. 33 del 16/04/2015, (in Italian). This regional law shows the organization of the administrative functions of the Provinces.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation /update)	Link (if available)	Summary of content
Council's deliberation no. 61, 22/12/2008		Local	Binding	Council of Camerino municipality	2008		https://www.comune.camerino.mc.it/documenti-cms/relazione-piano-di-protezione-civile/	Civil protection plan, approved by council's deliberation n. 61 of 22th Dec., 2008, according to Italian Law n. 225 of 24 th Feb., 1992. The municipal civil protection plan defines the preliminary activities and tasks of the local civil protection office (COC) and the emergency reception areas.

11.3. Key documents governing climate adaptation (see Section 5)

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Paris Agreement	Agreement	International	Binding	UNFCCC	2015-2016		https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement	The Paris Agreement builds upon the Convention and for the first time brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. As such, it charts a new course in the global climate effort.
EU Directive 2018/844		European Community	Binding	European Parliament	2018		https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018L0844	Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
EU Directive 2012/27		European Community	Binding	European Parliament	2012		https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012L0027	Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC Text with EEA relevance
EU Directive 2003/87		European Community	Binding	European Parliament	2003		https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32003L0087	Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC
COM/2018/738 Report on the implementation of the EU adaptation strategy	Report	European Community	No binding	European Commission	2018		https://eur-lex.europa.eu/legal-content/en/txt/?uri=celex%3a52018dc0738	Report from the commission to the European parliament and the council on the implementation of the EU strategy on adaptation to climate change. Impacts of weather and climate extremes

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
EU Climate Change Adaptation Strategy	Strategy	International (Europe)	Non-binding	European Commission	2013	Last evaluated in 2018. Update likely 2021.	https://ec.europa.eu/clima/policies/adaptation/what_en#tab-0-1	Framework and mechanisms for improving the EU's preparedness for current and future climate impacts.
Evaluation of the EU strategy on adaptation to climate change	Report	European Community	Non-binding	European Commission	2018		https://ec.europa.eu/clima/policies/adaptation/what_en#tab-0-1	This report examines the process and the results of the evaluation of the strategy COM/2018/738, including the lessons learned from its implementation.
SWD/2018/ 460 Adaptation preparedness scoreboard – Country Fiches	Report	European Community	Non-binding	European Commission	2018		https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD:2018:460:FIN	Commission Staff Working Document/Adaptation preparedness scoreboard Country fiches/Accompanying the document Report from the Commission to the European Parliament and the Council on the implementation of the EU Strategy on adaptation to climate change

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Legislative Decree no. 111/2019	Law	National	Binding	Italian Parliament	2019		https://www.gazzettaufficiale.it/eli/id/2019/10/14/19G00125/sg	This law is aimed primarily at adopting urgent measures for the definition of a national strategic policy to combat climate change and improve air quality. Urgent interventions are also introduced to resolve certain environmental infringement procedures
Legislative Decree no. 216/2006	Law	National	Binding	Ministry for the Environment	2006		https://www.minambiente.it/sites/default/files/archivio/allegati/mission_trading/Dlgs_216-06.pdf	National execution of the EU Directives 2003/87, 2004/101/CE and Kyoto Protocol on greenhouse emissions
National Adaptation Strategy	Strategy	National	No binding	Ministry for the Environment	2014		https://www.minambiente.it/notizie/strategia-nazionale-di-adattamento-ai-cambiamenti-climatici-0	The NAS provides a “State of the art on scientific knowledge of impacts vulnerabilities and adaptation of climate” that illustrate in a depth, for national territory, sectors which are affected on future impact of climate change

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
National Plan on adaptation to climate changes	Plan	National	Non- binding draft	Ministry for the Environment	2017		https://www.minambiente.it/sites/default/files/archivio_immagini/adattamenti_climatici/allegato_2_impatti_e_azioni.pdf	Report on the state of scientific knowledge on impacts, vulnerability and adaptation to climate change in Italy. Analysis of the EU and national legislation relevant to impacts, vulnerability and the 'adaptation to climate change. Elements for a National Strategy for Adaptation to Climate Change
PEAR 2020 Regional, environmental and energy plan	Plan	Regional	Non- binding	Marche Region	2016		https://www.regione.marche.it/Regione-Utile/Energia/Piano-Energetico-Ambientale-Regionale	The Regional Environmental Energy Plan (PEAR) identifies the planning and guidelines for environmental energy policy in the regional territory

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year published	Timeline for future evaluation/update	Link (if available)	Summary of content
Regional Plan for climate	Plan	Regional	Non- binding draft	Marche Region	2007		http://www.sinanet.isprambiente.it/gelso/banca-dati/regione/regione-marche/schema-di-piano-regionale-per-il-clima-della-regione-marche	The Plan intends to systemise and make climate change mitigation policies more effective
Forest fire emergency plan	Plan	Local	Binding	Municipality of Camerino	2018		https://www.comune.camerino.mc.it/documenti-cms/piano-incendi-boschivi/	Local law to protect the integrity of life, property, settlements and the environment from damages or from dangers deriving from natural disasters, catastrophes and other events



ARCH D3.3 City baseline report - Valencia

17 December 2021



Deliverable No.	D3.3
Work Package	WP3
Dissemination Level	PU
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Due date	2020-03-31
Actual submission date	2021-12-17
Status	For submission
Revision	3.0 (2021-12-17)
Reviewed by (if applicable)	Anne-Kathrin Schäfer (DIN), Erich Rome (Fraunhofer), Iryna Novak (ICLEI)

This document has been prepared in the framework of the European project ARCH – Advancing Resilience of historic areas against Climate-related and other Hazards. This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 820999.

The sole responsibility for the content of this publication lies with the authors. It does not necessarily represent the opinion of the European Union. Neither the REA nor the European Commission are responsible for any use that may be made of the information contained therein.

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This project has received funding from the European Union’s Horizon 2020 research and innovation programme under Grant Agreement no. 820999.

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1. City profile

This section profiles the city of Valencia in general terms, and introduces the local areas where the ARCH focus sites are located. Information is provided at a city-wide level, in terms of land use, population demographics and economy, followed by a closer look at the area(s) in the immediate vicinity of the focus sites.

The sites in focus for the ARCH project in Valencia city are the Huerta and the Albufera. Both sites are cultural landscapes, located in the metropolitan area of Valencia, and essential elements of its long agricultural history. They are also considered as two of its key landscape features, together with the Turia river and the Mediterranean Sea [1], and major components of the city green and blue infrastructure. As shown in Figure 1, the Huerta surrounds the city, while the Albufera is located to the South of it. Both areas stretch into neighbouring municipalities. The Huerta is an agricultural area (mainly covered by arable crops), whose size has decreased considerably over the last decades as a result of urban and infrastructure development. Its irrigation system is a heritage artefact from the Arab tradition, based on eight major irrigation ditches, distributed throughout the municipalities. Since its creation, seven of those irrigation ditches have been governed by the Water Tribunal, an institution that regulates the use of the flows and has been declared Intangible Heritage of Humanity due to its unique character. While the Huerta and other northern agriculture sites are known for oranges, artichokes and tiger nuts, among other arable crops, the southern agricultural sites which extend into the Albufera Natural Park cultivate centuries-old local rice varieties. The Albufera is one of the most important wetland areas in Spain, designated as a protected area under several international, national and regional agreements, as it brings food and other benefits to both fishers and rice farmers and it has a high ecological value.



Figure 1. Key landscape elements in the Valencia metropolitan area [1].

1.1. Land use

The total area of the municipality of Valencia is 138.35 km² [2]. In 2019, this area included 30.01 km² of cropland, 6.67 km² of forest (mainly in the “Devesa del Saler” public woodland, within the Albufera Natural Park), and 102.48 km² classified as “Other land” [2]. Representing about 22% of the total area, cropland is particularly important for the people of Valencia since in the municipality it is located either in the Huerta or the Albufera historic areas, and it is considered a key part of its historical, cultural and natural heritage [1]. The area made up of forest is only a small fraction of the total area, but likewise important not only because of its environmental value, but also because it is highly appreciated by Valencian people as a landmark for recreation and outdoor activities.

Cultivated land in the Valencia municipality has experienced little variation in the Albufera area during the last decades. However, the Huerta area decreased dramatically in the second half of the last century, not only in Valencia but also in the neighbouring municipalities, due to urban and infrastructure expansion. It is estimated that around 62% of the Huerta area irrigated by the historic seven hydraulic systems under the Water Court (“Tribunal de las Aguas”) has been lost since the 1950-71 period [1], despite its agricultural and historical value. Since 2003 there have been no major reductions in cultivated land (as shown in Figure 2), apart from slight declines in 2014 and 2018 [3]. However, urban development is currently planned on agricultural land in the Benimaclet district (a former village that has been incorporated into the Valencia municipality, located north-east of the city centre), which has caused high levels of public controversy and even academic discussion [4].

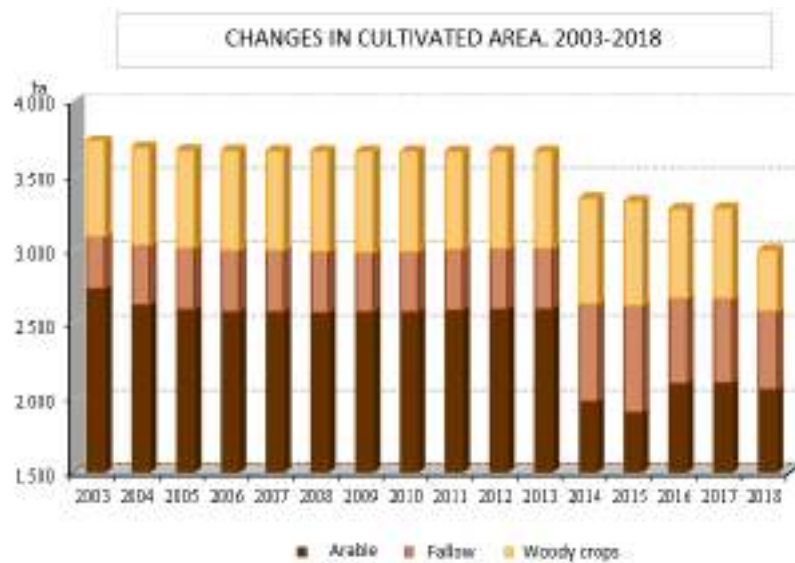


Figure 2. Valencia cultivated area. 2003-2018. Modified from [3].

1.2. Demographic features

1.2.1. Population density

Population density in Valencia is on average 8,055 inhabitants/km² [2]. The spatial distribution of the population in terms of place of residence is shown according to inhabitants per hectare in Figure 3 below.

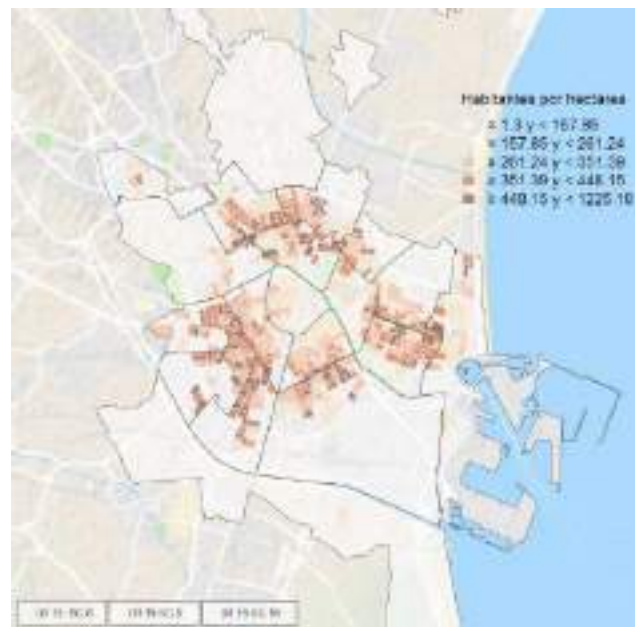


Figure 3. Population density in the city of Valencia [2].

1.2.2. Age and sex

Valencia has a population of 795,736 people (1/1/2019), with the majority female (417,305 females, 378,431 males) [2]. The evolution of the age demographic pyramid during the last century has changed radically as can be seen in Figure 4. The age pyramid has been reversed, as is the case in much of contemporary society. The majority of the population is aged 40-45 years old.

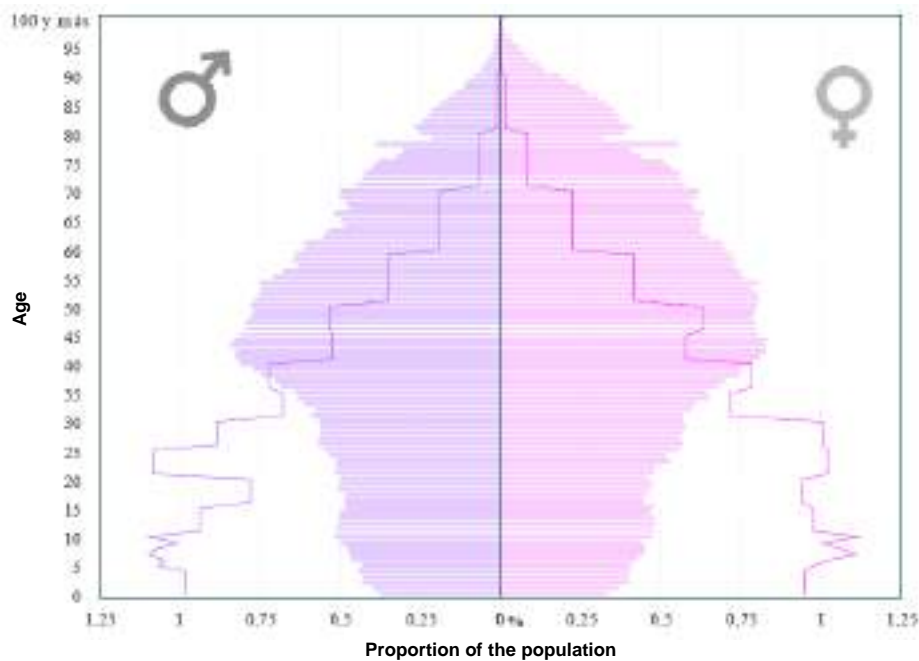


Figure 4. Population pyramid. Comparison 1900-2019 (1900: outline; 2019: solid) [2].

In the last seventy years the population has been growing overall in the city of Valencia, from half a million inhabitants to the current nearly 800,000 (see Figure 5 above).

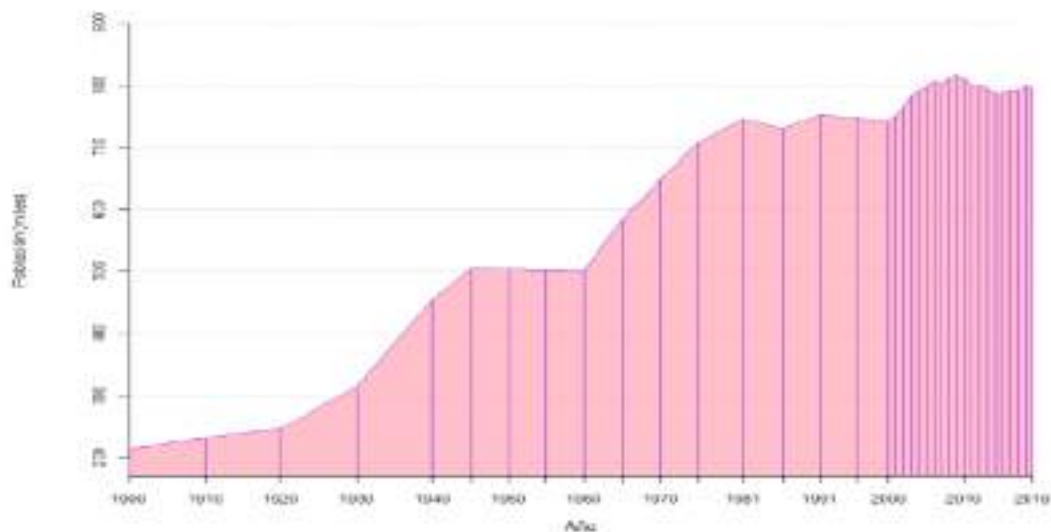


Figure 5. Census. 1900-2019 [2]

The population projection for the next years (2021, 2026 and 2031) by age and sex is shown in Figure 6. The portion of the population dependent on pensions is projected to increase, i.e. an increase of people no longer participating in the workforce (simultaneously reducing the city's economic growth potential), who will at the same time likely need care and special services. Since elderly people are likely to be vulnerable to the impacts of climate change, such as the effects of a heatwave, this projected demographic change is particularly relevant to the City's efforts to adapt to climate change.

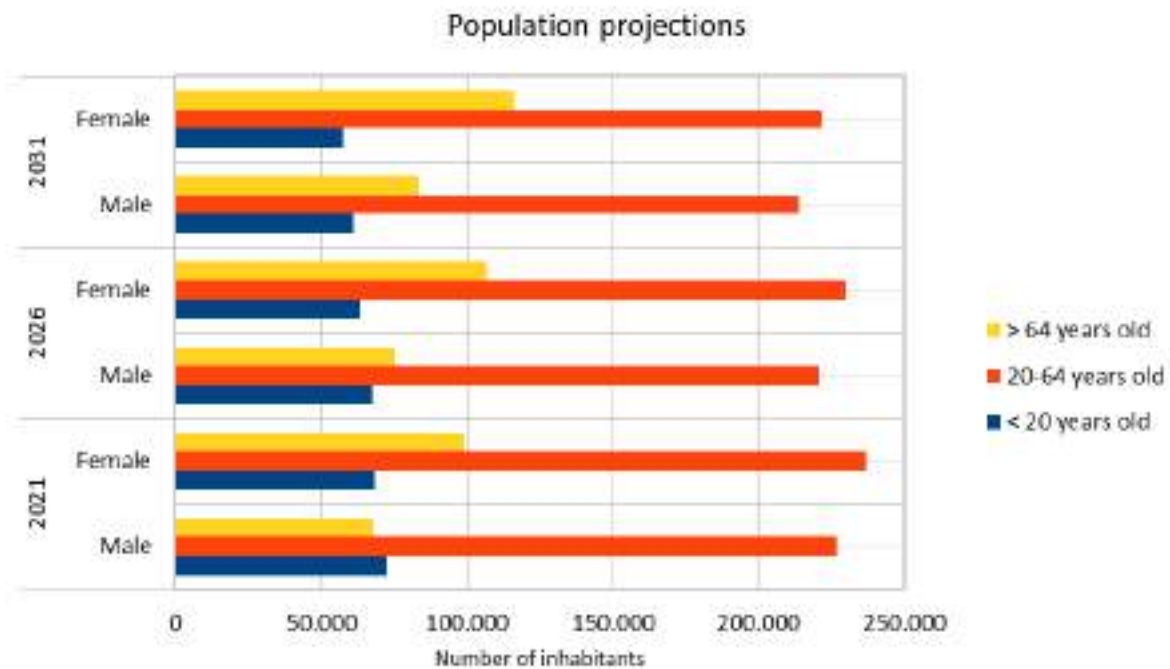


Figure 6. Population forecasts by sex and age in the city of Valencia. (Own elaboration from [3]).

The 2019 age distribution in the city of Valencia is shown in Figure 7 below, where percentages are always stated in relation to the total population size (795,736 inhabitants). Within the specified ranges, most of the population lies within the 45-64 interval. Males are in the majority within the 0-24 range, while females are more predominant at every other interval. The difference between genders is highest (2.75%) in the 65-84 range, i.e. there are over 21,000 more elderly women than men.

Age range	Total	Male	Female
0-5	4.85%	2.49%	2.35%
6-17	11.47%	5.88%	5.60%
18-24	7.02%	3.56%	3.46%
25-34	11.65%	5.76%	5.89%
35-44	15.31%	7.65%	7.66%
45-64	28.86%	13.78%	15.08%
65-84	17.62%	7.44%	10.18%
85+	3.22%	0.99%	2.23%

Figure 7. Valencia age distribution. 2019. Modified from [3].

The life expectancy (2015-2018 data) in Valencia is, as usual, higher for females (86.3) than for males (80.5) [2].

1.2.3. Population growth

Population change in the city of Valencia in recent years is summarised in Figure 8 and Figure 9 below. In the last 14 years, natural growth has decreased and even became negative since around 2013 [3] (-1,147 in 2018). No clear trend in net migration can be seen in Figure 9 for the period analysed, although net migration has increased from 2004 (from 10,538 up to 12,923 in 2018) [3] [5]. Total population change has been affected by these previous trends, alternating rises and falls, above and below the zero line. The last data available (2018) show a net population decrease (-2,763), taking into account not only natural change and net migration, but also other movements.

Population change (2018)	
Births	5,789
Deaths	6,936
Immigrants	40,231
Emigrants	27,308

Figure 8. Population change in the city of Valencia (2018). Modified from [2].

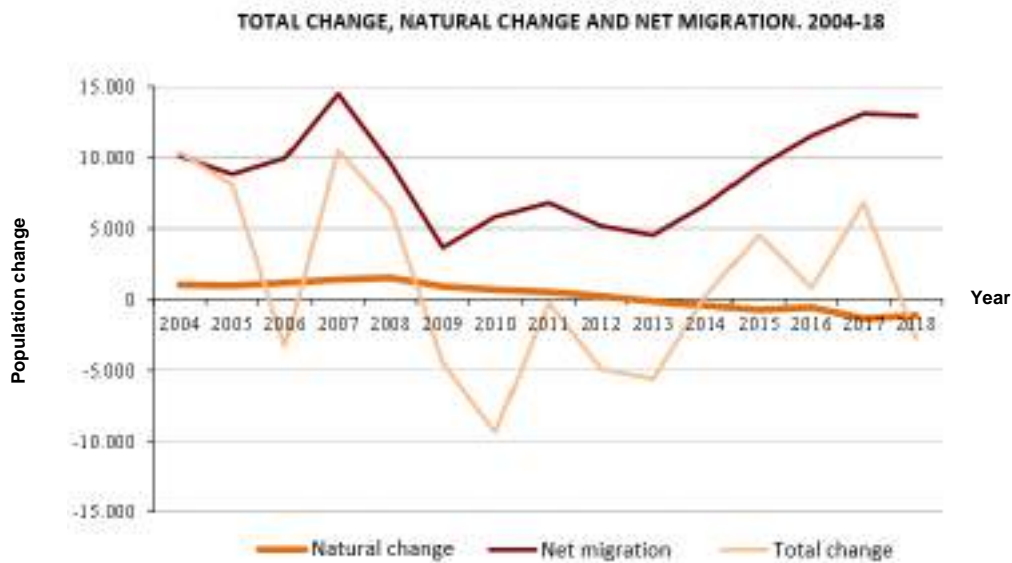


Figure 9. Population change in the city of Valencia (2004-2018). Modified from [3].

1.2.4. Vulnerable groups

Valencia uses the AROPE (at risk of poverty or exclusion) index to measure the risk of poverty and/or social exclusion, based on the sum of persons “either at risk of poverty, or severely materially deprived or living in a household with a very low work intensity” [6]. According to this measure, 29.8% of the population were at risk. This figure is higher than the average AROPE index calculated in the same year (2018) for both the whole Valencia province (26%) and the Valencia region (27.6%) [3], as well as higher than the national results for Spain (26.1%) [7]. Risk was higher within the male population (30%) than within the female population (29%), while 34.5% of the population under 16 was also found to be at risk [3].

Aside from use of the AROPE index, there is not a single valid definition of “vulnerable population groups” in the city of Valencia. On the contrary, several criteria are applied, such as those mentioned below, depending on the objective of the analysis or the organisation involved.

For instance, the Social Welfare Department of the city considers the following as priority beneficiary groups for their social intervention programs [8]:

- Immigrants, refugees and asylum seekers
- Homeless people or those suffering poor housing conditions
- Minor ethnic groups
- Prisoners and former prisoners
- People under addiction treatment
- Unemployed people
- Old people

- Women
- Infants, young people and families
- Young people with integration problems
- People with disabilities and dependent
- People with chronic and/or long-term diseases
- Other vulnerable groups and communities

In terms of vulnerability to climate impacts, the only vulnerable groups officially identified in Valencia found are those vulnerable to heat. At a regional level, an annual prevention and care programme (designed to prevent, minimise and otherwise address health problems related to extreme temperatures in the Comunitat Valenciana) was established in 2004 by the Regional Department of Universal Healthcare and Public Health. This programme is active between June and October every year [9]. While the programme is active, forecast temperatures for each area in the region are made available via web, together with advice, recommendations, and other information aimed to minimise the impacts on people from extreme heat.

The last programme, from 2019 [10], identified older people as the most sensitive group. Several other risk factors during a heatwave were also identified within four main groups: personal, local, environmental risk factors, and those concerning existing health problems. Some examples of those risk factors which define vulnerability to a heatwave from the programme perspective are shown in Figure 10.

Personal risk factors	Local risk factors	Environmental risk factors	Existing health problems
<ul style="list-style-type: none"> • Older people (>65 years) • Children (<4 years) • Pregnant women • ... 	<ul style="list-style-type: none"> • Demographic factors • Climatology • House fittings and income level 	<ul style="list-style-type: none"> • Lack of trees in the house surroundings • Buildings with south exposure and no protection • ... 	<ul style="list-style-type: none"> • Diabetes mellitus • Arteriosclerosis • Respiratory insufficiency. COPD. • ...

Figure 10. Main risk factors during a heatwave (excerpt) [10].

Several vulnerability maps have been developed and/or related analysis undertaken in Valencia. There are too many and, in some cases, they are also too extensive, to be added as annexes to this document. However, an overview is provided below, and the full references are freely available to download. Additional documents are provided by the city's Statistical Office [11] and Social Welfare Department [12], among others.

The main vulnerability mapping and analysis was released in 2018 based on data from 2016 [13], and is intended to be updated every three years. It includes not only a comprehensive report, but also the statistical data on which it is based, available as a spreadsheet file. Vulnerability was analysed and mapped based on several indicators, which are grouped on

three main topics, each one of them made up of several sub-sections: access to public facilities (including health, transport, education, population at risk and others), demographics (including population density, population increase, dependent population, population from outside the EU, population aged 65 or over living alone, population aged 80 or over and population under 18) and socio-economics (including educational level, cars, housing and economic status). This analysis was performed at census section level. A Global Vulnerability Index was also defined in order to summarise in a single Index the results from the sectoral indicators considered for each topic and sub-section. Figure 11 summarises the results of the Global Vulnerability Index aggregated at district level, and indicates the number and percentage of census sections and people living within them, which were identified as “Vulnerable”¹ or “Potentially vulnerable”².

District	Population	# of census sections	Vulnerable			Potentially Vulnerable		
			# of census sections	Population	% Population	# of census sections	Population	% Population
València	787.266	599	60	71.137	9,0	60	71.530	9,1
1. Ciutat Vella	16.472	25	0	-	-	0	-	-
2. l'Eixample	42.180	42	0	-	-	0	-	-
3. Extramurs	48.208	39	0	-	-	0	-	-
4. Campanar	37.084	27	3	3.919	10,6	1	877	2,4
5. la Saïdia	46.718	36	3	3.340	7,1	4	4.447	9,5
6. el Pla del Real	30.124	25	1	902	3,0	0	-	-
7. l'Oliviereta	48.105	36	7	8.543	17,8	4	4.560	9,5
8. Patraix	57.356	41	0	-	-	2	1.758	3,1
9. Jesús	51.943	38	3	4.143	8,0	5	5.939	11,4
10. Quatre Carreres	73.067	51	2	2.767	3,8	7	8.612	11,8
11. Pobles Marítims	57.710	46	14	15.324	26,6	8	9.376	16,2
12. Camins al Grau	64.536	43	1	1.163	1,8	9	10.605	16,4
13. Algirós	37.210	28	1	1.284	3,5	1	910	2,4
14. Benimaclet	28.868	22	0	-	-	0	-	-
15. Rascanya	52.210	39	9	10.269	19,7	10	12.440	23,8
16. Benicalap	44.931	31	10	12.465	27,7	4	6.285	14,0
17. Pobles del Nord	6.478	5	2	1.545	23,8	1	1.419	21,9
18. Pobles de l'Oest	13.969	10	2	3.162	22,6	2	2.139	15,3
19. Pobles del Sud	20.097	35	2	2.311	11,5	2	2.163	10,8

Figure 11. Global Vulnerability Index. Modified from [13].

The location of every district in Valencia city is shown in Figure 12. Of particular relevance to this current report are the districts where the ARCH focus sites are situated, which will be introduced later in Chapter 6. These districts are District no 19 “Pobles del Sud” (where the

¹ A census section (and therefore, the population living within) was considered “Vulnerable” if its Global Vulnerability Index was equal to or less than the 10th percentile.

² A census section (and therefore, the population living within) was considered “Potentially Vulnerable” if its Global Vulnerability Index lay within the 10th to 20th percentile range.

Albufera estuary is located) as well as. Districts no. 17 “Pobles del Nord”, 4 “Campanar”, 10 “Quatre Carreres”, 19 “Pobles del Sud”, 15 “Rascanya”, 14 “Benimaclet” and 13 “Algirós” (where parts of the Huerta are located). See Figure 12 below for the full extent of the Huerta.

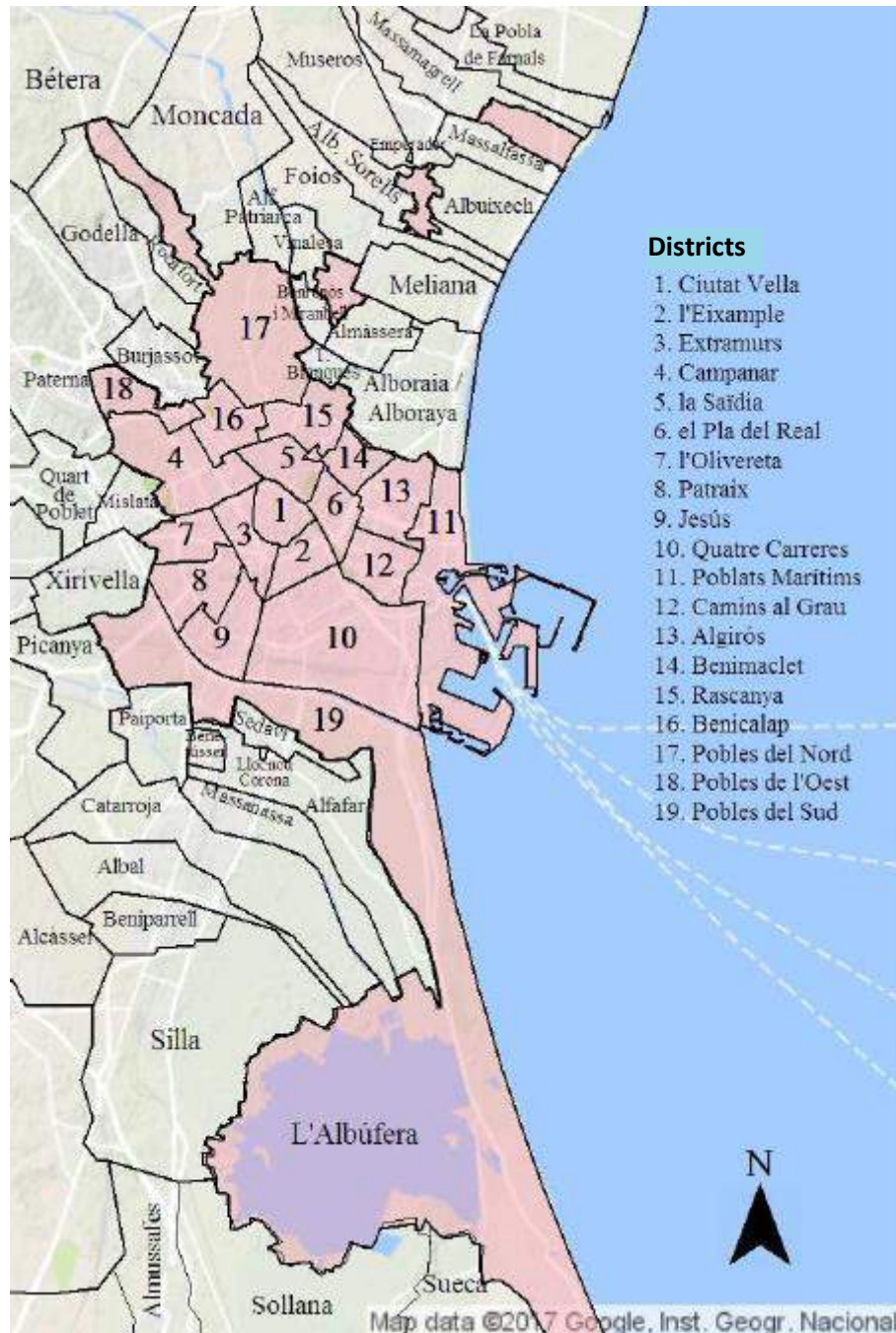


Figure 12. Valencia districts. Modified from [2].



Figure 13. Valencia green areas. Modified from [2].

Detailed analyses are also made available every year for some of the city neighbourhoods or districts [14], including some of the areas mentioned above, such as the Pobles del Sud [15] and Pobles del Nord [16] districts. A 2017 report prepared by the municipality [17] also spatially analysed vulnerability in the city, in the context of the recent economic crisis. In that case, the analysis was based on the social services structure of the city, and vulnerability indicators were disaggregated for each of the eleven municipal social services departments (each of whom provides services to certain neighbourhoods). For instance, Figure 14 shows the rate of households in risk of poverty and/or social exclusion per municipal social services department, according to the AROPE index previously described.

	Total	Livestock	Industrial	Construction	Trade and Services	Professional	Artistic
2019	128,562	39	4,330	8,586	85,857	28,828	922
%	100.0	0.0	3.4	6.7	66.8	22.4	0.7

Figure 16. Economic activities by economic activities tax (2019) [3].

The city of Valencia is fundamentally a service area whose influence reaches far beyond the limits of its municipal district. The population currently employed in the services sector accounts for 83% of the total, with a large proportion of final demand activities (i.e. goods or services for consumption, public or private investment, or for export), retail and wholesale trade, specialised services for companies and professional activities.

Nevertheless, the city also maintains an important industrial base, with an employed population of 11%, made up of small and medium-sized companies, among which the paper and graphic arts, wood and furniture, metal products, and the footwear and clothing sectors stand out.

The city's dynamism as an economic centre and reference point for many economic activities is reflected in the strength of key institutions for economic development such as Feria Valencia, the Autonomous Port, the Stock Exchange, the Conference Centre and its universities.

Valencia also has cultural institutions that are increasingly important in its development: the Palau de les Arts, the IVAM, the Palau de la Música or the City of Arts and Sciences bring undeniable added value to the city and its metropolitan environment as a cultural and leisure centre.

Agricultural activities are of relatively minor importance in terms of employment (see Figure 17), however agricultural land accounts for a relatively large share of land use: total of 3,348 hectares, about one fifth of the total area of the municipality, mostly made up of horticultural crops. Agriculture is also important for the city in terms of cultural heritage, due for instance to the existence of the "Tribunal de las Aguas de la Vega de Valencia" ("Water Court of the Plain of Valencia"), considered the oldest European existing justice institution, which was recognised as Intangible Cultural Heritage by UNESCO in 2009 [19]. The "Paella", a rice dish, is the most traditional and typical dish in Valencia, with great cultural importance. Traditionally, it is made from rice grown in the Albufera Natural Park. It is also traditional to eat it on the weekends, often in one of the many restaurants in the Huerta surrounding Valencia or the Albufera. Agro-tourism activities are also increasingly important, with new companies offering several tours and other agro-food tourism activities in the Huerta [20]. Ornithological tourism is also developing, and the Albufera Natural Park, including its agricultural zones, is one of the best areas around Valencia for birdwatching [21]. Therefore, the influence of the agriculture sector on the services sector in the city of Valencia must also be acknowledged and appreciated.

	Annual average	1st quarter	2nd quarter	3rd quarter	4th quarter
Total	276K	268,1	276.3K	278.6K	280.9K
Agriculture	2.2K	1.8K	1.8K	1.9K	3.2K
Industry	33.8K	31.1K	33.6K	37.6K	32.9K
Building industry	11.1K	11.2K	12.6K	10.9K	9.6K
Services	228.9K	224.0K	228.3K	228.2K	235.2K

Figure 17. Number of gainfully employees by economic sector (2018) [3].

The average unemployment rate in Valencia city during 2018 was 14.5% (based on [3]), slightly lower than the national average during the same period (15.25%) [22]. The monthly evolution of the unemployment rate during that year is shown in Figure 18. The highest unemployment was recorded in January, while the lowest rate corresponds to June data.

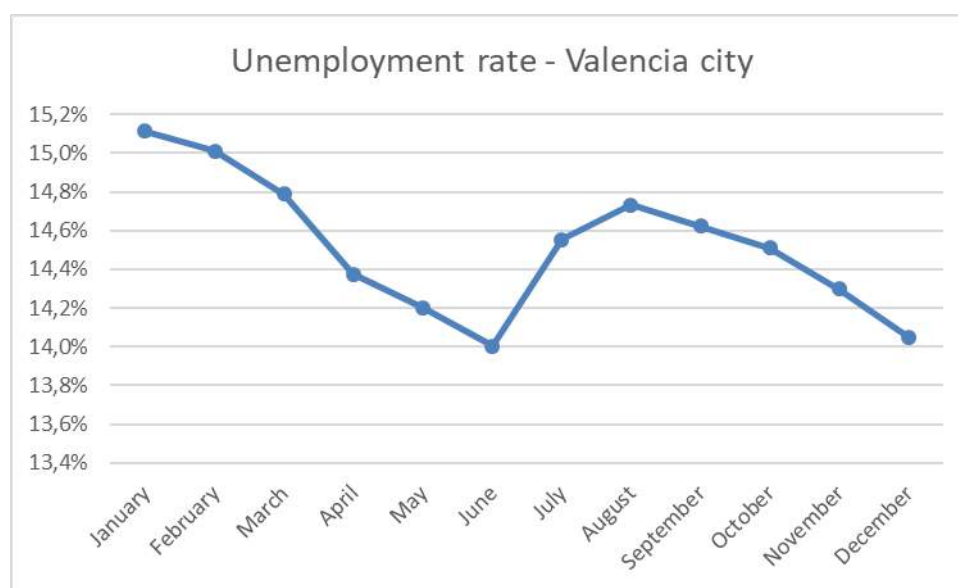


Figure 18. Unemployment rate. 2018. Based on data from [3].

The youth unemployment rate in Valencia city was 20.8% in the fourth quarter of 2018 (slightly higher for young women at 22.0%, compared to 20.0% for young men) [23].

1.4. Around the focus sites: the Huerta and the Albufera

1.4.1. Overview

While the Huerta is originally an agricultural landscape (mainly dominated by arable and woody crops), the Albufera Natural Park combines agricultural areas (mainly rice paddies) with large

areas with natural character, such as the Albufera lagoon, or the “Devesa del Saler” forest and other highly valuable ecosystems located in the sandbar between the lagoon and the sea. Some Huerta areas in the southern part of the municipality are also located within the Albufera Natural Park boundaries, and were classified in a particular category (“Espacios de Valor Natural”, Areas of Natural Value) within the Huerta Land Use Plan [1]. The overlapping area between both sites is shown in Figure 19.

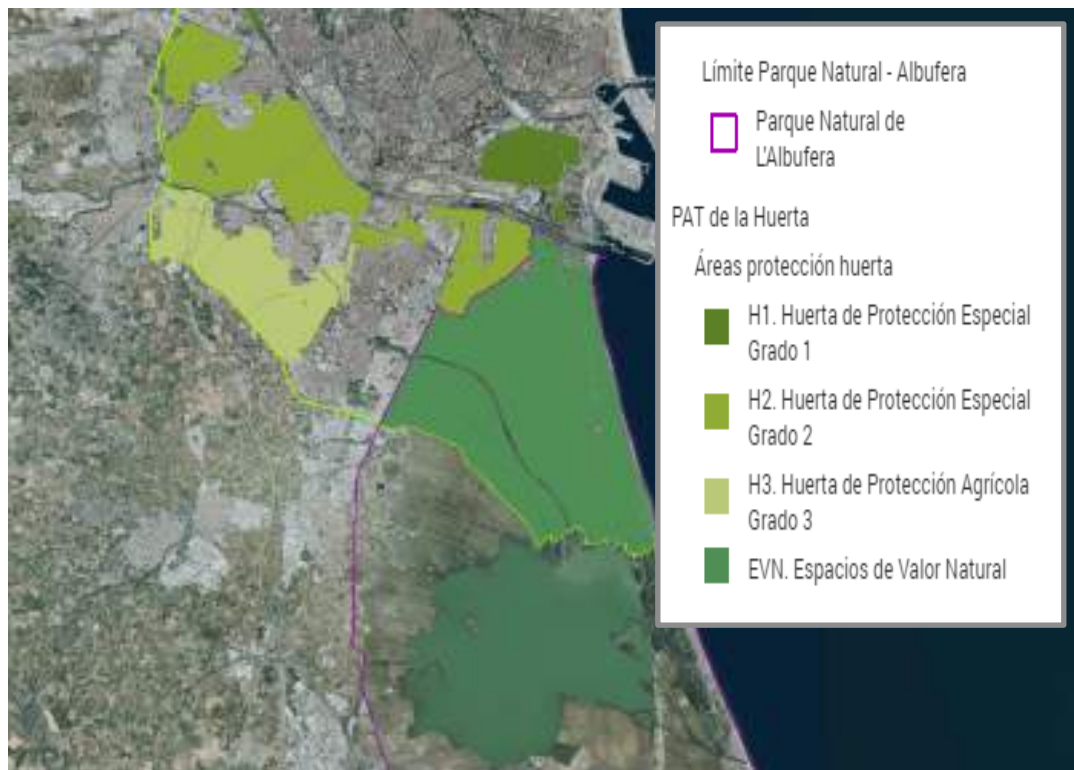


Figure 19. Areas of Natural Value (“EVN. Espacios de Valor Natural”), in the overlapping area within both Huerta (“Áreas protección huerta”)(outlined in green) and Albufera (“Límite Parque Natural-Albufera”)(outlined in purple) protected sites [24].

1.4.2. Employment

The districts adjacent to the Huerta and Albufera have been identified in previous sections (see part 5.2.3 above). These are peripheral districts of the city of Valencia with a socio-economic rank lower than the average of the city. These neighbourhoods occupy land that was previously farmland, meaning many older people are still engaged in agricultural employment and activities, while young people are more disconnected [25]. Initiatives are emerging that try to reverse this loss of connection with traditional agricultural livelihoods, such as farmers and local markets, or direct sales from producers to neighbours. As seen in Figure 12 and Figure 13, the “Pobles del Sud” district includes some Huerta areas, as well as the Albufera Natural Park sections that belong to the Valencia municipality, including the own Lagoon.

1.4.3. Vulnerable groups

There are vulnerable groups living within the vicinity of the Huerta and Albufera areas, as described in previous sections and references (see Figure 11 and subsequent comments for

some estimates of the number of vulnerable and potentially vulnerable people living in the districts adjacent to Huerta and Albufera). More detail on the prevalence per district of the main causes of vulnerability and potential vulnerability previously identified (access to public facilities, demographics and socio-economics) can be found in [13].

As will be mentioned in Chapter 6, both the Huerta and the Albufera are large and complex, and therefore smaller pilot areas could be established within them for the project purposes. In that case, additional, more detailed information regarding vulnerable groups in such areas could be extracted from the already identified sources or additional ones. For instance, it has already been mentioned that the “Pobles del Sud” district includes areas within both the Huerta and the Albufera. In addition to the previously identified sources of information, detailed vulnerability data could also be found if needed in the “Pobles del Sud” district analysis [26], which includes a thorough review on vulnerability, energy poverty or poverty, among other issues. Some of this information is extracted from the previously mentioned references. As an example of the available information, Figure 20 shows the total and relative vulnerable population in each of the population nuclei in the Pobles del Sud district.

Pobles del Sud	Population (2016)	Total Vulnerable Population (2016)	% Vulnerable Population (2016)
PINEDO	2.607	0	0,00%
EL SALER	1.704	0	0,00%
EL PALMAR	769	0	0,00%
EL PERELLONET	1.430	0	0,00%
EL FORN D'ALCEDO	1.215	1.207	99,30%
EL CASTELLAR-EL OLIVERAL	6.881	703	10,20%
LA TORRE	4.643	2.473	53,30%
FAITANAR	979	979	100,00%
Total CMSS	20.228	5.362	26,51%

Figure 20. Vulnerability per population nucleus in the “Pobles del Sud” district. Modified from [26].

Following is a detail of additional available spatial information regarding the Benicalap district, one of the Huerta neighbouring districts previously mentioned. Its vulnerable and potentially vulnerable census sections are described and mapped in [13], as seen in Figure 21.

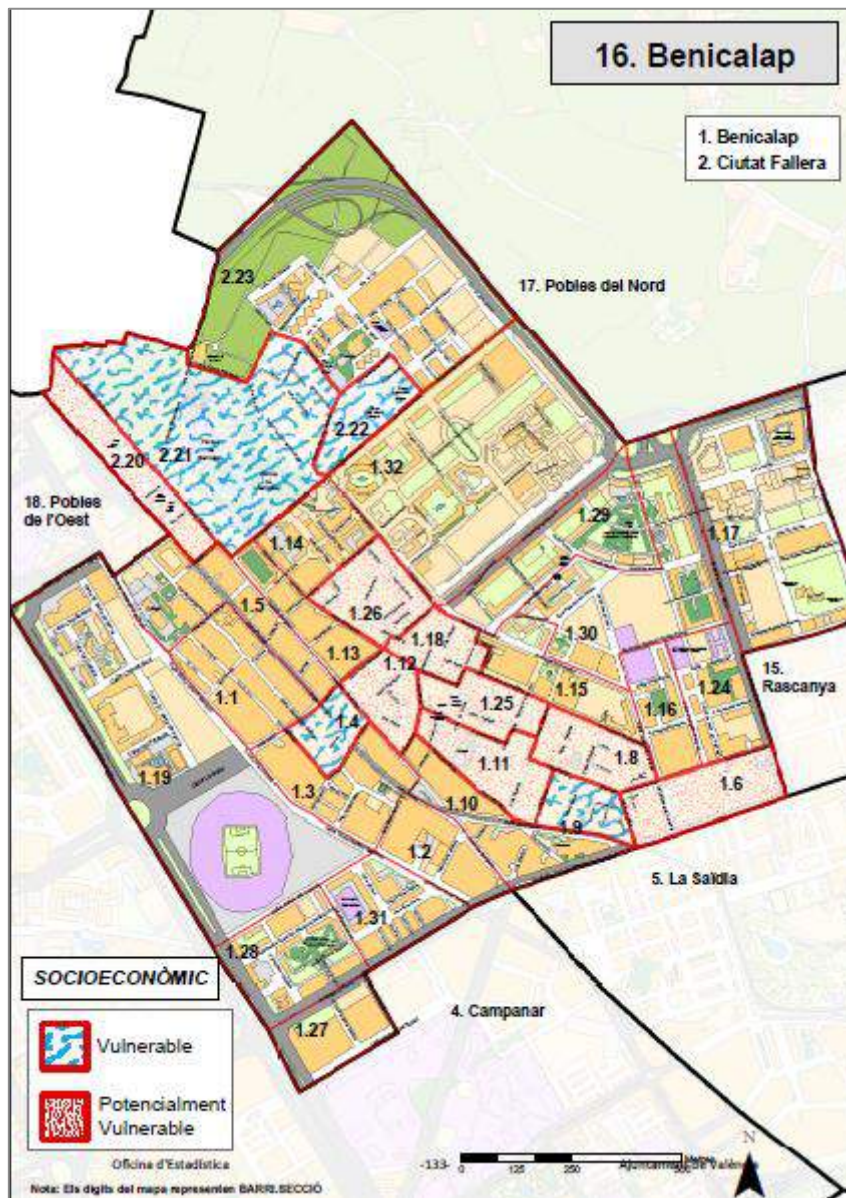


Figure 21. Socio-economic vulnerability mapping – Benicalap (*Huerta areas shown in green, in the census section coded 2.23*) [13].

Additional data, for instance regarding the aging index or the dependence index, are also available at neighbourhood level in [17]. See Figure 22 and Figure 23 for some examples of the information available in relation to Benicalap and other nearby neighbourhoods which are also close to the northern part of the Huerta, and which are all dependent on the Campanar Social Services Department.

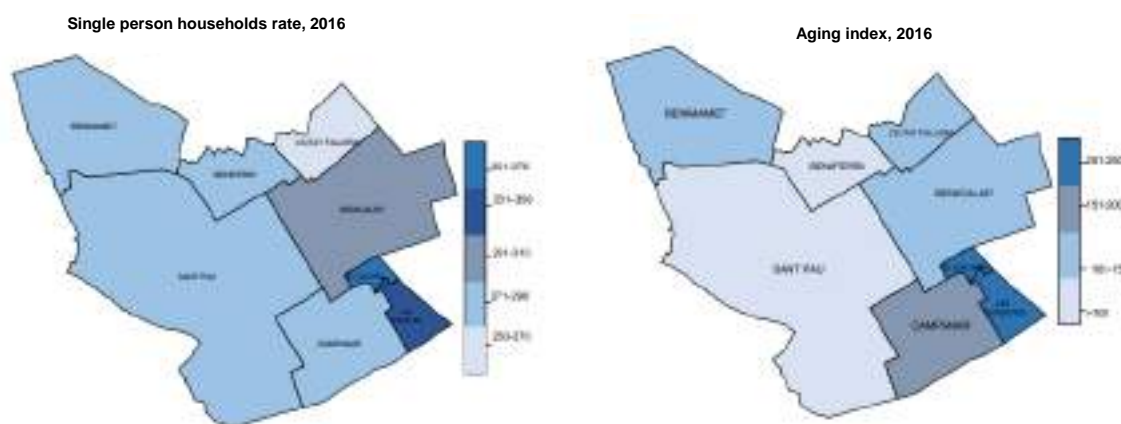


Figure 22. Single person households rate (left) and aging index (right) at neighbourhood level. 2016 data from the Campanar Social Services Department. Modified from [17].

	Female rate*	Male rate**	Aging Index	Dependency ratio	Single person households rate
Campanar	115,9	86,3	183,3	55,0	285,5
les Tondetes	113,5	88,1	228,4	53,2	339,6
el Calvari	108,0	92,6	216,4	58,8	363,2
Sant Pau	104,9	95,4	53,2	54,6	273,5
Beriscolap	106,3	94,1	102,7	50,9	296,0
Clutat Follers	102,1	97,9	122,3	50,9	259,1
Bonnamet	105,3	95,0	106,4	52,0	284,3
Basilari	103,5	98,6	80,4	38,8	271,7
Total CMSS	107,2	93,3	108,1	52,5	293,5
Ciutat de València	109,0	91,5	136,2	53,4	324,7

Figure 23. Neighbourhood level data from the Campanar Social Services Department [17] (*Female rate is defined as the number of females per 100 males at 1 January of year t; **Male rate is defined as the number of males per 100 females at 1 January of year t).

1.5. Overview of existing local framework for disaster risk reduction, climate adaptation and cultural heritage management

The boxes ticked below provides a preliminary overview of the local policy framework in regard to disaster risk reduction, climate adaptation and cultural heritage management (specifically, which information has already been mapped), which will be expanded on in Chapters 3, 4 and 5.

- ☐ Emergency response procedures and responsibilities in the city
- ☒ Existing adaptation measures, strategies and key legislation in the city
- ☐ Existing cultural heritage protection measures, strategies and key legislation in the city
- ☐ Existing databases on climate risk information for the city
- ☐ Decision-making structures in the city regarding adaptation
- ☐ Decision-making structures in the city regarding cultural heritage protection
- ☒ Inventory of heritage assets and their condition

2. Target cultural heritage landscapes identified for ARCH

The information below concerns the Huerta and Albufera at a general level. In discussion with stakeholders, the focus may still be refined in future to focus on selected districts, zones or ecosystems, due to the complexity and size of both cultural heritage landscapes.

2.1. La Huerta de València

2.1.1. Overview

The “Huerta” has been defined by Meeus as one of 30 main European landscapes, consisting of “Irrigated, *fertile valleys on Mediterranean coast*”, characterised by the presence of intensive horticulture and permanent crops such as fruit trees [27]. The “Huerta de València” is one of the last six landscapes of such type remaining in Europe (see Figure 24).

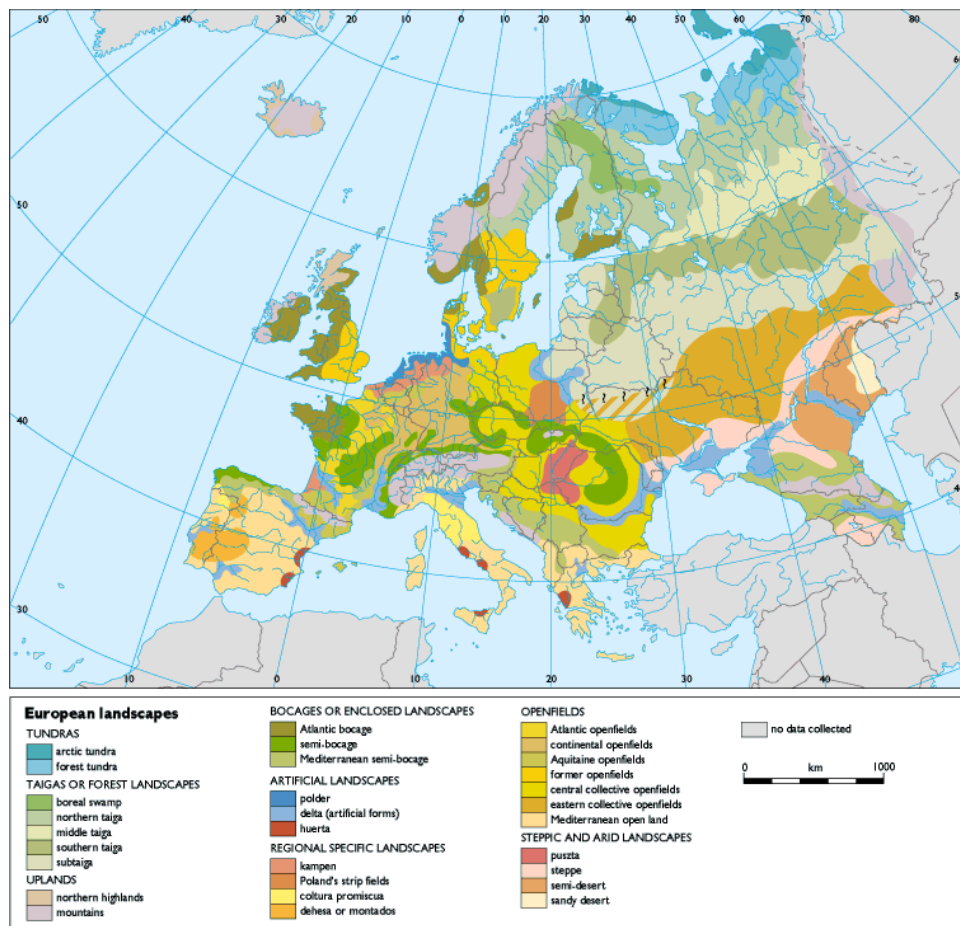


Figure 24. European landscapes [27].

The term “Huerta” is a specific, definable and recognisable historical concept that corresponds to an irrigation model created in medieval times. In this way, the Huerta de València is the territory delimited by the maximum perimeters of the irrigation ditches of medieval Islamic origin that captured the water in the district of València. That is, the seven hydraulic systems that

have formed part of the Water Court (“Tribunal de las Aguas”) for centuries, plus the Royal Acequia of Moncada.

The planning, establishment and development of the space of the Huerta was marked by three fundamental spatial elements:

- The network of irrigation ditches (“acequias”).
- The location of settlements: protected rural areas and goods.
- The road network.

The Huerta area is extremely large, well beyond the municipal boundaries of València city. The part of the Huerta within the “detailed” planning area alone (in dark green in Figure 25) has been estimated at nearly 11,393 ha [1] spans a total of 40 municipalities, of which València is only one, alone with: Albuixech, Aldaia, Alfafar, Alfara del Patriarca, Almàssera, Benetússer, Bonrepòs i Mirambell, Burjassot, Catarroja, Emperador, Foios, Godella, Lugar Nuevo de la Corona, Manises, Massalfassar, Massamagrell, Massanassa, Meliana, Mislata, Moncada, Museros, Paiporta, Paterna, Picanya, La Pobla de Farnals, Puçol, El Puig, Quart de Poblet, Rafelbunyol, Rocafort, Sedaví, Tavernes Blanques, Torrent, Vinalesa and Xirivella. The “extended planning area” (also shown in Figure 25 in lighter green), considered in the same land use plan, covers the whole of “L’Horta” county, including, for historical reasons, four additional municipalities (Albal, Alcàsser, Beniparrell and Picassent), where the Huerta can in fact no longer be found, at least according to the criteria considered in regional regulations [1] [28].

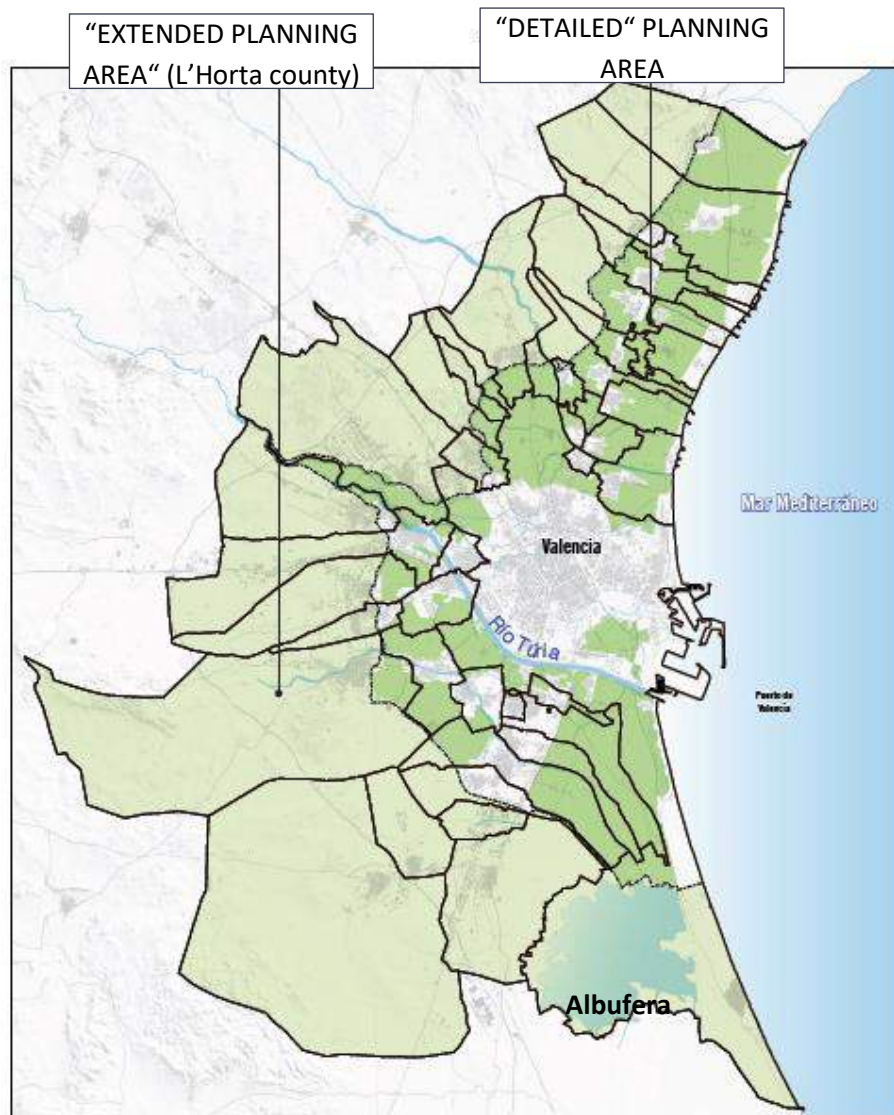


Figure 25. Planning Areas. Huerta de València Regional Plan (municipal boundaries shown in black). Modified from [1].

The Huerta de València is considered “*historic, cultural, natural and agricultural heritage of the Valencian people*” [1]. Relevant international cultural heritage designations are listed in section 3.1. Its social and public functions are recognised by regional law (Article 4, Law 5/2018 [28]: “*The agricultural activity and the natural, cultural and landscape heritage of the Huerta de València fulfils a relevant social function, since it favours the development of the agricultural sector, food sovereignty, human welfare, sustainable development and climate change mitigation*”. However, other functions, such as its potential role regarding the adaptation of the city of València to climate change, have not yet been fully assessed.

In November 2019, the historical irrigation system and its “Horta” have been recognised on the register of [Globally Important Agricultural Heritage Systems \(GIAHS\)](#), managed by the UN Food and Agriculture Organization (FAO). According to the FAO’s Yoshihide Endo who coordinates the GIAHS programme:

“The Horta of Valencia is invaluable. Half of the crops grown here are at risk of disappearing in the region. It provides for both farmers and fishers. Its citrus fruits have a Geographical Indication (GI) label due to their high quality and variety. The site is also home to a wide range of birds, fish and plants, many classified as rare, endemic or endangered,”³

2.1.2. Stakeholders

The map of actors involved in managing, planning for and working within the Huerta is very diverse, but of particular importance is the role of the newly-created **Consell de l’Horta** (kick-off in February 2020) thanks to the recently-established Law of the Huerta in 2018. The Council’s objective [28] is:

“to guarantee the survival and promote the revitalisation of agricultural activities in the Huerta, promoting an agriculture that is more respectful of the environment as well as the possibility of allowing complementary uses and activities compatible with agricultural activities, as well as encouraging citizen participation in the taking of decisions that affect the Huerta, food sovereignty, the reconnection between the countryside and the city, and promoting a local agri-food system”

(art. 39 of the Law of the Huerta de València).

At the time of writing, the Council is made up of members from the Agriculture Department (regional government), the Provincial Government of Valencia and the Municipality of València. The rest of the municipalities that form part of the Huerta area will join later.

There are also other public actors involved in the management of the Huerta. The current structure of the municipal government [29] includes the following areas relevant to the ARCH project:

- “Urban Ecology, Climate Emergency and Energy Transition”,
- “Education, Culture and Sports” (which holds, among others, local competencies on cultural heritage and resources) and
- “Innovative Development of Economic Sectors and Employment” (which holds, among others, local competencies on agriculture, sustainable food and Huerta).

Three departments of the regional government are also relevant:

³ for further information: <http://www.fao.org/news/story/en/item/1252906/icode/>

- “Agriculture, Rural Development, Climate Emergency and Ecological Transition”,
- “Territorial Policy, Public Works and Mobility” and
- “Education, Culture and Sport”.

The private sector is very important to the Huerta, especially farmers cultivating agricultural land there, such as the SME Terra I Xufa. Other relevant private companies include agritourism company Horta Viva and startup Green Urban Data which develops software to promote the use of remote sensing and other open data for climate change adaptation..

In terms of civil society, social movements have had a long tradition of protecting and supporting the territory in the Huerta, such as Per L'Horta, CERAI and the Assut Foundation. Universities and agricultural research centres are also present in the territory. In the figure below you can see a map of actors according to influence and interest, undertaken by the authors (for more detail on the stakeholder mapping exercise, see forthcoming ARCH report *D3.2 Local partnership and work plan*).

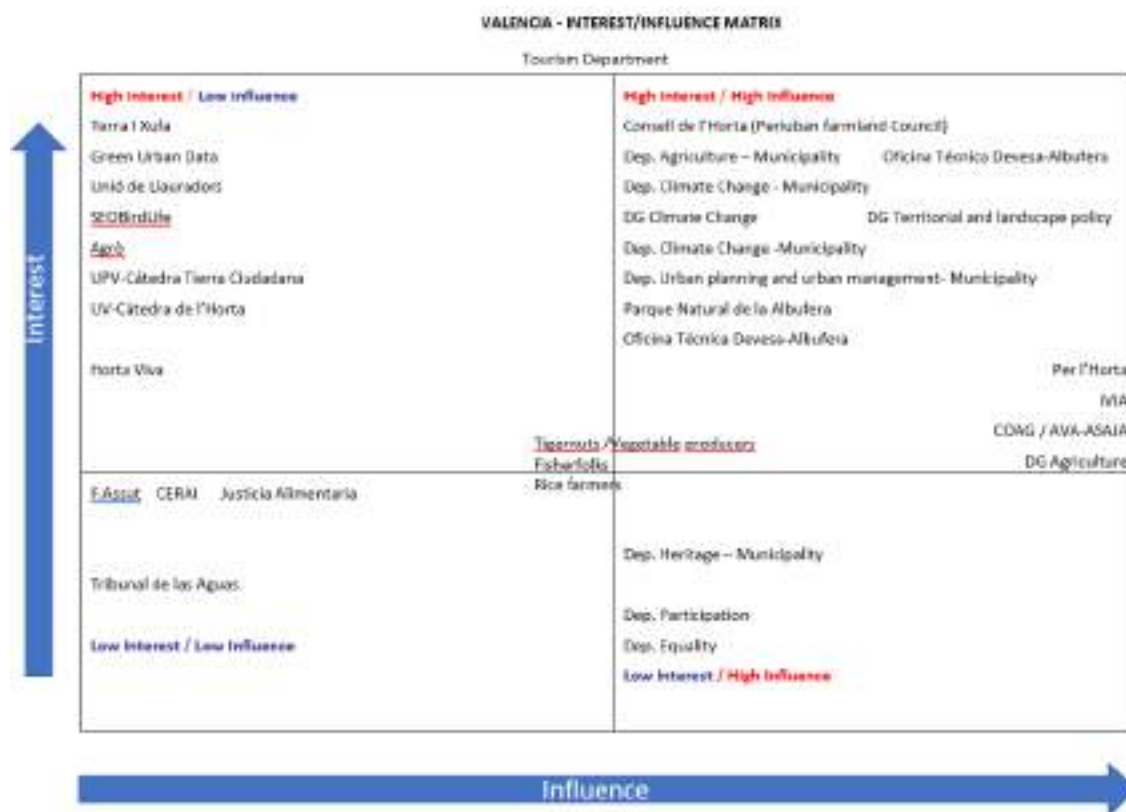


Figure 26. Stakeholder mapping, current as of February 2020. For latest version and more information, refer to *Local partnership and work plan for Valencia (D3.2)*.

2.1.3. Hazards affecting the site

The following section briefly introduces the hazards potentially affecting the Huerta, which have been classified and named based on the hazard classification system from UNDRR's Quick Risk Estimation (QRE) Tool [30]. More detail on hazards is provided in Chapter 10. No relevant **geophysical** hazards were identified. Flood risk is the main **hydrological** hazard for the

Huerta, although wave action could be considered as well in some very specific locations close to the coastline. Within the **meteorological** group of hazards, convective storms and extreme temperature are considered the main risks. Drought is the only relevant **climatological** hazard identified and could become highly significant considering the key influence of irrigation in the agricultural character of the Huerta landscape. Insect infestation is the only **biological** hazard identified according to the QRE Tool, since the tool's definition of "Disease" seems to focus on human diseases. However, as with pests, diseases affecting crops could also change in incidence and prevalence in the Huerta due to climatic changes.

The City developed a *Sustainable Energy and Climate Action Plan (SECAP)* in 2019, [31] including a vulnerability analysis (VA) [32] based on previous climate projections [33], both published in 2015. These VAs also provided the basis for Valencia's *Climate Adaptation Plan 2050* [34] published in 2017⁴. However, they are not spatially explicit, since they are solely based on data from one weather station, which moreover is located in the Valencia airport (outside the Valencia municipal boundaries, and more than 13 km from the coastline). Climate projections were calculated for the RCP4.5 and RCP8.5 scenarios in relation to several descriptive variables of future temperature and rainfall patterns. It should be noted that they are based on statistical downscaling methods, and not on the more advanced regional climate models such as EURO-CORDEX [35] and other derived and gridded data which are currently available. Therefore, assumptions made in the past VAs are of limited use, since they are mainly qualitative and based on data on which faces certain limitations.

The VA [32] was structured around five priority sectors (selected based on strategic and historical importance: water ("Agua"), biodiversity ("Biodiversidad"), coastal zones ("Zonas costeras"), health ("Salud"), and transport and land use planning ("Transporte y ordenación urbana"). Although the sectors agriculture and energy were not addressed in this first study, they were included in a further expansion of the report [36], and also in the analysis that forms part of *Climate Adaptation Plan 2050* [34]. Graphs below show how the level of vulnerability (ranging from "Despreciable" or negligible to "Muy alta" or very high) of each of the sectors in the first VA [32] is expected to evolve in the future (from 2014 up to 2100) in relation to the following expected changes due to climate change: temperature rise (Figure 27), decreasing precipitation (Figure 28), heavy rains (Figure 29), other extreme events (heatwaves and droughts) (Figure 30) and sea level rise (Figure 31). Heavy rains are considered in the analysis as the less dangerous impact driver, as the maximum vulnerability identified to their impacts is just low ("Baja"). Impacts due to sea level rise were also not considered especially worrying, since only coastal areas were considered to have a high vulnerability to it ("Alta"), and the rest of the sectors were considered, at most, to have a low vulnerability. The VA considered indeed that health was not vulnerable to sea level rise at all. The health and water sectors were assessed as highly vulnerable to heatwaves and droughts after 2040, while the rest of the sectors only scored medium ("Media") vulnerability to such extreme events, at most. Higher

⁴ It is worth noting that the *Climate Adaptation Plan 2050* also includes results from an updated VA that also addressed the energy and agriculture sectors (see also Figures 32 and 33 below). This updated version, dated March 2016, is apparently not referenced or linked in any of the key documents consulted by the authors, but can be found online: [https://www.valencia.es/ayuntamiento/Energias.nsf/0/57AABB553B187CC8C1257F8700396AD6/\\$FILE/An%C3%A1lisis_vulnerabilidad.pdf?OpenElement&lang=1](https://www.valencia.es/ayuntamiento/Energias.nsf/0/57AABB553B187CC8C1257F8700396AD6/$FILE/An%C3%A1lisis_vulnerabilidad.pdf?OpenElement&lang=1)

levels of vulnerability were linked to temperature rise and decreasing precipitation. In the case of temperature rise, water, biodiversity, coastal areas and health were considered highly vulnerable to temperature rise by 2070, at latest. Water, biodiversity and health were also assessed as highly vulnerable to decreasing precipitation from 2070, or in some cases earlier. No sector was considered to show a very high vulnerability to any of the climate change impact drivers analysed, for any of the time horizons considered.

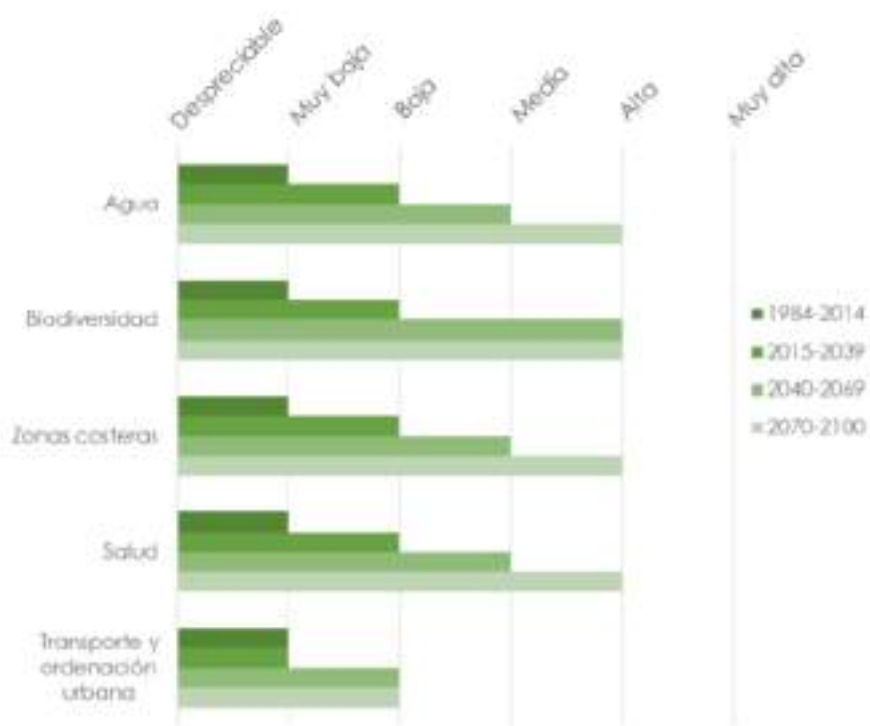


Figure 27. Levels of vulnerability to temperature rise [32].

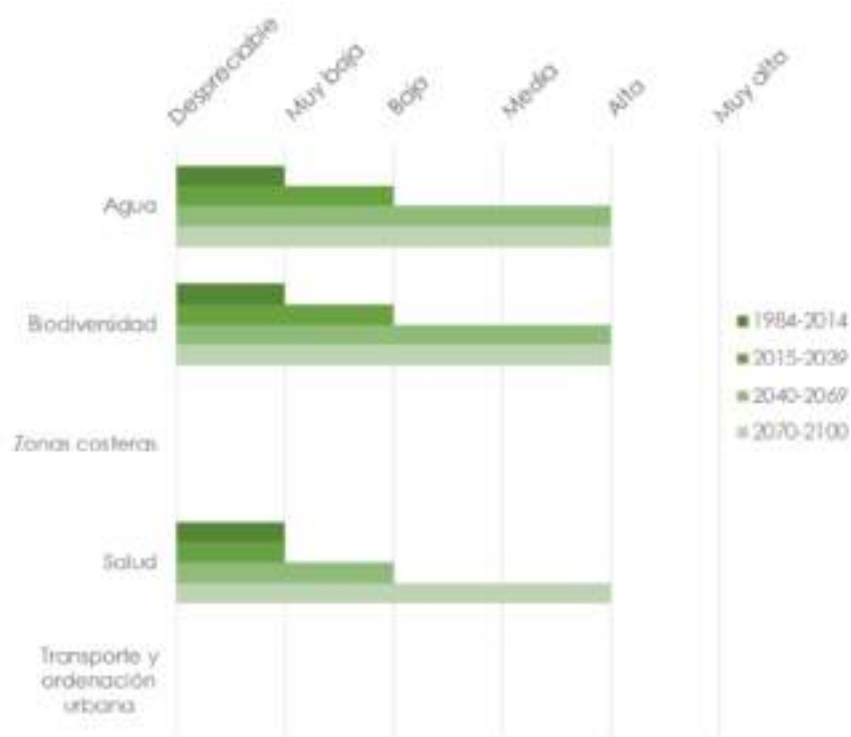


Figure 28. Levels of vulnerability to decreasing precipitation [32].

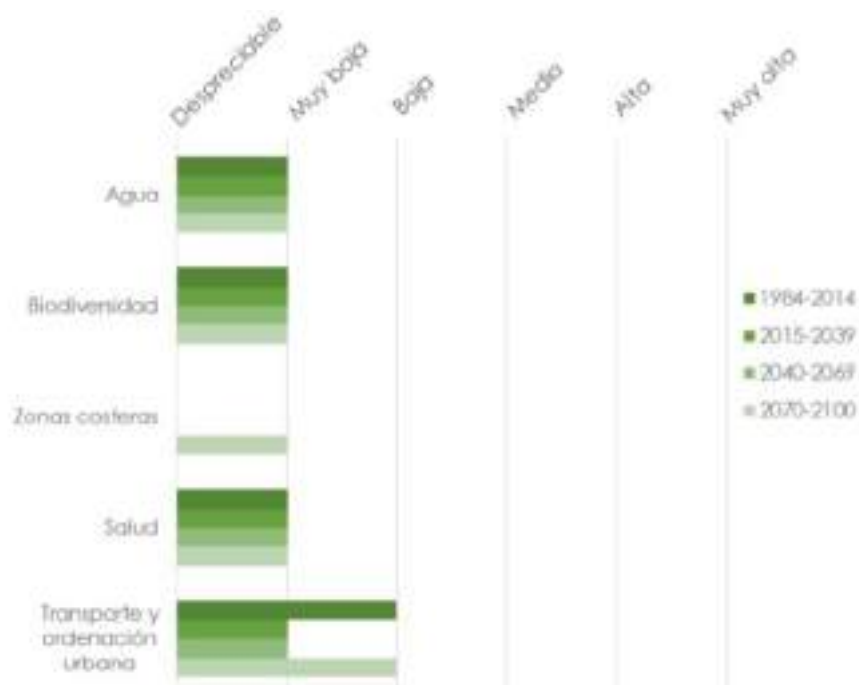


Figure 29. Levels of vulnerability to heavy rains [32].

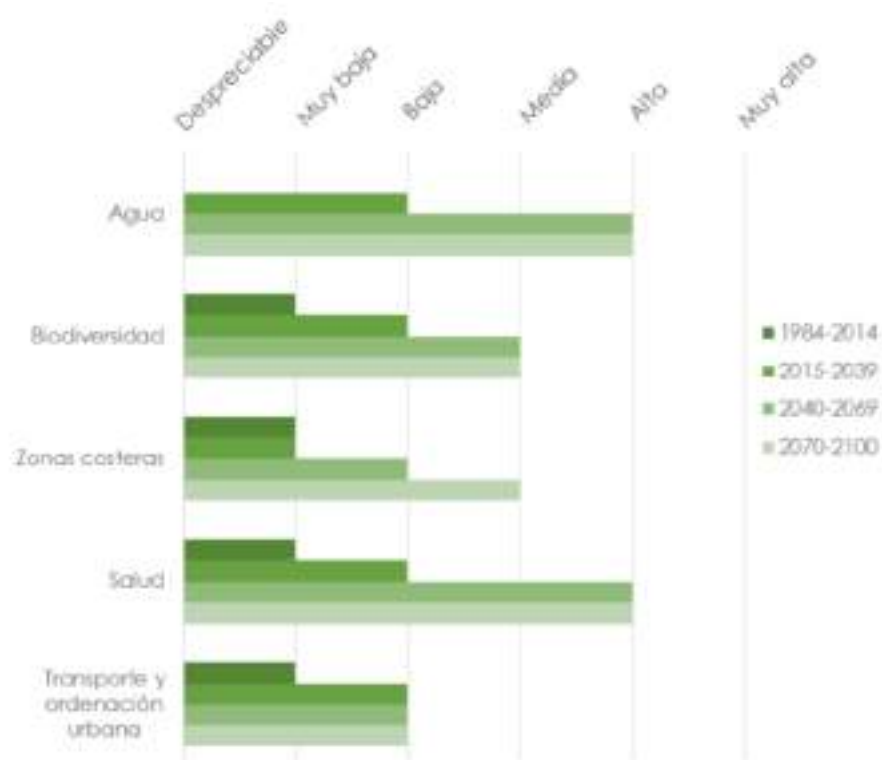


Figure 30. Levels of vulnerability to other extreme events (heatwaves and droughts) [32].

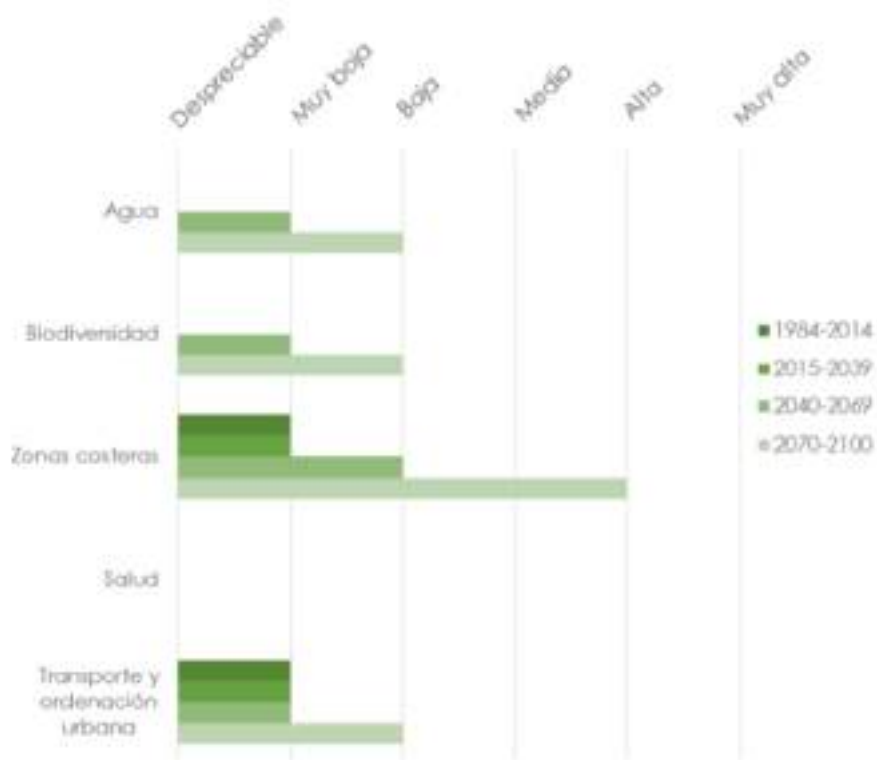


Figure 31. Levels of vulnerability to sea level rise [32].

Climate change hazards in the agriculture (Figure 32) and energy (Figure 33) sectors were presented in a slightly different way in the subsequent expansion of the VA [36]. The impacts likelihood (“Probabilidad”) was assessed from unlikely (“Improbable”) to highly likely (“Muy Probable”). Consequence from such impacts was ranked, from minimal (“Mínima”) to catastrophic (“Catastrófica”). Drivers of impacts are then shown in the table according to their likelihood and consequence, for four different timeframes (T=average temperature, P= average annual rainfall, LT= heavy rainfall, REE= other extreme events, NM=sea level rise, (0=1984-2014, 1=2015-39, 2=2040-69, 3=2070-2100)).

2. CONSECUENCIA							
Despreciable		Mínima	Menor	Significativa	Importante	Crítica	Catastrófica
1. PROBABILIDAD	Improbable	NM0; NM1	LLT3	LLT2			
	Muy poco Probable		REE0		LLT1		
	Poco Probable		NM2	T0; P0	LLT0		
	Probable			T1; REE1	P1		
	Bastante probable			NM3	T2; REE2; REE3	P2; T3	
	Muy Probable					P3	

Figure 32. Risks of climate impacts in the agricultural sector, with magnitude of risk ranging from minimal to catastrophic, and probability ranging from unlikely to high likely [32].

2. CONSECUENCIA							
Despreciable		Mínima	Menor	Significativa	Importante	Crítica	Catastrófica
1. PROBABILIDAD	Improbable	NM0; NM1; LLT3			REE0		
	Muy poco Probable		LLT1; LLT2				
	Poco Probable	T0; P0	NM2	LLT0	V0		
	Probable		T1; P1			REE1; V1; V2	
	Bastante probable		T2	P2; T3; NM3		REE2; REE3	V3
	Muy Probable				P3		

Figure 33. Risks of climate impacts in the energy sector, with magnitude of risk ranging from minimal to catastrophic, and probability ranging from unlikely to high likely [32].

Climate change impacts and economic sectors in Valencia were also ranked in relation to four time horizons in [32], according to the levels of vulnerability above, although the difficulty in comparing “different impacts, affecting very different stakeholders” was explicitly recognised.

Figure 34 classifies, in decreasing order of importance, the five aforementioned groups of expected changes in relation to the level of risk associated with the sectors considered in the document. Furthermore, Figure 35 classifies seven economic sectors, in decreasing order too, in relation to their assessed level of vulnerability to the climate impacts considered.

	1984-2014	2015-2039	2040-2069	2070-2100
1	Torrencial rain	Heat waves and drought	Heat waves and drought	Heat waves and drought
2	Increasing temperatures	Increasing temperatures	Increasing temperatures	Increasing temperatures
3	Decreasing precipitation	Decreasing precipitation	Decreasing precipitation	Decreasing precipitation
4	Heat waves and drought	Torrencial rain	Rising sea level	Rising sea level
5	Rising sea level	Rising sea level	Torrencial rain	Torrencial rain

Figure 34. Impact classification according to their level of risk associated. Modified from [32].

	1984-2014	2015-2039	2040-2069	2070-2100
1	Agriculture	Biodiversity	Water	Water
2	Biodiversity	Agriculture	Biodiversity	Biodiversity
3	Energy	Water	Health	Health
4	Transport and urban planning	Health	Agriculture	Coast
5	Health	Energy	Coast	Agriculture
6	Water	Transport and urban planning	Energy	Energy
7	Coast	Coast	Transport and urban planning	Transport and urban planning

Figure 35. Sector classification according to their level of vulnerability. Modified from [32].

The VA does not analyse in detail the expected impacts of climate change in the Huerta areas of the municipality. The text only contains very brief generic information in relation to the expected impacts on agriculture of the considered changes in climate conditions. Agriculture was addressed in more detail in the subsequent expansion of the VA [31], but still no details are given in relation to issues such as which crops or which areas would be likely more affected, beyond a reference to sea level rise as a threat to some agricultural areas. There is no reference either to the potential role of the existence of Huerta areas surrounding the city in relation to the expected impacts on the urban environment, i.e. as contributing to coping capacity.

2.1.4. Measures proposed to address hazards and build resilience

Some measures to address these forecast climate impacts have already been proposed, but not implemented yet, for instance in the Valencia's *SECAP* [31]. The Annex to the *SECAP* includes many adaptation actions related to the Huerta (planned for implementation between 2019 and 2030), some of them are especially relevant for the aims of the ARCH project. For instance, Measure A.5.2.1 (Figure 36) is particularly interesting in that it explicitly links cultural heritage and adaptation, aiming to disseminate the values of the Huerta and Albufera, and comprising both the Huerta and Albufera areas together. Figure 37 shows a measure aimed at increasing public engagement in relation to the preservation of the Huerta as an adaptation measure for the city itself. Increasing resilience of urban and natural ecosystems is considered an interesting co-benefit which could be obtained. Figure 38. Measure A.4.1.4 Extension of reserved and protected areas for agricultural use which aims at increasing the protection of land for agricultural use in the city, even if it is already considered as available for development. Additionally, Figure 39. Measure A.4.2.2 Acknowledgement of the containment function of the rural territory which aims at identifying, assessing, and even monetising the Huerta's role as an element of green infrastructure, capable of absorbing rainfall (thereby mitigating flood impacts) and attenuating heatwaves. Finally, Measure A.11.2.1 (Figure 40) is focused on the recovery and protection of existing peri-urban Huerta areas, mentioning as a co-benefit the increased infiltration rate for rainfall.

TRANSMISIÓN DE LOS VALORES DE LA HUERTA Y EL ENTORNO DEL PARQUE DE LA ALBUFERA COMO ELEMENTO DE AUTENTICIDAD	
Agentes implicados: Ayuntamiento de Valencia	
Adaptación	Prioridad a medio plazo
<p>Descripción de la acción: Desarrollo de una cultura ligada al territorio. Perfeccionamiento de la oferta actual y difusión para dar a conocer los itinerarios e iniciativas existentes.</p> <p>Código Plan de Adaptación: A.5.2.1</p> <p>Ayudas: Para la realización de esta medida, en el momento de redacción del presente Plan, se podría contar con las siguientes ayudas:</p> <ul style="list-style-type: none"> ■ Generalitat. ■ Programa LIFE. <p>Periodo de actuación: 2022-2026</p> <p>Indicadores:</p> <ul style="list-style-type: none"> ■ Desarrollo de soportes de comunicación e información. 	
Beneficios asociados	Preservación del entorno natural. Valoración de la imagen de la huerta y del territorio.

Figure 36. Measure A.5.2.1: Transmission of the values of the Huerta and the surroundings of the Albufera Natural Park as an element of authenticity [31].

FOMENTAR LA IMPLICACIÓN DE LA CIUDADANÍA EN LA PRESERVACIÓN DE LA HUERTA COMO ESTRUCTURA ADAPTATIVA FRENTE AL CAMBIO CLIMÁTICO	
Agentes implicados: Ayuntamiento de Valencia y Generalitat	
Adaptación	Prioridad a corto plazo
<p>Descripción de la acción: Fomentar la implicación de la ciudadanía en la preservación de la huerta como estructura adaptativa frente al cambio climático.</p> <p>Código Plan de Adaptación: A.3.1.7</p> <p>Ayudas: Para la realización de esta medida, en el momento de redacción del presente Plan, se podría contar con las siguientes ayudas:</p> <ul style="list-style-type: none"> Programa LIFE. Convocatorias de la Fundación Biodiversidad. <p>Periodo de actuación: 2017-2021</p> <p>Indicadores:</p> <ul style="list-style-type: none"> Iniciativas participativas en torno a problemáticas como la huerta, los recursos energéticos, etc. Participantes a las iniciativas participativas en torno a problemáticas como la huerta, los recursos energéticos, etc. Iniciativas de huertos urbanos compartidos. 	
Beneficios asociados	Contribuir al incremento de la resiliencia de los ecosistemas urbanos y naturales.

Figure 37. Measure A.3.1.7 To promote the involvement of citizens in the preservation of the Huerta as an adaptive structure in the face of climate change [31].

AMPLIACIÓN DE ZONAS RESERVADAS Y PROTEGIDAS PARA EL USO AGRARIO	
Agentes implicados: Ayuntamiento de Valencia, Consejo agrario, alcaldes pedáneos y Asociación Per l'Horta	
Adaptación	Prioridad a medio plazo
<p>Descripción de la acción: Ampliación de zonas reservadas y protegidas para el uso agrario en el PGOU y revertir la calificación de suelo urbanizable a no urbanizable de determinados terrenos usados como agrícolas o abandonados.</p> <p>Código Plan de Adaptación: A.4.1.4</p> <p>Ayudas: Para la realización de esta medida, en el momento de redacción del presente Plan, se podría contar con las siguientes ayudas:</p> <ul style="list-style-type: none"> FEADER. Generalitat <p>Periodo de actuación: 2022-2026</p> <p>Indicadores:</p> <ul style="list-style-type: none"> Zonas calificadas para uso agrícola. 	
Beneficios asociados	Preservación de nidos de biodiversidad. Dinamización del sector e incremento de los ingresos generados a nivel local.

Figure 38. Measure A.4.1.4 Extension of reserved and protected areas for agricultural use [31].

RECONOCIMIENTO DE LA FUNCIÓN DE CONTENCIÓN DEL TERRITORIO RURAL	
Agentes implicados: Ayuntamiento de Valencia, Consejo agrario, alcaldes pedáneos y Asociación Per Huerta	
Adaptación	Prioridad a medio plazo
<p>Descripción de la acción:</p> <p>Reconocimiento de la función de contención del territorio rural – espacios de huerta- su alto índice de permeabilidad y de recarga freática. Reconocimiento del papel de la huerta urbana como elemento mitigador del efecto de isla de calor.</p> <p>Monetización de los servicios ambientales ofrecidos por la huerta y valoración de la oportunidad de la creación de un pago.</p> <p>Revalorizar el trabajo del agricultor.</p> <p>Código Plan de Adaptación: A.4.2.2</p> <p>Ayudas: Para la realización de esta medida, en el momento de redacción del presente Plan, se podría contar con las siguientes ayudas:</p> <ul style="list-style-type: none"> FEADER. Programa LIFE. Horizon 2020. <p>Periodo de actuación: 2022-2025</p> <p>Indicadores:</p> <ul style="list-style-type: none"> Monetización de los servicios de la huerta. 	
Beneficios asociados	Valoración de la imagen de la huerta y del territorio.

Figure 39. Measure A.4.2.2 Acknowledgement of the containment function of the rural territory [31].

RECUPERACIÓN Y PROTECCIÓN DE LA HUERTA PERIURBANA EXISTENTE	
Agentes implicados: Ayuntamiento de Valencia, Red de Distribución de Agua del Municipio.	
Adaptación	Prioridad medio plazo
<p>Descripción de la acción:</p> <p>Recuperación y protección de la huerta periurbana existente.</p> <p>Código Plan de Adaptación: A.11.2.1</p> <p>Ayudas: Para la realización de esta medida, en el momento de redacción del presente Plan, se podría contar con las siguientes ayudas:</p> <ul style="list-style-type: none"> LIFE Programme IDAE Proyectos Clima Marquerita <p>Periodo de actuación: 2022-2025</p> <p>Indicadores:</p> <ul style="list-style-type: none"> Huerta periurbana existente recuperada y protegida. 	
Beneficios asociados	Permeabilización del suelo urbano, aumentando así la infiltración de las aguas lluvia al subsuelo.

Figure 40. Measure A.11.2.1 Recovery and protection of existing periurban Huerta [31].

The *Regional Climate Change and Energy Strategy* [37] also includes measures related to agriculture, most of which could be applied in the Huerta. Similar to the *SECAP*, the Strategy doesn't have an associated budget, and therefore depends on other funding sources in order to develop the proposed actions within the proposed 2020–2030 timeframe.

Moreover, some other projects based on European funding have started working in the adaptation of the Huerta (or neighbouring areas) to climate change, with the participation of Las Naves⁵ or the Valencia city among other partners. For instance, the AELCLIC (“Adaptation of European Landscapes to Climate Change”) project (co-funded by EIT Climate-KIC) worked during 2019 in the Huerta area between Valencia and Alboraya in order to create a local network of stakeholders able to co-define the contents of a potential Landscape Adaptation Plan to Climate Change (LACAP). The results and materials used in the Huerta pilot [38] and also those produced after the cross-cutting analysis of the works developed in 15 representative landscapes distributed across Europe [39] are freely available. Another project “Green Cities for Climate and Water Resilience, Sustainable Economic Growth, Healthy Citizens and Environments” (GrowGreen) [40], funded by Horizon 2020, is currently developing and monitoring a range of nature-based solutions (NBS) demonstrative actions in the Benicalap district, next to the Huerta, and in some cases focused on the transition zones between Huerta and city. Finally, Valencia has just started working in TOMORROW [41], another Horizon 2020 funded project, which aims at “empowering local authorities to lead the transition towards low-carbon, resilient and more liveable cities”.

2.1.5. Support needed to build resilience

Based on the existing knowledge available to the City of Valencia with respect to hazards facing the Huerta (as described above), its associated gaps and shortcomings, as well as information gathered from various departments and stakeholders (among them the Department of Agriculture, Consell de l’Horta, Department of the Environment, Las Naves and the Climate and Energy Foundation), three priority objectives can be identified with respect to building cultural heritage resilience:

- To acknowledge and explore how the Huerta helps to mitigate the effects of climate change in the urban environment of València.
- To understand and demonstrate in detail the impacts of possible climate change scenarios on the Huerta.
- To design detailed resilience strategies in order to cope with these identified impacts.

As described previously, these objectives seek to fill an existing knowledge gap, given that the vulnerability level of the Huerta to climate change, and its role in the city’s overall ability to adapt to climate impacts, have not been assessed in detail in the existing plans and strategies.

Specific support needs still need to be better identified after discussion with stakeholders, in order to clarify the need for addressing specific impacts or focusing on selected Huerta zones.

⁵ Las Naves is the social and urban innovation centre for the city of Valencia, promoting urban innovation with a clear commitment to the people. Its objective is to improve directly or indirectly the quality of life of the residents of the city. Las Naves manages and develops projects and innovative solutions with the active participation of all major stakeholders from the local innovation environment across four so-called “propellers”: public sector, private sector, academia and civil society. Las Naves’ projects revolve around five main areas: Mobility, Energy and Water, Agri-food, Health and Healthy City, and Creative and Cultural Industries [98].

2.2. La Albufera de València

2.2.1. Overview

The Albufera de València (hereafter the Albufera) is a site of 21,120 ha in size, designated as a Wetland of International Importance under the Ramsar agreement. It is also designated as a Natural Park, under the regional protected area regime, and as a Natural 2000 site, under the European Habitats and Birds Directives. The following description of the site is provided by the Ramsar convention [42]:

Albufera de Valencia. 05/12/89; Comunidad Valenciana; 21,000 ha; 39°20'N 000°21'W. Special Protection Area EC Directive; Natural Park. A large coastal lagoon fed by streams, rivers and irrigation channels, fringed by areas of rice cultivation. The site is separated from the sea by an urbanized dune peninsula. Vegetation is dominated by aquatic, halophytic, and dune communities. The site's fauna is notable for its species diversity. Regional endemics include fish and crustaceans. The area supports a rich assemblage of breeding waterbirds, and large numbers of various species of waterbirds, especially ducks, winter at the site. Human activities include rice cultivation, fishing, and hunting. Ramsar site no. 454. Most recent RIS information: 1999.

A map of the Natural Park is shown in Figure 41 [43]. The most important areas owned by the city of Valencia are the coastal lagoon, some of the rice cultivation areas, and most of the sand bar (locally known as “Devesa”), including emblematic locations such as the population nuclei of El Saler and El Palmar. The remaining areas of the Natural Park belong to neighbouring municipalities such as Silla, Catarroja or Sueca.



2.2.2. Stakeholders

The Albufera management scheme is highly complex. Although the lagoon belongs to the city of Valencia, its water level (and, by extension, the water management regime of the surrounding rice paddies) is managed by rice farmers. These farmers control the body (“Junta de desagüe”) which manages the gates in the “golas” (channels between the lagoon and the sea). The city of Valencia is involved in the regular maintenance of the golas, beaches, irrigation channels and other areas of the wetland, and for many years has supported the ecological restoration of the dune systems (which was funded via successive LIFE projects such as LIFE00 NAT/E/007339 [44] and LIFE04 NAT/ES/000044 [45]). These ecosystems, located in the sandbar (“Devesa”), were partly destroyed during early stages of an intended residential development of the area that started in the 1960s, and was finally stopped due to the strong public opposition⁶. Many of these maintenance and restoration actions are managed by the city’s *in situ* technical office (“Oficina Técnica Devesa-Albufera”).

The regional government is also involved in managing the Albufera, since it is responsible for most of the competences related to the area’s protected status. A comprehensive legal regime exists [46]. The principal decision-making body for most of the protected area management matters is the management board (“Junta Rectora”) of the Natural Park, where many stakeholders are present (from several departments of the regional government, to a representative of the lateen sailing sports federation – see the complete list in [47]). Their technical office in the Park is very active too, and undertakes many different actions throughout the year, including environmental and wildlife monitoring, which are summarised in annual management reports [48]. The forest management branch of the regional government is also involved in the management of the area, since the forest in the Devesa is registered as public woodland, and therefore subject to a complementary specific management regime.

National authorities are also involved in the management and maintenance of the Albufera. For example, the Júcar Basin Management Agency (CHJ), which depends on the Spanish government, is in charge of establishing how much water (a critical element of the ecosystem) is assigned to the Albufera by means of hydrological planning. The CHJ is also responsible for a monitoring and control network which collects data on hydro-morphological, physical-chemical and biological parameters, some of them continuously monitored through different sensors located in the lagoon and surroundings [49].

The Albufera inhabitants are also key stakeholders to be considered. There are residents not only in the population nuclei which are part of the Valencia municipality, such as El Saler, El Palmar or El Perellonet, but also in scattered buildings which were built in the Devesa area before the 1960s urban development of the area was stalled. Other important stakeholders in the Albufera are boat operators people engaged in commercial fishing, hunters, the restaurant sector and tourism operators, including birding specialist guides. Civil society organisations such as A.E.Agró and SEO-Birdlife have been involved in the area for many years, and are for instance together in charge of the management of an artificial wetland for water treatment (Tancat de la Pipa). The Fundació Assut is another organisation very active in the area. Finally, the València area of the Albufera also includes a research centre focused on aquatic fauna

⁶ More details can be found in [44] and [45]

(Centre d'Investigació Piscícola d'El Palmar) and a wildlife recovery centre (Centro de recuperación de Fauna del Saler).

2.2.3. Hazards affecting the site

General information from the 2015 VA of the city of Valencia has been already cited in section 2.1.3, along with its limitations. There has been no vulnerability mapping undertaken for the Albufera itself in the VA, nor a detailed analysis of potential impacts on its ecosystems due to climate change. However, there is a brief list of existing and potential impacts in the wetland, such as those associated with water temperature rise, decrease in rainfall, heavy rains and sea level rise [32]. Analysing in detail potential impacts such as future water quality changes in the Albufera and consequences for its natural and cultural heritage requires complex modelling at catchment scale, which has been out of the scope of previous studies.

The Albufera lagoon has been suffering from eutrophication for decades, due to excessive nitrogen and phosphorus inputs from fertilisation of the rice paddies and associated untreated, polluted waters discharged into the channels leading to the lagoon. The forecast temperature rise and changes in rainfall and water availability (and demand) according to the climate change scenarios projected at regional level are expected to aggravate these water quality problems, exacerbating the ecological deterioration of the lake [32]. Moreover, the lagoon and its surroundings are already showing salinisation processes, which will increase as the sea level continues to rise, causing additional changes in the lagoon ecosystem and rice cultivation. Salinity is a key factor in shallow lakes such as the Albufera, since it is one of the main water quality parameters that determines changes in the composition of plankton, which in turn strongly influences the eutrophication level of the lagoon and therefore its whole ecological status. Due to its proximity to the sea, and the low altitude of the sandbar that separates the lagoon from the sea, sea level rise could potentially lead not only to the total change of the lake ecosystem composition due to extreme salinisation, but even to its complete disappearance under the sea. The same can be said regarding the dune and forest areas of the Devesa sand bar, which additionally will suffer an increase in already high wildfire risk, as the climate becomes hotter and drier. Other potential challenges include an increase in the presence of invasive species, or the damage caused by increasingly frequent convective storms, affecting almost every ecosystem in the area, from the beaches to the forest and golas.

2.2.4. Measures proposed to address hazards and build resilience

The management regime of the Albufera Natural Park does not explicitly take into account climate change yet. However, some special measures aimed at improving the ecological status of the lagoon have been agreed by the local, regional and national administrations, and will be integrated by the Jucar basin management agency in the current review of the basin hydrological plan which, by law, needs to take climate change into account regarding the allocation of water resources⁷.

⁷ The new plan would be intended to cover the period 2021-2027, however at the time of writing the intended date of completion was unknown, and a related public consultation had been placed on hold due to the state of

Other measures have been proposed, but not implemented yet, for instance in the Valencia's *SECAP* [31]. The adaptation measures detailed in the Annex to the *SECAP* include one combined measure for both the Huerta and the Albufera, already mentioned (Figure 36. Measure A.5.2.1: Transmission of the values of the Huerta and the surroundings of the Albufera Natural Park as an element of authenticity). Other proposed measures related to the Albufera are shown in Figure 42 (Increasing the participation in the “Junta de Desagüe”) and Figure 43 (dune conservation actions). Other measures, such as those shown in Figure 44 and Figure 45, do not mention explicitly the Albufera, but could be easily applied to it.

REGULACIÓN PARA MAYOR PARTICIPACIÓN EN LA JUNTA DE DESAGÜE DE LA ALBUFERA DE VALENCIA	
Agentes implicados: Ayuntamiento de Valencia, Gobierno de Valencia	
Adaptación	Prioridad medio-plazo
<p><u>Descripción de la acción:</u> Regulación que implique mayor participación en la Junta de desagüe de la Albufera de Valencia y para el abordaje de la problemática de la gestión del agua de forma integral (ciclos de inundación y vaciado) en el parque natural ya que tiene un impacto muy grande sobre el ecosistema del mismo y de la franja marítima.</p> <p>Código Plan de Adaptación: A.12.1.3</p> <p><u>Ayudas:</u> Para la realización de esta medida, en el momento de redacción del presente Plan, se podría contar con las siguientes ayudas:</p> <ul style="list-style-type: none"> ■ European Agricultural Fund for Rural Development (EAFRD) ■ European Maritime and Fisheries Fund (EMFF) ■ LIFE Programme ■ Cross-border cooperation ■ Natural Capital Financing ■ Facility (NCF) <p><u>Periodo de actuación:</u> 2022-2025</p> <p><u>Indicadores:</u></p> <ul style="list-style-type: none"> ■ Junta de desagüe de la Albufera de Valencia creada. 	
Beneficios asociados	Protección de las especies residentes en el municipio y conservación de las especies autóctonas.

Figure 42. Measure A.12.1.3 Regulation for greater participation in the Albufera de Valencia drainage board [31].

ACOMETER LABORES DE CONSERVACIÓN DE LA LÍNEA DE DUNAS	
Ageries implicados: Ayuntamiento de València, Gobierno de Valencia	
Adaptación	Prioridad corto plazo
<p>Descripción de la acción: Acometer labores de conservación de la línea de dunas.</p> <p>Código Plan de Adaptación: A.12.1.4</p> <p>Ayudas: Para la realización de esta medida, en el momento de redacción del presente Plan, se podría contar con las siguientes ayudas:</p> <ul style="list-style-type: none"> European Agricultural Fund for Rural Development (EAFRD) European Maritime and Fisheries Fund (EMFF) LIFE Programme Cross-border cooperation Natural Capital Financing Facility (NCFP) <p>Periodo de actuación: 2017-2021</p> <p>Indicadores:</p> <ul style="list-style-type: none"> Biodiversidad en el municipio conservada. 	
Beneficios asociados:	Protección de las especies residentes en el municipio y conservación de las especies autóctonas.

Figure 43. Measure A.12.1.4 Undertake conservation work on the dune line [31].

DESARROLLAR ACUERDOS INTERINSTITUCIONALES PARA GESTIONAR EL RIESGO CLIMÁTICO DE MANERA EFICIENTE	
Ageries implicados: Ayuntamiento de València, Estado, Generalitat	
Adaptación	Prioridad a corto plazo
<p>Descripción de la acción: Crear o reforzar los mecanismos de coordinación / cooperación entre otras administraciones y el Ayuntamiento de Valencia de forma transversal a todos los sectores:</p> <ul style="list-style-type: none"> entre el Estado y el Ayuntamiento (ej. Costa: competencia de Estado). entre la Generalitat y el Ayuntamiento. a nivel de área metropolitana. <p>Identificar donde fallan los mecanismos de coordinación actuales; crear mecanismos de retroalimentación entre organizaciones para informar de las necesidades a los que dispongan de las competencias; crear convenios de cooperación para llevar a cabo iniciativas interterritoriales.</p> <p>Código Plan de Adaptación: A.9.1.1</p> <p>Ayudas: Para la realización de esta medida, en el momento de redacción del presente Plan, no se han encontrado ayudas disponibles.</p> <p>Periodo de actuación: 2017-2021</p> <p>Indicadores:</p> <ul style="list-style-type: none"> Grado de comunicación y coordinación entre el Ayuntamiento y otras administraciones. Acuerdos institucionales sobre cambio climático de forma eficiente gestionados. 	
Beneficios asociados:	Mayor comunicación entre las instituciones, siendo mejores y más eficientes las medidas tomadas ante riesgos climáticos.

Figure 44. Measure A.9.1.1 Develop inter-institutional agreements to manage climate risk efficiently [31].

TRANSPOSICIÓN PLAN DE ACCIÓN TERRITORIAL DE LA INFRAESTRUCTURA VERDE DEL LITORAL EN LA PDOU Y OTRAS NORMATIVAS MUNICIPALES	
Agentes implicados: Promotores privados de vivienda; constructoras; ingenierías y urbanistas; ciudadanía; Administraciones públicas estatales y regionales; Servicios municipales.	
Adaptación	Prioridad medio plazo
<p>Descripción de la acción:</p> <p>Transposición Plan de Acción Territorial de la Infraestructura Verde del Litoral (PATIVL) en el PDOU y otras normativas municipales del PATIVL, del PATRICOVA y de todas las planificaciones sectoriales sostenibles que contribuyen a incrementar la resiliencia del territorio ante el cambio climático.</p> <p>Código Plan de Adaptación: A.8.1.2</p> <p>Ayudas: Para la realización de esta medida, en el momento de redacción del presente Plan, se podría contar con las siguientes ayudas:</p> <ul style="list-style-type: none"> European Agricultural Fund for Rural Development (EAFRD) Community-led Local Development (CLLD) Integrated Territorial Investments (ITI) LIFE Programme Urban innovation actions CIVITAS activity Fund Sustainable mobility Cross border cooperation Transnational cooperation INTERREG EUROPE URBACT III Proyectos Clima <p>Periodo de actuación: 2023-2025</p> <p>Indicadores:</p> <ul style="list-style-type: none"> Número de medidas de adaptación al cambio climático en el PDOU. Introducir la adaptación en la planificación y ejecución urbanística municipal. 	
<p>Beneficios asociados:</p> <p>Crear ciudades resilientes al cambio climático que permitan reducir sus impactos y desarrollar sus capacidades adaptativas.</p>	

Figure 45. Measure A.8.1.2 Transposition of the territorial action plan for coastal green infrastructure into the general urban development plan (land-use planning) and other municipal regulations [31].

The *Regional Climate Change Strategy* [37] mentioned earlier also includes many measures which could be applicable in the Albufera. For instance, Measure 61 deals with adaptation measures of crops in wetlands, while Measure 77 aims at maximising wetlands' capacity to act as buffer zones regarding storms or coastal erosion. Both measures are quoted below. Acronyms contained within square brackets refer to the regional department or departments responsible for the measure implementation ("MN" refers to the competent department for the natural environment, and "AG" refers to the competent department in the domain of agriculture and stockbreeding).

Measure 61. Adapting crops in wetlands. Linked actions:

[MN] [AG] To promote farming compatible with wetlands conservation; to establish progressive measures to dispose rice straw residues, in order to reduce carbon dioxide emissions from straw burning.

[MN] [AG] To promote crops more compatible with maintaining flooded areas, increasing the flow absorption capacity in flood season.

[MN] [AG] Limiting the use of fertilizers in certain crops in order to promote their role reducing the amount of organic matter reaching the wetlands.

[MN] [AG] To promote farming practices that prevent organic matter to be stored in the soil in a non-stabilised form, such as the adjustment of mowing height.

[MN] [AG] Research on more cost-effective and sustainable channels and ditches maintenance systems. Conservation and restoration of the irrigation networks considered of historical interest and traditional in order to recover the crops on water-meadows along rivers and streams, as well as on their slopes, to recover previous microclimatic conditions, to increase air moisture as a way to promote cloud formation and improve precipitation patterns.

Measure 77. To maximise the wetlands capacity to buffer against storm impacts (floods and coastal erosion). Linked actions:

[MN] Preservation of coastal sandbars or shingle banks linked to wetlands.

[MN] Preservation of river mouths (designated wetlands⁸).

[MN] Monitoring of salinization processes. Installation of a network of piezometers in wetlands.

[MN] Maintenance of adequate water levels to prevent seawater intrusion.

[MN] Impact assessment of the increased salinity in natural ecosystems.

Some existing projects that could be considered in order to avoid redundancies and exploit potential synergies are the already-mentioned TOMORROW project, the “PIMA Adapta Costas” (aimed at improving the resilience of the Spanish coast regarding climate change impacts [50]) or some other European funded projects such as the Interreg Delta Lady [51]. In a further step the scope of those projects, which could complement or support key actions that the ARCH project could develop in the Albufera area, will be clarified.

To date, and subject to the above-mentioned uncertainties, no specific climate change adaptation measures in the Albufera have been identified as implemented or currently under implementation to address these climate challenges⁹, beyond the mentioned dune restoration project developed over the past decades, or the analysis and incorporation of the Albufera water requirements as part of updated hydrological planning at basin scale.

2.2.5. Support needed to build resilience

The previous paragraphs show some potential lines of action that could be developed by the ARCH project in Valencia. The lack of associated budget for either the Regional Strategy or the Valencia Action Plan is one of the main reasons why the ARCH project is so important,

⁸ Reference to the Valencian Wetlands Catalogue [99] (in the Valencia Region, wetlands have been given special conservation status, including a specific category of protected areas).

⁹ It should be noted that some relevant actions, e.g. measures from the *Regional Climate Change Strategy* [37] mentioned above, have been proposed but not yet applied to the Albufera. Further consultation with stakeholders is needed to determine whether these actions are planned for implementation, and if so, in what time frame.

since it could act as a powerful lever to develop some of those actions, which are mainly dependent on external funding.

Some of the identified potential actions show synergies with some of the measures that could be implemented in the Huerta area. At the same time, some measures proposed in the previous section in relation to the Huerta area could also be extended to and benefit the Albufera area, for instance in relation to the identified knowledge gaps in relation to the vulnerability of the Albufera to climate change, and the role it can play within the city's adaptation to climate change strategy.

In particular, assessing how is the Albufera helping the city to cope with the changing climate, or how will it do it in the future, seems particularly relevant. Modelling climate change impacts on agriculture, aquatic and forest ecosystems would also be needed in order to be able to design resilience strategies in order to cope with these identified impacts. At the same time, this should also be considered as a prerequisite for maximizing those potential environmental services provided by the Albufera and Huerta regarding climate change adaptation in the city.

Again, discussion with stakeholders is still needed in order to prioritize specific support needs or focusing on addressing specific impacts or selected Albufera zones or ecosystems.

3. Governance framework for cultural heritage management

This section considers the governance framework for cultural heritage relevant to Valencia's identified sites, by illustrating existing policies, strategies and programmes for the management, protection and use of cultural heritage at the different governance levels. It also reflects on the extent to which existing local commitments and action plans take into account the key international governance instruments created by UNESCO.

3.1. International

UNESCO¹⁰ and European Cultural conventions¹¹ started in 1952 and 1954, respectively to address cultural recommendations and agreements. Since then, they have worked towards the protection of World Cultural and Natural Heritage. In 2009, the irrigators' tribunal of the plain of Valencia (linked to the Huerta) was inscribed on the UNESCO representative list of the intangible cultural heritage of humanity¹², following the Convention for the Safeguarding of the Intangible Cultural Heritage, which entered into force in 2006¹³. Furthermore, in 2002, the Food and Agriculture Organization of the United Nations launched a programme¹⁴ to support the conservation of Globally Important Agricultural Heritage Systems (GIAHS). Recently, in 2019, the Huerta was added to the GIAHS list.

On the other hand, at European level the protection of European cultural heritage (both natural and architectural), in rural and island regions is covered by a resolution adopted in 2006 by the European Parliament¹⁵.

3.2. National

Guided by international frameworks, Spain has deployed several regulations¹⁶ that set the basis for the management of cultural heritage (using the title 'historical heritage'). According to law 16/1985, of 25 June, Spanish Historical Heritage includes buildings and movable objects

¹⁰ <https://whc.unesco.org/>

¹¹ <https://www.coe.int/en/web/culture-and-heritage/european-cultural-convention>

¹² <https://ich.unesco.org/en/RL/irrigators-tribunals-of-the-spanish-mediterranean-coast-the-council-of-wise-men-of-the-plain-of-murcia-and-the-water-tribunal-of-the-plain-of-valencia-00171>

¹³ <https://ich.unesco.org/en/convention>

¹⁴ <http://www.fao.org/giahs/background/a-global-partnership/en/>

¹⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52006IP0355>

¹⁶ Law 16/1985, of 25 June, on Spanish Historical Heritage; Law 10/2015 of 26 May on the Safeguarding of Intangible Cultural Heritage; Law 1/2017 of 18 April on the restitution of cultural property unlawfully removed from the territory of Spain or another Member State of the European Union, transposing Directive 2014/60/EU of the European Parliament and of the Council of 15 May 2014 into Spanish law; Royal Decree 111/1986, of 10 January, partially implementing Law 16/1985, of 25 June, on Spanish Historical Heritage ; Royal Decree 1680/1991, of 15 November, implementing the ninth additional provision of Law 16/1985, of 25 June, on Spanish Historical Heritage, on State guarantees for works of cultural interest; Law 16/1985 on Historical Heritage; Royal Decree 111/1986 on the partial implementation of the Law

of artistic, historical, palaeontological, archaeological, ethnographic, scientific or technical interest. It also includes documentary and bibliographic heritage, archaeological sites and areas, as well as natural sites, gardens and parks, which have artistic, historical or anthropological value.

3.2.1. Management of historical heritage

Historical heritage is managed by the Ministry of Culture and Sports while natural heritage is managed by the Ministry of Ecological transition. There are two sub-directorates in charge of the protection and conservation of Spanish cultural heritage, dependent on the Directorate General of Fine Arts and Cultural Heritage.

General Sub-directorate for the Protection of Historical Heritage: responsible for the legal protection of cultural heritage. This entity is responsible for relations with other states and international organisations, such as UNESCO, in the field of cultural heritage, in the following cases, except for the European Heritage Days, which are coordinated by the Cultural Heritage Institute of Spain. In addition, this Sub-directorate coordinates the following bodies:

- Spanish Historical Heritage Council: Coordinating body between the State Administration and the Autonomous Communities¹⁷ whose purpose is to facilitate communication and exchange of action programmes and information relating to Spanish Cultural Heritage.
- Board for the Qualification, Valuation and Export of Spanish Historical Heritage Goods: Collegiate consultative body attached to the General Directorate of Fine Arts and Cultural Goods and Archives and Libraries responsible for reviewing applications for export, import and acquisition of goods.

General Sub-directorate of the Spanish Cultural Heritage Institute: main functions are the elaboration and execution of plans for the conservation and restoration of Spanish cultural heritage; the study of updated methods and techniques for its restoration and conservation; the archiving, technical treatment and diffusion of the relevant documentation; interventions and works carried out in each specific case; the diffusion and exchange with international bodies; the training of technicians who attend to the aims of the Institute, and the proposal of agreements for the conservation of heritage with other public administrations and public or private entities.

3.2.2. Management of natural heritage

A legally-binding *Strategic Plan for Natural Heritage and Biodiversity*¹⁸, published in 2011, establishes goals, objectives and actions to promote the conservation, sustainable use and

¹⁷ An Autonomous Community is a Spanish administrative territorial entity. The Spanish constitutional system establishes a system of recognition of territorial autonomy that grants States legal and administrative functions similar in many aspects to that of a federal state. Territorially the system of decentralisation is organized with 17 Autonomous Communities, Comunidad Valenciana being one of them; and two cities with statute of autonomy - Ceuta and Melilla-.

¹⁸ https://www.miteco.gob.es/es/biodiversidad/temas/conservacion-de-la-biodiversidad/valoracion-y-aspectos-economicos-de-la-biodiversidad/cb_vae_plan_estrategico_patrimonio_nat_bio.aspx

restoration of natural heritage and biodiversity for the period 2011-2017. Its application will be extended until another strategic plan is adopted to replace it.

This national Strategic Plan incorporates the commitments made by Spain at international and EU level in the field of biodiversity, in particular those derived from the United Nations Convention on Biological Diversity's *Strategic Plan for Biodiversity 2011-2020* (approved by the Contracting Parties in October 2010) and the *EU Biodiversity Strategy to 2020* (adopted in May 2011 by the European Commission and endorsed by the Council of Environment Ministers in June 2011).

The Spanish Inventory of Natural Heritage and Biodiversity¹⁹ is one of the instruments to store knowledge and plan to care for natural heritage and biodiversity, together with the *State Strategic Plan for Natural Heritage and Biodiversity* and the *Natural Resource Management Plans*, in accordance with Law 42/2007, of 13 December, on Natural Heritage and Biodiversity. Within this inventory the Albufera is included under "Other Natural Protected Areas".

3.3. Regional

At the regional level, Law 4/1998 on Valencian Cultural Heritage aims at the protection, conservation, dissemination, promotion, research and enhancement of Valencian cultural heritage [52].

There is also a general inventory of Valencia's cultural heritage. This is divided into goods of cultural interest, goods of local relevance, movable goods of heritage relevance and intangible goods of local relevance. Within this classification, goods related to the Huerta are considered, such as farmhouses ("alquerías") and "barracas", typical constructions of the Huerta (see Figure 46 and Figure 47). Also inventoried as Valencian cultural heritage are some traditional irrigation channels and their related infrastructure (Figure 48), and even traditional paths connecting Valencia with neighbouring municipalities through the Huerta (Figure 49).



¹⁹ <https://www.boe.es/buscar/doc.php?id=BOE-A-2011-8228>

Figure 46. „Alquería de Pallés“ (Huerta farmhouse, Valencia Municipality). Element included within the general inventory of Valencia's cultural heritage [1].



Figure 47. „Barracas de Panach“ (Huerta farmhouses, Valencia Municipality). Element included within the general inventory of Valencia's cultural heritage [1].



Figure 48. „Llungües del braç de dalt-del mig“ (Part of the Huerta irrigation network, Valencia Municipality). Element included within the general inventory of Valencia's cultural heritage [1].



Figure 49. „Camí Vell de Picassent“ (Old path from Valencia to neighbouring Huerta municipalities). Element included within the general inventory of Valencia's cultural heritage [1].

There are also additional relevant protected heritage elements that are located within Valencia's Huerta areas, but are not directly related to farming. The most prominent examples are those related to religious symbols, places of worship or other religious sites, such as the old “Sant Miquel dels Reis” monastery (Figure 50).



Figure 50. „Monasteri de Sant Miquel dels Reis“ (Monastery within the Valencia municipality Huerta). Element included within the general inventory of Valencia's cultural heritage [1] [53].

The Water Tribunal, a key element of the Huerta which has already been mentioned based on its inclusion on the UNESCO representative list of the intangible cultural heritage of humanity (locally known as “Tribunal de las Aguas de la Vega de Valencia” or simply “Tribunal de las Aguas”) is also included within the regional inventory of Valencia's cultural heritage as an intangible element in the domain of traditional knowledge [54] (Figure 51).



Figure 51. „Tribunal de las Aguas de la Vega de Valencia“ (which meets weekly in the Apostles Gate of Valencia Cathedral). Element included within the general inventory of Valencia's cultural heritage [54].

There are also regionally protected heritage elements in the Albufera area of the Valencia municipality. Besides those pertaining to some of the previously described categories, related to farming or religious worship, some elements are unique to the Albufera conditions. For instance, the gates in the “Gola de Pujol” (one of the channels between the Albufera Lagoon and the sea, crossing the Devesa forest area – see Figure 52), the dock and boatyard facility in the El Palmar population nuclei, as well as some drainage pump stations essential to complex water management in the rice paddies.



Figure 52. „Comportes de la Gola de Pujol“ (gates in the „Gola de Pujol“ channel). Element included within the general inventory of Valencia's cultural heritage [55].

Regarding intangible heritage, two of the traditional activities pursued in the Albufera (traditional fishing and lateen sailing) are also protected at a regional level (they were designated together as a single element, including traditional knowledge and activities related to both areas) [56].



Figure 53. „Actividades tradicionales de la Albufera de Valencia“ (traditional activities from the Albufera de Valencia). Element included within the general inventory of Valencia's cultural heritage [56].

The Regional Plan for the Huerta [1] also includes an inventory of protected cultural items (Document 5 of the Plan) where the main cultural resources in the whole Huerta area (not only in the Valencia municipality, but also in neighbouring municipalities) are catalogued and mapped. Some of these items are located in the Albufera agricultural areas which are included within the scope of this Regional Plan. Several levels of protection are also defined in the Plan, with their corresponding norms.

Lastly, there is a regional inventory of heritage and notable trees protected by law which was recently updated [57]. As shown in Figure 54, the inventory comprises several trees or groups of trees (which are shown as a single element) within the Huerta and Albufera sites, which are subject to the provisions of the regional tree heritage law [58].

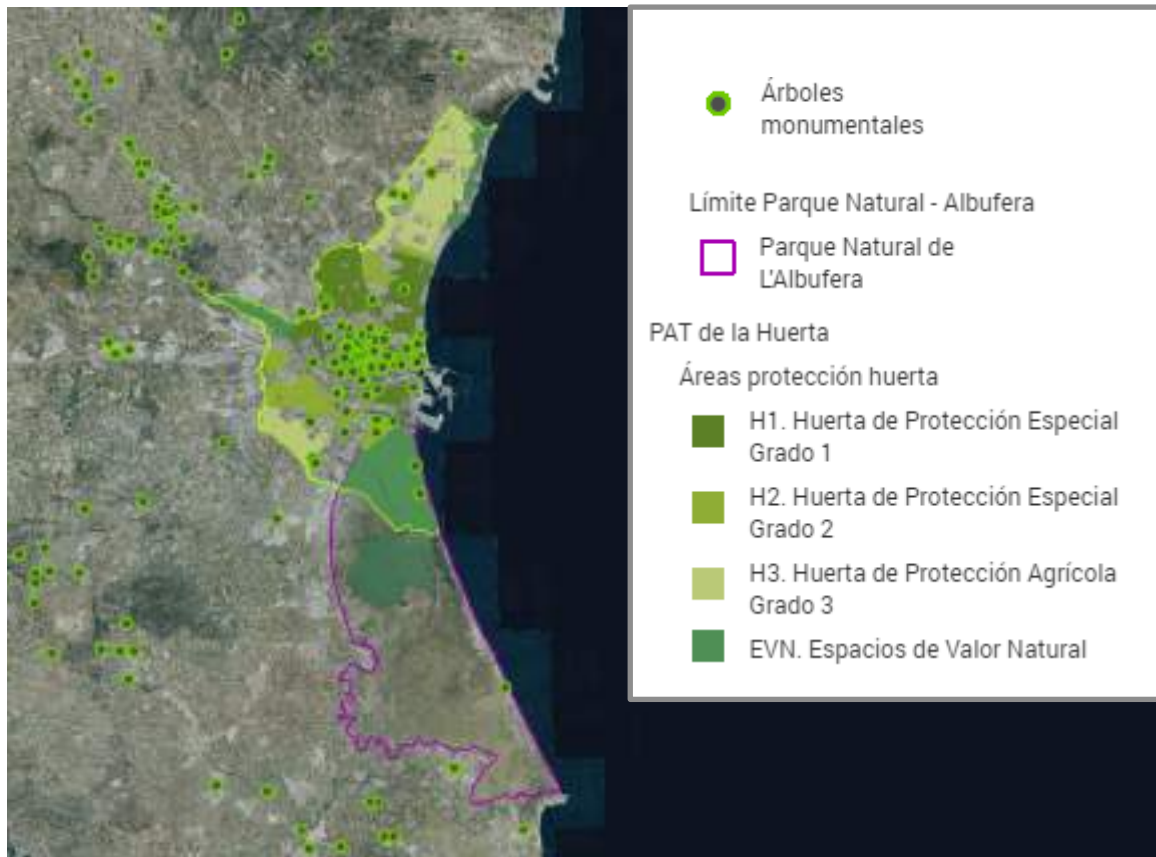


Figure 54. Heritage and notable trees (“Árboles monumentales”) included in the regional inventory within and surrounding Huerta (“Áreas protección huerta”) and Albufera (“Límite Parque Natural-Albufera”) protected areas [24].

3.4. Local

Within the Department of Education, Culture and Sports, there is a delegation of heritage and cultural resources that includes the Historical and Artistic Heritage Service. At the same time, the Resource Management area of the City Council has a delegation of municipal heritage that is mainly responsible for legal heritage management.

In the area of Urban Ecology, Climate Emergency and Energy Transition, there is a section dedicated to trees of heritage significance, within the Delegation of Sustainable Gardening and Renaturalisation of the City.

The last revision of the Valencia masterplan included a Catalogue of Protected Goods and Areas. It was organised in two parts, depending on the rural or non-rural character of each element. The rural section of the Catalogue [59] is highly relevant, since it includes lists, maps and norms relative to the most important items catalogued in both the Huerta and Albufera areas of Valencia, such as irrigation channels, historic roads, typical rural huts (“Barracas”) or the “Golas”, channels connecting the Albufera Lagoon and the sea.

Local and regional catalogues and inventories are, to some extent, redundant, since heritage protection at regional level usually implies some level of protection at local level, and vice versa.

3.5. Gaps and needs

Considering to what extent the local policies are actually able to take into account recommendation coming from the UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage, it is relevant to refer to the Overall Results Framework²⁰. This tool was prepared to measure the impact of the 2003 Convention at various levels of governance through clearly identified objectives, indicators and benchmarks, as well as by means of a results-oriented monitoring system, under the following thematic areas:

- I. Institutional and human capacities*
- II. Transmission and education*
- III. Inventorying and research*
- IV. Policies as well as legal and administrative measures*
- V. Role of intangible cultural heritage and its safeguarding in society*
- VI. Awareness raising*
- VII. Engagement of communities, groups and individuals as well as other stakeholders*

Although there is a full set of regulations and other legal administrative measures setting a comprehensive governance framework for heritage protection, as has been described, recent events such as the demolition of the “Forn de la Barraca” (a historical building in the Huerta area of the neighbouring municipality of Alboraya), despite strong public opposition, show that this governance framework is far from being ideal. Significant further effort could also be placed in making both formal and non-formal education strengthen the transmission of (and promote respect for) Intangible Cultural Heritage (ICH).

At the time the report was written, it is also difficult to elaborate on to what extent inventories reflect the diversity of ICH and contribute to safeguarding, as well as how much research findings and documentation are accessible and are utilized to strengthen policymaking and improve safeguarding. The next National Periodic report of the Convention for the Safeguarding of the Intangible Cultural Heritage (due date: 15/12/2021), will perhaps provide more information in this regard, since this report will include a section on the current state of the “Water Tribunal of the plain of Valencia” element inscribed in the UNESCO Representative List of the Intangible Cultural Heritage of Humanity²¹.

More closely associated with the objectives of the ARCH project, it should be noted that no specific mention to climate change has been found in the heritage protection governance framework review [60]. Therefore, no current mechanisms have been identified in order to proactively assess and mitigate potential impacts of climate-related hazards on historic areas.

²⁰ See <https://whc.unesco.org/en/hul/>

²¹ <https://ich.unesco.org/en/RL/irrigators-tribunals-of-the-spanish-mediterranean-coast-the-council-of-wise-men-of-the-plain-of-murcia-and-the-water-tribunal-of-the-plain-of-valencia-00171>

4. Governance framework for disaster risk reduction

This section looks at the governance framework for Disaster Risk Reduction (DRR) relevant to Valencia's identified sites. After a first overview of the international context, it moves forward considering existing policies, strategies and action plans at national, regional and local level. It also reflects on the extent to which existing local commitments in particular are able to take into account and align to key international instrument for guiding disaster risk reduction, the Sendai Framework.

4.1. International

In 1994, a UN World Conference on Disaster Risk Reduction (DRR) was convened to discuss how to tackle the growing natural disasters. The focus was on developing effective measures around preparation, response and mitigation of disasters.

In 2000, the United Nations International Strategy for Disaster Reduction (UNISDR) was launched and five years later the **Hyogo Framework for Action**²² launched, the main UN-wide policy on the subject of DRR existing at the time of its conception (2005-2015). Later on, in 2015, the **Sendai Framework**²³ for action 2015-2030 was adopted which is based on four priorities: (1) Understanding disaster risk, (2) Strengthening disaster risk governance to manage disaster risk, (3) Investing in disaster risk reduction for resilience, (4) Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and construction.

At EU level, a framework for EU cooperation on disaster prevention across all types of natural and man-made hazards was agreed in 2009²⁴. Risk assessment together with risk analysis are the pillars of this prevention framework which are fundamental for a successful disaster management strategy. Two years later, the EU undertook to identify the risks Europe may face in the future based on national risk assessments²⁵. This overview focuses primarily on risks that may have cross-border impacts and/or those larger scale impacts that may be experienced by more than one Member State.

²² https://www.unisdr.org/files/1037_hyogoframeworkforactionenglish.pdf

²³ <https://www.unisdr.org/we/coordinate/sendai-framework>

²⁴ <https://eur-lex.europa.eu/legal-content/es/ALL/?uri=CELEX:52014SC0134>

²⁵ https://ec.europa.eu/echo/files/about/COMM_PDF_SEC_2010_1626_F_staff_working_document_en.pdf

4.2. Spanish Emergencies and Risk Management of Cultural Heritage.

4.2.1. National Plan for Emergencies and Risk Management in Cultural Heritage (NPERMCH)

In 2015 the Spanish government approved a *National Plan for Emergencies and Risk Management in Cultural Heritage* (NPERMCH)²⁶. This plan promotes the conservation of cultural heritage by the implementation of preventive measures and actions in order to correct the deterioration of heritage over time. In this sense, the NPERMCH, like other national plans, is a multidisciplinary tool designed to be managed at different levels with the participation of different administrations (state, autonomous and local) and other public and private entities, for the promotion of knowledge, the programming of preventive actions, the training of technicians and the dissemination of knowledge about cultural heritage.

4.2.1.1. Objectives of the NPERMCH

The NPERMCH responds to the risk of damage as a result of a catastrophe, whether natural or anthropogenic. Disasters of anthropogenic origin are often related to negligence or carelessness (failures in surveillance or security systems that cause fires, floods, etc., lack of maintenance of buildings, etc.) and in other cases intentional (deliberately-lit fires, theft and illicit traffic, vandalism, politically or religiously motivated attacks and armed conflicts).

The overall objective of the NPERMCH is to define and implement preventive and palliative actions necessary for the protection of cultural property, against the action of phenomena of natural origin or other causes of anthropogenic origin likely to cause immediate damage.

In line with this, the NPERMCH has three fundamental goals: (i) to design measures or procedures for the prevention and protection of cultural heritage in the event of a catastrophe; (ii) to establish for these cases an action methodology to minimise the damage that could occur and to design action instruments and (iii) to coordinate the different institutions that intervene in emergency situations that affect the safety of people and property.

To this end, it is necessary to establish mechanisms for collaboration and participation at the state, regional and local levels, of the institutions responsible for civil protection and those responsible for safeguarding cultural heritage, as well as to manage the necessary resources, guaranteeing the rescue and protection of cultural property. The NPERMCH is a key instrument for executing 1) the Preliminary Phase and 2) the Damage Assessment and Emergency Intervention Phase of the National Coordination and Support Plan for the Protection of Cultural Property²⁷ and is considered fundamental for its operational efficiency.

In addition to the broad objective and goals outlined above, the specific objectives of the NPERMCH are as follows:

²⁶ <https://sede.educacion.gob.es/publiventa/plan-nacional-de-emergencias-y-gestion-de-riesgos-en-patrimonio-cultural/patrimonio-historico-artistico/20705C>

²⁷ Note that a link to this plan could not be located at the time of writing.

- Identify phenomena or hazards of natural origin that can seriously affect cultural property, as well as the probability of occurrence based on geographical, climatological, geological and biological parameters, etc.
- Identify hazards of anthropogenic origin -whether intentional, fortuitous or deriving from negligence- that can seriously affect cultural property and the probability of occurrence based on sociological, political, economic, etc. parameters.
- Identify and geographically locate the cultural property that may be affected by the various risks.
- Design measures to prevent and protect cultural property from the various risks to which it may be exposed.
- Establish coordination mechanisms between the different administrations.
- Design a damage assessment methodology in accordance with the provisions of the Coordination and Support Plan for the Protection of Cultural Property.
- Establish a criterion for prioritising actions.
- Plan resources and protocols for urgent action for the safeguarding and rescue of cultural property in the event of an emergency.
- To exchange knowledge and experiences between the different institutions that intervene in an emergency.
- To make society aware of the importance of safeguarding cultural assets, involving all citizens.

4.2.2. NPERMCH Guidelines for Autonomous Communities

In order to deal with the damage caused by catastrophic episodes, it is recommended that Autonomous Communities (among them Valencia) create their own cultural heritage emergency management units which, in collaboration with Civil Protection and cultural institutions, would then draw up prevention and action programs to safeguard cultural heritage.

These units, to be formed by technicians from different public administrations, would be in charge of urgent attention in emergency situations that could affect the integrity of cultural property and/or the people involved in rescue and recovery tasks; the design and application of preventive measures to avoid or minimise the consequences of disasters; the definition of lines of action, research and documentation programmes, as well as the training and dissemination programmes contained in this plan. Specifically, a unit would be required to undertake:

- Elaboration of the Map of Cultural Heritage Risks in its regional scope.
- Definition of the immediate measures to be implemented or recommended, in coordination with the other responsible agents involved.
- Elaboration of emergency intervention proposals.

- Elaboration, where appropriate, of Master Plans for the orderly recovery of the cultural heritage affected by the catastrophe and the monitoring of each of the interventions.

At the time of writing, it was unclear how the work undertaken by Valencia's emergency management unit was to be funded. This is to be explored in consultation with local stakeholders.

4.3. Regional

There is not a unique competent body at regional level regarding DRR. On the contrary, competences are shared among different departments according to the type of risk.

For instance, the Agriculture, Rural Development, Climate Emergency and Ecological Transition Department is responsible for wildfire prevention at the regional level [61]. In this regard, a complex regulatory and planning framework exists, under which the Albufera Natural Park, for instance, is subject to a specific Forest Fire Prevention Plan according to its protected area status [62]. At the same time, the whole municipality of Valencia (including its part of the Albufera National Park) is also under the framework of the Liria forest management zone, which includes other municipalities as well, and also has its own specific Forest Fire Prevention Plan [63]. Other regional forest fire prevention plans and measures also apply [64]. There is also an online dashboard (see screenshot in Figure 55) regarding wildfire information at regional level [65], which serves as an information hub for every stakeholder involved in fire prevention and analysis.



Figure 55. Integrated Wildfire Management System (screenshot) [65].

The Mediterranean Center for Environmental Studies (CEAM), which is a foundation dependent on the Regional Department of Agriculture, Rural Development, Climate Emergency and Ecological Transition, has also a webpage named “CEAMET” [66] which is used to disseminate public information, forecasts and warnings in relation to several

environmental risks. For instance, CEAMET is used in the framework of the Extreme Temperatures Warning System (in partnership with the Regional Health Department), UV Radiation Warning System, and Tropospheric Ozone Warning System (see Figure 56).



Figure 56. Entry point to the CEAMET Warning Systems (screenshot) [66].

In addition to the former examples of complex governance at the regional level, a regional flood risk management plan (PATRICOVA) was developed by the regional department competent on land use planning [67].

There is also a different body in charge of the regional emergency telephone number “1·1·2 Comunitat Valenciana” [68], which depends on the Justice, Interior and Public Administration Department. It not only attends emergency calls, but also, among many other competences, functions as an access point to most of the real-time information regarding risks monitored at the regional level, such as wildfire or weather risks (see Figure 57). It also provides guidelines to citizens on best practices regarding protection from different hazards, such as flood risk, wildfire risk or seismic risk [69].

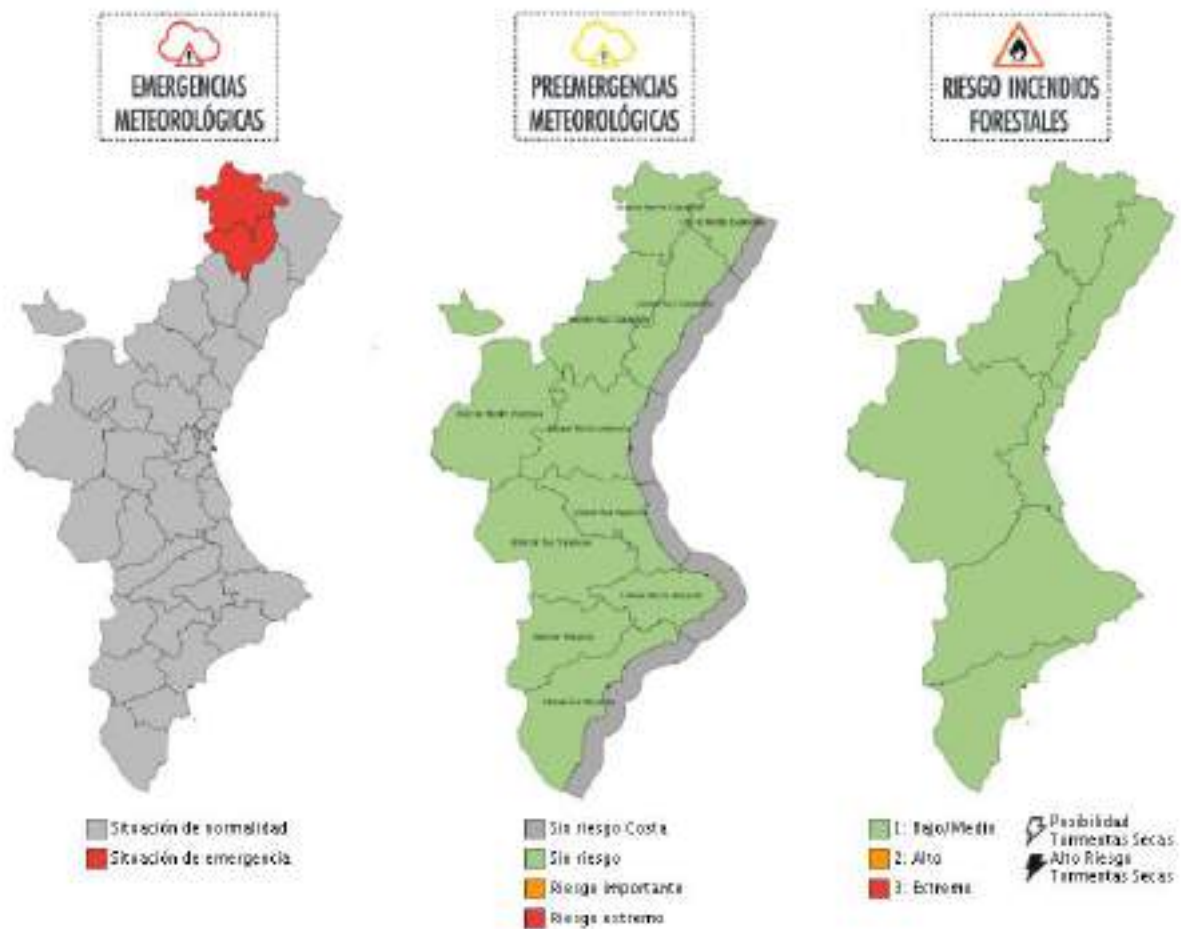


Figure 57. 1-1-2 Comunitat Valenciana Meteorological Risks Warnings (screenshot) [68].

4.4. Local

The city's Health Service is responsible for issuing health alerts regarding risks such as those caused by UV radiation and extreme temperatures [70].

The Air Quality city agency is in charge of the activation/deactivation of the local air pollution protocol in cases of high levels of PM10 or nitrogen dioxide [71], based on the data recorded by the regional air quality measurement network.

The city also has a Citizens' Protection Area [72], which includes the City Fire and Civil Protection Departments. The City Fire Department is not only in charge of firefighting, but also of fire prevention, and has a special fire station located next to the Albufera forest area ("Devesa del Saler"). There are also currently in force a specific operating procedure regarding wildfires in the Devesa del Saler [73] and a city ordinance in relation to fire protection [74]. It should also be noted that, according to regional regulations, every Valencian municipality where forested land is found needs to prepare a Local Fire Prevention Plan [75]. In the case of the municipality of Valencia, such a Plan has yet to be developed, for reasons that were unknown at the time of writing.

The city is also able to order the closure of the city parks and gardens, including cemeteries, in case of weather-related hazards, as set out in the corresponding Parks and Gardens City Ordinance [76].

Surveillance, rescue, life-saving and safety in the city beaches are also under the responsibility of the Beaches Service of the city [77], as established in the City Ordinance related to Beaches and Neighbouring Zones Use [78]. The city is therefore responsible, among other competences, for enforcing bathing prohibitions, in the presence of any health hazard detected by the Regional Department with competence in the Environmental area, or even shutting down the bathing areas if needed by any identified risk.

4.5. Gaps and needs

No explicit mention of heritage protection among the local governance framework for DRR has been found during this first stage of research, suggesting there is an opportunity here to establish links between these two areas of management. However, further information is needed in order to confirm this, as mentioned in the following section.

Taking into consideration how well DRR at the local level currently aligns to the strategies proposed in the Sendai Framework, it is useful to look at the Framework's four main priorities and the associated desired actions²⁸:

Priority 1: Understanding disaster risk.

Priority 2: Strengthening disaster risk governance to manage disaster risk.

In the case of the Valencia municipality, it seems there is no mention of a single, unified pre-disaster risk assessment or a strong mechanism in place that could foster coordination across institutions at local level. Consistent efforts are instead made at national (NPERMCH) and regional level (Integrated Wildfire Management System), or even at a local level, but individually by each of the organisms or authorities which have responsibilities over specific risks. Both could be definitely relevant for the city scale, especially with reference to Valencia's targeted areas of la Huerta and the Albufera whose jurisdictional borders are not confined within the municipality.

Priority 3: Investing in disaster risk reduction for resilience.

Especially in relation to the management of city beaches and, increasingly, nature-based solutions for climate change adaptation, Valencia is taking a first step towards strengthening the sustainable use and management of ecosystems and implementing integrated environmental and natural resource management approaches that incorporate disaster risk reduction.

Priority 4: Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction.

²⁸ See: <https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030>

Some effort is already invested in developing and maintaining a people-centred approach and operating early warning systems, as well as disaster risk and emergency communication mechanisms. It is unclear whether the latter are developed through a participatory process or tailored to the needs of users, including social and cultural requirements, in particular gender. More precise insights would be needed to assess if the city is promoting the application of simple and low-cost early warning equipment and facilities, and to broaden release channels for natural disaster early warning information.

5. Governance framework for climate change adaptation

This section looks at the governance framework for climate change adaptation of relevance to the City of Valencia and its targeted sites. It elaborates on the relevant policies, strategies, visions and action plans for climate change adaptation in Valencia at the different governance levels. It concludes with a reflection on the extent to which local governance of climate change adaptation takes into consideration key international governance instrument the 2015 Paris Agreement.

5.1. International adaptation framework

In 1972, during the first Earth Summit in Stockholm (United Nations Conference on Human Environment - Stockholm, 1972), international agencies and governments from around the world got together to help defining ways to stimulate sustainable development at the global level; climate change was already at the center. Given the magnitude of the problem, in 1988 the Intergovernmental Panel for Climate Change was established.

Twenty years after the first Earth Summit, the [UN Framework Convention on Climate Change](#) (UNFCCC) was adopted in New York and is currently made up of 196 signatory states that meet annually; among the main agreements and commitments of the Convention we can find the Kyoto Protocol (1997) and the Paris Agreement (2015). The first entailed a commitment to reduce greenhouse gas emissions, having the second to reinforce these commitments in order to keep the temperature rise global average below 2°C compared to pre-industrial levels.

At the European level, the European Adaptation Strategy to Climate Change is effective since 2013 and described below.

5.1.1. EU Climate Change Adaptation Strategy (2013)

The overall objective of the strategy is to contribute to a Europe more resilient to climate change and variability. This translates into improved preparedness and responsiveness to the impact of climate change at local, regional, national and European levels, with particular emphasis on better coordination and a common approach. The strategy has three priorities, divided into eight actions, which are shown in Figure 58. The documents on which the strategy is based are the SWD (Staff Working Documents) 2013: numbers 133-139. These documents cover the following themes: Adaptation in coastal and marine areas; Impacts on human, animal and plant health; Adaptation of infrastructures; Climate change, environmental degradation and migration; Technical guidelines for Cohesion Policy programmes and investments;

Principles and recommendations for rural development programmes; and Guidelines for the development of adaptation strategies.

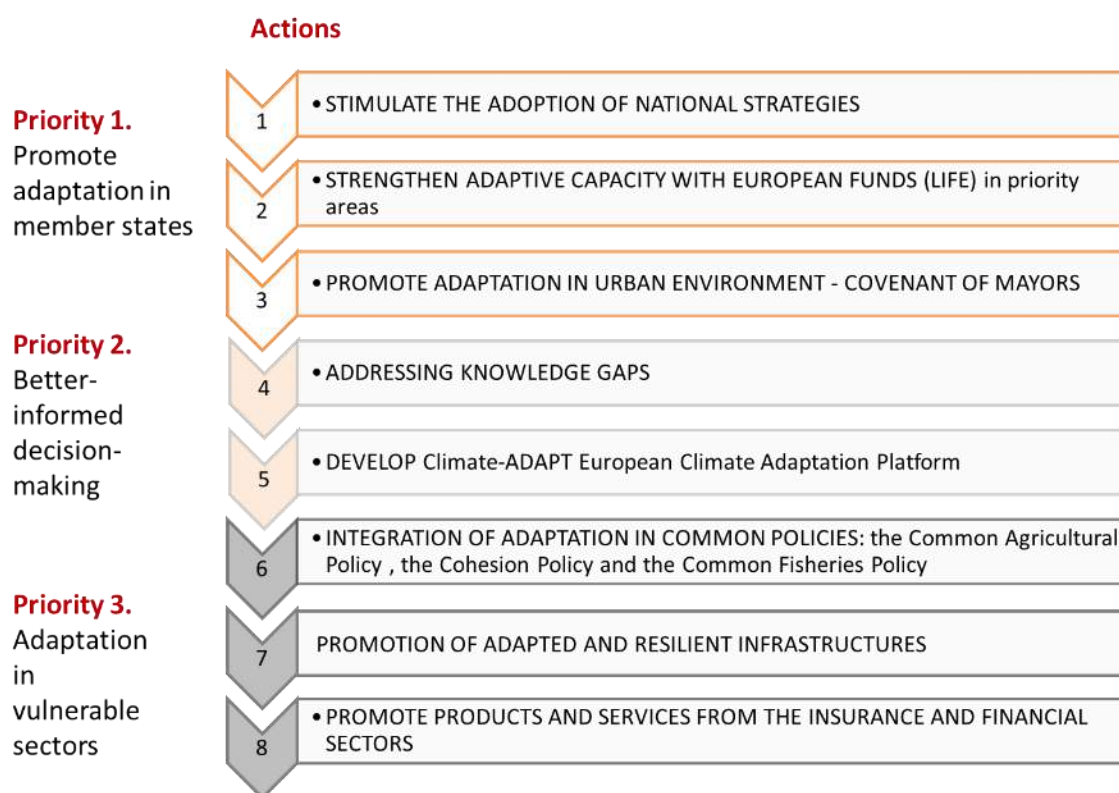


Figure 58. Priorities and key actions to contribute to a more climate-resilient Europe.

The Commission recognises the importance of cities for successful adaptation by translating this into the European Climate Change Strategy (Action 3). Based on the model of the Covenant of Mayors, the Commission supports mitigation and adaptation in cities, notably by launching a voluntary commitment to adopt local mitigation and adaptation strategies and awareness-raising activities.

5.2. Spanish adaptation framework

5.2.1. Key National Documents and Policies on Adaptation

5.2.1.1. Spanish Strategy for Climate Change and Clean Energy (EECCEL). Horizon 2007-2012-2020

This document is the first climate change strategy including adaptation in its content. However, the strategy is largely mitigation-oriented in order to comply with the Kyoto Protocol, though it also mentions adaptation briefly. The main adaptation related objective is the development and implementation of the PNACC (described below). The EECCEL also includes objectives in this area of awareness, sensitisation and research on climate change and clean energy.

5.2.1.2. National Plan for Adaptation to Climate Change (PNACC) and Third Work Programme (TPT) (2006, 2014)

The main objective of this Plan is the integration of adaptation to climate change into the planning and management of different socio-economic sectors and Spanish systems. The specific objectives are the generation of regional climate scenarios, the promotion of impact assessments, vulnerability and adaptation options in all sectors and ecological systems contemplated in the Plan, the progressive promotion of integrated cross-sector assessments in different geographical areas, as well as the dissemination and communication of the main results obtained. It also establishes the need to strengthen R&D&I as well as periodic monitoring and evaluation reports of the PNACC and its component projects. Despite the interdependence of several sectors among them, the Plan is divided into 16 sectors for its development: Biodiversity, Water Resources, Forests, Agricultural Sector, Coastal Zones, Hunting and Inland Fishing, Mountain Areas, Soil, Fishing and Marine Ecosystems, Transport, Human Health, Industry and Energy, Tourism, Finance - Insurance, Urbanism, Construction. In the first work program, 3 of these sectors or systems were identified as priorities: Water Resources, Coastal Zones and Biodiversity.

The third work programme of the PNACC continues to develop the objectives of the PNACC and to maintain the structure of the second programme with 4 axes and two pillars:

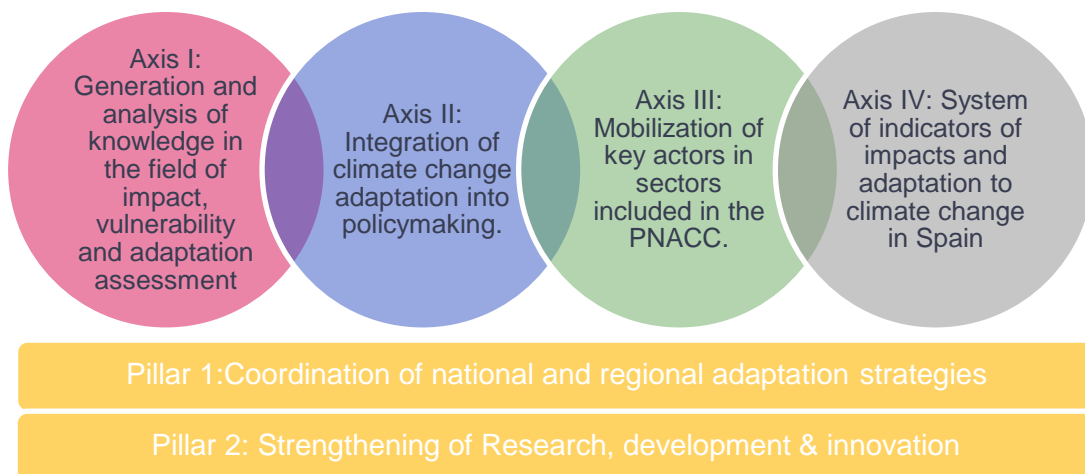


Figure 56. Structure of the Spanish PNACC.

The fourth PNACC monitoring report summarizes the progress made between 2015-2018 corresponding to the third work programme. In this period, in the area of knowledge generation, new sectoral assessments have been developed that affect strategic areas such as biodiversity, water, soil - desertification, agriculture, aquaculture, tourism, health, energy, marine environment and coastal areas.

The creation of the PIMA ADAPTA instrument, which is fed by income from auctions of emission allowances, has allowed for a substantial expansion of support economic to projects in the area of adaptation. In this context Valencia was supported to restore the native riverbank vegetation and the elimination of common cane (*Arundo donax*) in the Turia Natural Park. On the other hand, the LIFE SHARA project is enabling the strengthening of the components relating to the management knowledge, training and governance, all strategic areas in the case of adaptation. Among the inspiring experiences of adaptation to climate change disseminated within the framework of LIFE SHARA an example from Valencia was highlighted: Changing the city from food policies.

5.2.1.3. Strategy for adaptation to climate change on the Spanish coast (2016)

This strategy is based on and shares objectives with the Coastal Act (Act 22/1988), later amended by Act 21/2013.

The general objectives of the Strategy:

- Increase the resilience of the Spanish coast to climate change and climate variability.
- Integrate adaptation to climate change into the planning and management of the Spanish coast.

The strategy consists of three parts: i) current diagnosis of the coast, ii) specific objectives, general guidelines and proposed measures, iii) implementation and monitoring and iv) annex of the plans and programmes linked by sectors and autonomous communities. The strategy lists 26 adaptive measures to favour the resilience of the Spanish coast. Aligned with this strategy an action to repair the protection layer of the Marjal dels Moros in Valencia was deployed.

Furthermore, in the context of the coast context, the Ministry of Agriculture and Fisheries, Food and Environment presents a comprehensive study that proposes definitive solutions to the erosion of the southern coast of Valencia²⁹.

5.2.2. Recent developments

The Spanish Government has recently declared a state of climate emergency [79]. The declaration included the commitment to pass a number of measures within the following 100 days, such as, among others, a national Climate Change and Energy Transition Law. These measures had not yet been approved at the time of writing, and were placed on hold due to the state of emergency arising from the COVID-19 pandemic. The National Adaptation Plan will also be reviewed, including a new monitoring system. Therefore, the next months will be

²⁹ <https://www.miteco.gob.es/es/costas/temas/proteccion-costa/estrategias-proteccion-costa/valencia/estrategia-proteccion-valencia.aspx>

key in setting the new framework in which adaptation to climate change will take place in Spain.³⁰

5.3. Regional

The main responsibilities in climate change at a regional level are assigned to the General Directorate of Climate Change, which is dependent on the Autonomous Secretariat for Climate Emergency and Ecological Transition of the Regional Department of Agriculture, Rural Development, Climate Emergency and Ecological Transition.

The Regional Government has also declared a state of climate emergency [80]. Among other measures in current development, a regional Climate Change Law is also being prepared. However, the procedure for preparation and adoption of such a regulation was also placed on hold at the time of writing due to the state of emergency arising from the COVID-19 pandemic.

The Regional Government has also adopted the Regional Climate Change Strategy update [37], which has already been extensively cited in previous sections. The main objectives of the Regional Strategy in relation to Climate Change Adaptation are:

- To identify vulnerabilities
- Risk detection
- To increase resilience in the economic fabric and the Valencian society
- To adopt preventive measures to minimise the potential damages that climate change might produce on people and the environment.

The strategy includes a comprehensive list of measures and actions in relation to mitigation, adaptation, and also with a combined approach integrating mitigation and adaptation. Several work lines are established, and within each of them general measures are set, and later disaggregated into actions. For each action, the regional department or body in charge is identified.

There are also several bodies through which public engagement and participation in climate change are promoted and conducted. Some of them are currently under review, such as the Climate Change Experts Valencian Committee, but others are still active, such as the Advisory and Participatory Environmental Board ("CAPMA") [81] in which the main social and professional groups are present.

5.4. Local

The city of Valencia is aware of the potential impact that climate change presents for the different sectors at the local level. The municipal government structure [29] includes an Area

³⁰ At the time this report was initially prepared and delivered (30.04.2020), the second, and currently adopted, National Plan for Adaptation to Climate Change (PNACC, 2021-2030) was still under development.

of Urban Ecology, Climate Emergency and Energy Transition. Within this area, especially relevant to the ARCH project are the Departments of Climate Emergency and Energy Transition, as well as the Department of Protected Areas Conservation and Devesa-Albufera. There is also a Department of Agriculture, Sustainable Food and Huerta, within the Innovative Development of Economic Sector and Labour Area.

There is also a Municipal Climate and Energy Foundation (“València Clima i Energia”), which depends on the Department of Climate Energy and Energy Transition [82]. Its main areas of work are climate change information and training, as well as the transformation of the city in terms of resilience and ability to face the present and future challenges from global warming. The previously cited *SECAP* of Valencia [31], prepared in accordance with the requirements of the EU Covenant of Mayors for Climate & Energy initiative [83] is the most updated document outlining local commitments in relation to climate change. The adaptation measures proposed are detailed, prioritised and allocated time schedules in the Annex to the Plan.

Some considerations can be done with regards to the policy and regulatory framework at local level: in the *SECAP* we can see how, starting from the *Análisis de Riesgos y Vulnerabilidades* (which includes a vulnerability assessment for the agriculture, water, biodiversity, coast, energy, health, transport and urban planning sectors), the strategic objectives of the “Plan of Adaptation to Climate Change of València 2050” (prepared by the City Council in January 2017) will then be realised through 14 goals, aiming to: raise awareness; increase community resilience in the face of climatic events and its consequences; protect the “Huerta” ecosystem, while highlighting the benefits it brings; improve intra- and inter-institutional coordination.

The Paris Agreement (see Part 5.1 above) sets out a framework of fundamental international significance for climate action at all levels of government, and hence warrants some reflection in terms of its relevance at local level. It primarily targets climate mitigation, and directly addresses nation states, with a focus on nationally-determined contributions to emissions. Article 7 of the agreement, however, deals explicitly with climate adaptation and how parties recognise that it represents indeed a global challenge that needs to be faced at all governance levels, including the local dimension. Some of the key aspects of particular relevance for the city of Valencia, to which the local commitments (outlined in the previous part of this section) align, are set out as follows:

Adaptation (Art. 7)

Each Party shall, as appropriate, engage in adaptation planning processes and the implementation of actions, including the development or enhancement of relevant plans, policies and/or contributions, which may include:

- (a) The implementation of adaptation actions, undertakings and/or efforts;*
- (b) The process to formulate and implement adaptation plans;*
- (c) The assessment of climate change impacts and vulnerability, with a view to formulating nationally determined prioritized actions, taking into account vulnerable people, places and ecosystems*

The above fields of action can be understood as a framework in which all nations that are party to the Paris Agreement are expected to take action. In that sense, they are of limited use as an implementation guide for local governments, however it can be assumed that such national governments are working to establish national policy frameworks for action that will in turn demand regional and local levels of government to implement complementary strategies.

This current report was prepared at a time that the new Spanish adaptation plan (PNACC, 2021-2030) was still under development, hence regard for the detail of this new forthcoming strategy, based on the lessons learned from the first national plan, will be of importance to local ongoing work to update vulnerability assessments, monitoring models and adaptation actions – in order to ensure that local objectives and strategies both serve and are supported by national guidelines.

5.5. Gaps and needs

As mentioned previously, the current policy and regulatory framework at national and regional level is under revision. Therefore, future developments in the next few months should be considered in the next steps of the project. Further, given that governance is complex, due to the involvement of many bodies and other stakeholders, a round of meetings with the main authorities involved will be developed in order to verify and complete the information presented herein.

6. 6. Expected impacts of climate change-related and natural hazards

The purpose of this section is to report and review the preliminary collection of relevant information about hazards, exposed elements, as well as impacts provided by ARCH city partners in collaboration with their local research partners, in order to offer an initial overview on the risks that might affect the selected historic areas and their communities. It should be noted that the content in this section is not exhaustive, but rather should be understood as a departure point to serve as a basis for future work.

This section is structured as follows: a description of the methodology is provided, followed by a Risk Profile Table, outlining hazards, exposed elements, impacts, and corresponding resilience-building measures already planned or implemented to date. Next follows a review, interpretation, and validation of the information provided in the Risk Profile Table. Finally, an outlook is provided concerning further risk analysis work in the context of the ARCH project.

6.1. Methodology

In order to elicit relevant information for risk analyses from city partners, ENEA, Fraunhofer, ICLEI, and TecNALIA developed a Risk Profile Table template (see Part 6.2 below) based on the central risk components identified in the 5th Assessment Report of the Intergovernmental Panel on Climate Change [84]: hazards, exposed elements, impacts (physical, societal, functional, economic, and intangible), as well as corresponding resilience-building measures already planned or implemented to date. This template was filled out by city partners and provides a starting point from which to conduct more detailed risk analyses. Furthermore, it allows to provide a useful starting point for the data, models, methods, and tools to be developed during the project

The information provided in the Risk Profile Table was reviewed and harmonised by ENEA in order to provide a comparable description across all city cases and ensure relevance to (and validity for) similar on-going³¹ and/or future initiatives and projects in the field of disaster risk reduction, climate change adaptation, and cultural heritage preservation.

The following standards, reference material, and tools were identified as most suitable for this exercise:

- The City Climate Hazard Taxonomy [84] for classification of hazards³²;

³¹ E.g. United Nations Office for Disaster Risk Reduction: Words into Action guidelines: National disaster risk assessment. UNDRR, 2017. Online: <https://www.undrr.org/publication/words-action-guidelines-national-disaster-risk-assessment>

³² It should be noted that hazards were identified and named in the Risk Profile Table based on [30] rather than [84].

- The UNDRR QRE Tool [30] and ISO standard 37120 Sustainable cities and communities — Indicators for city services and quality of life³³ for the classification of exposed elements and impacts; and
- The ICOMOS CCHWG³⁴ classification and INSPIRE³⁵ directive for the classification of heritage assets.

Based on the harmonised information, initial proposals for risk analysis focus actions (e.g. which methods and tools to apply for which part/issue of a historic area) were formulated by ENEA. The initial proposals will be further defined during the co-creation process and in exchange with the relevant local stakeholders.

³³ <https://www.iso.org/standard/68498.html>

³⁴ https://adobeindd.com/view/publications/a9a551e3-3b23-4127-99fd-a7a80d91a29e/g18m/publication-web-resources/pdf/CCHWG_final_print.pdf

³⁵ INSPIRE, Infrastructure for Spatial Information in Europe D2.8.III.2 Data Specification on Buildings – Technical Guidelines (5.3.1.1.4. Classification of buildings, pages 43-45).

6.2. Risk profile table

Heritage site (historic area)	Hazard ³⁶	Exposed element ³⁷	Impacts					Corresponding resilience- building measure	Notes/Evidence
			Physical	Societal	Functional	Economic	Intangible	Description (please indicate specific S or general G)	
Huerta	Flood (*) (riverine flooding, coastal flooding and flash floods) and Convective Storms (**) <i>(Unless indicated otherwise, the information in subsequent columns applies to both hazards)</i>	Buildings. Natural environment Tangible heritage (irrigation infrastructure, agricultural machinery and equipment). Intangible cultural heritage (agricultural traditional skills and customs). People (urban area and at the site). Road, railroad and other infrastructure networks.	Damage to buildings, roads and other infrastructure and equipment. Loss of agricultural soil due to erosion (*) and **) or salinization(*). Loss of irrigation water due to damage to storage or distribution infrastructures (*) and **) and salinization (*).	Injury and mortality. Loss of access to key services such as food provision and access to critical infrastructures.	Disruption of transport services and water supply. Disruption of ecosystem services (food production, etc).	Agricultural losses due to damages to crops, cropland, infrastructures or machinery, among other. Loss of tourism revenue due to service disruption.	Damage or loss of cultural heritage (buildings, infrastructures, etc).	Flood mapping, zoning, and monitoring (S). (*) Flood defence works (S).(*) Early warning systems (S). Water supply diversification and infrastructure improvements (S). Coastal defences (S). Various measures within the Valencian Climate Change and Energy 2030 Strategy (S). Various measures within the Valencia Sustainable Energy and Climate Action Plan (S). Green Infrastructure Management (G).	[1], [24], [31], [37], [67], [25], [85], [86], [87], [88], [89],

³⁶ Note: the UN Office for Disaster Risk Reduction (UNDRR)’s Resilience Scorecard defines ‘hazard’ as ‘a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation’. Of these, the ARCH project is addressing natural and climatic hazards.

³⁷ Note: the UN Office for Disaster Risk Reduction’s Resilience Scorecard defines ‘exposure’ as ‘the situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas’.

Heritage site (historic area)	Hazard ³⁶	Exposed element ³⁷	Impacts					Corresponding resilience- building measure	Notes/Evidence
			Physical	Societal	Functional	Economic	Intangible	Description (please indicate specific S or general G)	
Huerta	Extreme temperature (*) and Drought (**) <i>(Unless indicated otherwise, the information in subsequent columns applies to both hazards)</i>	Natural environment, crops and croplands. Intangible cultural heritage (agricultural traditional skills and customs). People (urban area and at the site).	Damage to crops, soils and the natural environment. Increased evapotranspiration (*).	Illness or death (*). Loss of access to key services such as food provision. Increased competition for water.	Decrease of the ecosystem services (less food production if disruption to water supply, or very extreme heat events, or due to new or increase of existing pests and diseases).	Decrease of agricultural productivity leading to loss of revenue. Loss of tourism revenue due to service disruption (*).	Damage or loss of cultural heritage (such as agricultural traditional customs).	Extreme temperatures and heat waves program (S) (*). Various measures within the Valencian Climate Change and Energy 2030 Strategy (S). Various measures within the Valencia Sustainable Energy and Climate Action Plan (S). Various measures within the River Basin Management Plan (S)(**)	[31], [37], [25], [1], [87], [89], [86], [85], [24], [90], [88], [91]
Huerta	Insect infestation	Natural environment, crops and croplands. Tangible cultural heritage (channels) Intangible cultural heritage (agricultural traditional skills and customs). People (urban area and at the site).	Damage to crops, and the natural environment.	Illness or death. Loss of access to key services such as food provision.	Decrease of the ecosystem service (less food production if new or increase of existing pests).	Decrease of agricultural productivity leading to loss of revenue. Loss of tourism revenue due to service disruption.	Damage or loss of cultural heritage (such as agricultural traditional customs).	Regional Action Plan on Vector-Borne Diseases (S). Asian Tiger Mosquito Prevention and Control Campaign (S). Various measures within the Valencian Climate Change and Energy 2030 Strategy (S). Various measures within the Valencia Sustainable Energy and Climate Action Plan (S).	[31], [37], [25], [1], [89], [86], [85], [24], [92], [93]

Heritage site (historic area)	Hazard ³⁶	Exposed element ³⁷	Impacts					Corresponding resilience- building measure	Notes/Evidence
			Physical	Societal	Functional	Economic	Intangible	Description (please indicate specific S or general G)	
Albufera	Flood (*) (riverine flooding, coastal flooding and flash floods) and Convective Storms (**) <i>(Unless indicated otherwise, the information in subsequent columns applies to both hazards)</i>	Buildings. Natural environment. Tangible cultural heritage (irrigation infrastructure, agricultural machinery and equipment). Intangible cultural heritage (agricultural and fishing traditional skills and customs). People (urban area and at the site). Road and other infrastructure networks. Boats and jetties. “Golas” (sea-lagoon channels) and associated infrastructure. “Motas” (traditional elevated paths and field margins for water management).	Damage to buildings, boats and jetties. Impacts on roads, channels and other infrastructure. Loss of soil due to erosion or salinization. Loss of irrigation water due to damage to storage or distribution infrastructures and salinization. Loss or damage to highly valuable ecosystems. Damage to “golas”, “motas” and associated infrastructure.	Injury and mortality. Loss of access to key services such as food provision. Loss of jobs and associated impacts in local people.	Damage to coastal, forest and lagoon ecosystems. Loss of crops and fish stocks. Disruption of transport and tourist services. Disruption to electricity and water supply.	Agricultural losses due to damages to crops, cropland, infrastructures or machinery, among other. Loss of tourism revenue due to service disruption. Fishing losses.	Damage or loss of cultural heritage (traditional leisure activities in the forest lagoon areas, buildings, infrastructures, jetties, traditional fishing equipment and practices, etc).	Flood mapping, zoning, and monitoring (S) (*). Flood defence works (S) (*). Early warning systems (S). Water supply diversification and infrastructure improvements (S). Coastal defences (S). Various measures within the Valencian Climate Change and Energy 2030 Strategy (S). Various measures within the Valencia Sustainable Energy and Climate Action Plan (S). Green Infrastructure Management (G). Forest Management (G) (**). Protected Area Management (G).	[67], [37], [31], [1], [25], [85], [86], [87], [88], [89], [46], [24], [94]

Heritage site (historic area)	Hazard ³⁶	Exposed element ³⁷	Impacts					Corresponding resilience- building measure	Notes/Evidence
			Physical	Societal	Functional	Economic	Intangible	Description (please indicate specific S or general G)	
Albufera	Wave action	Beaches. “Golas” (sea-lagoon channels) and associated infrastructure. Lagoon shores and banks. People. Road and other infrastructure networks. Boats and jetties. Fishing equipment.	Loss of highly valuable ecosystems. Damage to “golas”, and associated infrastructure. Damage to buildings, boats and jetties. Impacts on roads, channels, fishing equipment and other infrastructure.	Injury and mortality. Loss of access to key services due to increased coastal erosion.	Damage to coastal and lagoon ecosystems. Loss of fishing equipment. Disruption of fishing and tourist services.	Loss of tourism revenue due to service disruption and damage to beaches, jetties and other areas. Fishing losses.	Damage or loss of cultural heritage (traditional leisure activities in the beach and lagoon areas, buildings, infrastructures, jetties, traditional fishing equipment and practices, etc).	Coastal defences (S). Various measures within the Valencian Climate Change and Energy 2030 Strategy (S). Various measures within the Valencia Sustainable Energy and Climate Action Plan (S). Green Infrastructure Management (G). Protected Area Management (G).	[37], [31], [1], [25], [85], [86], [87], [88], [89], [46], [24]
Albufera	Extreme temperature (*) and Drought (**) <i>(Unless indicated otherwise, the information in subsequent columns applies to both hazards)</i>	Natural environment, crops and croplands. Intangible cultural heritage (agricultural and fishing traditional skills and customs). People (urban area and at the site).	Damage to crops, soils and the natural environment. Increased evapotranspiration. Increased wildfire risk.	Illness or death. Loss of access to key services such as food provision. Increased competition for water.	Increased eutrophication of lagoon water and damages to forest areas, leading to a worse ecological state. Decrease of the ecosystem services (such as less food production, or due to new or increase of existing pests and diseases).	Agricultural losses due to damages to crops and cropland. Loss of tourism revenue due to service disruption. Fishing losses.	Damage or loss of cultural heritage (traditional leisure activities in the forest and lagoon areas, fishing practices, etc).	Extreme temperatures and heat waves program (S) (*). Various measures within the Valencian Climate Change and Energy 2030 Strategy (S). Various measures within the Valencia Sustainable Energy and Climate Action Plan (S). Forest Management (G). Protected Area Management (G). Green Infrastructure Management (G). Various measures within the River Basin Management Plan (S) (**).	[37], [31], [1], [25], [85], [86], [87], [88], [89], [46], [24], [90], [94], [91]

Heritage site (historic area)	Hazard ³⁶	Exposed element ³⁷	Impacts					Corresponding resilience- building measure	Notes/Evidence
			Physical	Societal	Functional	Economic	Intangible	Description (please indicate specific S or general G)	
Albufera	Wildfire	<p>Natural environment, crops and croplands.</p> <p>Intangible cultural heritage (agricultural and fishing traditional skills and customs).</p> <p>People (urban area and at the site).</p> <p>Buildings.</p> <p>Roads and other infrastructure.</p> <p>Wildlife</p>	Damage to crops, soils, the natural environment and human-made structures.	<p>Illness or death, direct or indirect (e.g. due to air quality problems).</p> <p>Loss of access to key services such as the place of residence or food provision.</p>	<p>Damage or total destruction of the ecosystem, leading to a decrease of the ecosystem services.</p> <p>Disruption in transport and other services.</p> <p>Loss of housing.</p>	<p>Agricultural losses due to damages to crops and cropland.</p> <p>Loss of tourism revenue due to service disruption.</p> <p>Fishing losses.</p> <p>Impacts on buildings and other human-made structures.</p>	Damage or loss of cultural heritage (traditional leisure activities in the forest, beach and lagoon areas, fishing practices, etc).	<p>Albufera Natural Park Fire Prevention Plan (S).</p> <p>Forest Management (G).</p> <p>Protected Area Management (G).</p> <p>Green Infrastructure Management (G).</p>	[37], [31], [1], [25], [85], [86], [87], [88], [89], [46], [24], [94]
Albufera	Insect infestation	<p>Natural environment, crops and croplands.</p> <p>Tangible heritage (channels).</p> <p>Intangible heritage (agricultural traditional skills and customs).</p> <p>People (urban area and at the site).</p>	Damage to crops, and the natural environment.	<p>Illness or death.</p> <p>Loss of access to key services such as food provision.</p>	Decrease of the ecosystem services (less food production if new or increase of existing pests).	<p>Decrease of agricultural productivity leading to loss of revenue.</p> <p>Loss of tourism revenue due to service disruption.</p> <p>Fishing losses.</p>	Damage or loss of cultural heritage (traditional leisure activities in the forest, beach and lagoon areas, fishing practices, etc).	<p>Regional Action Plan on Vector-Borne Diseases (S).</p> <p>Asian Tiger Mosquito Prevention and Control Campaign (S).</p> <p>Various measures within the Valencian Climate Change and Energy 2030 Strategy (S).</p> <p>Various measures within the Valencia Sustainable Energy and Climate Action Plan (S).</p> <p>Forest Management (G).</p> <p>Protected Area Management (G).</p> <p>Green Infrastructure Management (G).</p>	[37], [31], [1], [25], [85], [86], [87], [88], [89], [46], [24], [92], [93], [94]

Note: Hazards identified and named based on [30] .Due to the size of both areas (Huerta and Albufera) and their complex land use, regulatory and governance frameworks, the previous table should not be considered as complete or comprehensive, but rather the first stage of an exploratory process to be further refined during the project development.

6.3. Preliminary classification of hazards, exposed elements, and impacts

The purpose of this section is to review, interpret, validate, and harmonise the information provided in the Risk Profile Table as a sound basis for the project to address Valencia's risks for the two historic areas that will be examined, i.e. Huerta and Albufera. This preliminary analysis covers:

- a) hazards,
- b) elements exposed to those hazards, and
- c) impacts that the identified hazards might cause on the exposed elements.

A related purpose is to identify possible data gaps, and proposals for focus project actions in the context of the city case.

6.3.1. Hazards

The Valencia city authors of previous sections show an awareness of the hazards that are affecting the two selected sites, as also highlighted by the preliminary resilience assessment presented later in part 7. Seven different hazard types have been identified in the Risk Profile Table. Five of them – *Convective Storms*, *Drought*, *Extreme temperature*, *Flood* and *Insect Infestation* – are hazards affecting both areas, whereas *wave action* and *wildfire* only affect Albufera. For the purpose of this discussion, these hazards have been classified in Table 1 below according to the hazard categories belonging to the *C40 City Climate Hazard Taxonomy*³⁸, which are broken down into main hazard types, and hazard sub-types³⁹.

The hazard categories identified in the Risk Profile Table for both Huerta and Albufera are: **Meteorological, Climatological, Hydrogeological, and Biological**. Although not specifically reported in the Risk Profile Table (because it was based on the QRE tool and associated terminology), the hazards **extreme precipitation and sea-level rise** can be extrapolated from identification of convective storms, coastal flooding and wave action, while **pollution** was identified elsewhere in this report (see part 2.2.3). Therefore, human-induced hazards have also been included in the hazard classification. Table 1 below lists all hazard categories and (sub-)types identified for Huerta and Albufera.

³⁸ <https://www.c40.org/researches/city-climate-hazard-taxonomy>

³⁹ It should be noted that C40's taxonomy has some limitations in that the hazards classified as "Meteorological, climatological and hydrological" are themselves the result of meteorological events. Conflating meteorological and climatic hazards is problematic as the two types have different time scales. At the time of writing, discussion on hazard classification is ongoing and a single system has not yet been agreed upon.

Hazard Group	Hazard Main Type	City Climate Hazard Type (sub type indicated in brackets where applicable)
Meteorological	Precipitation	Rain storm
	Wind	Severe wind; Cyclone
	Lightning	Electrical storm (Lightning/thunderstorm)
	Extreme temperature - Cold	Extreme winter conditions (Ice, hail); Cold wave (Cold snap, frost); Extreme cold weather (Cold days)
	Extreme temperature - Hot	Heat wave; Extreme hot weather (Hot days)
Climatological	Water scarcity	Drought (Lack of precipitation and seasonal melt (snow, glacial))
	Wild fire	Forest fire; Land fire (Bush fire, grass fire, pasture fire, scrub fire)
Hydrological	Flood	Flash/surface flood; River flood; Coastal flood
	Wave action	Storm surge
	Chemical change	Salt water intrusion
Biological	Insects and microorganisms	Water-borne disease; Vector-borne disease; Air-borne disease; Insect infestation

Table 1. Hazard categories and types identified for both Huerta and Albufera. Bold characters indicate hazard types relevant for Albufera only.

6.3.2. Exposed Elements

The elements exposed to the aforementioned hazards, identified within the Risk Profile Table for Huerta and Albufera have been reorganised in Table 2 below, according to the following categories:

- Natural Environment
- Built Environment: critical Infrastructures and Buildings;

- Cultural heritage;
- Services (essential or basics and productive);
- Human and social aspects.

Here, the cultural heritage category subsumes all exposed elements that are in themselves heritage, i.e. exposed elements declared as heritage are only categorised as such and not as any of the other categories (e.g. traditional fishing equipment is not categorised under services while non-traditional fishing equipment is).

Exposed Element Categories	Exposed Element Types
Natural Environment	Ecosystems
	Wildlife
Built Environment	Buildings
	Road, railroad and other critical infrastructures
	Storage and irrigation water infrastructures, channels
Cultural Heritage	Tangible and Intangible elements (see Table 3)
Services, essential and productive	Cropland
	Agricultural machinery and equipment
	Fishing Equipment
	Boats and Jetties
Human and Social Aspects	External people (e.g. tourists,)
	Local people

Table 2. Exposed elements identified for both Huerta and Albufera; in bold the ones that are peculiar to Albufera only.

Table 3 reports in further detail the exposed elements categorised as cultural heritage. Here, reference has been made to the six categories identified by the ICOMOS Climate Change and Cultural Heritage Working Group, CCHWG (2019). For Huerta and Albufera, four out of the six CCHWG categories are of particular relevance, i.e.: **Movable heritage, Building and Structures, Cultural Landscapes and Intangible Heritage**. These cultural heritage categories have been broken down further into cultural heritage types (i.e. Archaeological heritage and Associated and Traditional Communities) to provide a more detailed picture.

Exposed Cultural Heritage Categories	Exposed Cultural Heritage Types
Moveable heritage	Traditional agricultural equipment Traditional fishing equipment
Archaeological resources	Archaeological finds
	<i>Archaeological materials</i>
	<i>Archaeological sites</i>
	<i>Archaeological monuments</i>
Buildings and structures	Buildings
	"Golas"
	"Motas"
	Hydrographic, irrigation and drainage network
Cultural landscapes	Combined works of nature and humankind
Associated and traditional communities	
Intangible heritage	Knowledge and skills to produce traditional crafts: Agricultural traditional skills Traditional fishing practices
	Social practices: traditional leisure activities in lagoon, beaches and forest areas
	Cultural heritage value
	<i>Performing arts</i>
	<i>Festive events</i>
	Rituals, Agricultural traditional customs
	<i>Oral traditions</i>
	<i>Knowledge and practices concerning nature and universe</i>

*Golas, sea-lagoon channels and associated infrastructure. **Motas traditional elevated paths and field margins for water management

Table 3. Categories and sub-categories of the cultural heritage exposed elements identified for both Huerta and Albufera; underlined characters identify elements peculiar to Huerta and bold characters the ones peculiar to Albufera only. In Italics elements that may be relevant for future analysis, although not included in the Risk Profile Table.

6.3.3. Impacts

The identification of impacts in the Risk Profile Table for Valencia is exhaustive and well supported by the evidence and information collated in this baseline report. Table 4 below briefly reports the different impacts identified for the five categories of impacts, included in the Risk Profile Table for the different exposed elements categorised as per Table 3.

		Impacts				
Exposed Elements		Physical	Functional	Societal	Economic	Intangible
Natural Environment	Ecosystem	Increase in existing pests /diseases. Decease in fishes. Costal Erosion. Physical damage to lagoon, shores, banks & beaches. Evapotranspiration & eutrophication of lagoon water	Decrease in ecosystem services (including food provision)		Agricultural sector: direct economic losses and loss of revenue	Loss of agricultural traditional skills and customs
	Wildlife		Decrease in ecosystem services	Loss of access to key services	Fishing, hunting and tourism sector: direct economic losses and loss of revenue	Loss of cultural heritage values
Built Environment	Buildings	Physical Damage			Direct Economic loss due to physical damage	
	Storage & irrigation infrastructures, channels	Physical Damage	Loss/ disruption of service	Loss of access to key services		

		Impacts				
Exposed Elements		Physical	Functional	Societal	Economic	Intangible
	Road, railroad and other critical infrastructures	Physical Damage	Loss/ Disruption of service	Loss of access to key services		
Cultural Heritage	Tangible and Intangible elements	Physical Damage	Loss/ Disruption of service	Loss of access to culture	Direct Economic loss due to physical damage	Loss of cultural heritage values
Services, essential and productive	Cropland	Loss of crops	Loss/ Disruption of service	Loss of access to food provision	Agricultural sector: Direct economic loss & LoR*	Loss of agricultural traditional skills and customs
	Agricultural machinery & equipment	Direct Physical Loss	Loss/ Disruption of service	Loss of access to food provision	Agricultural sector: Direct economic loss & LoR*	Loss of agricultural traditional skills and customs
	Boats & Jetties		Loss/ Disruption of service		Tourism Sector: direct economic loss & LoR	Traditional leisure activities in lagoon areas
	Fishing Equipment		Loss/ Disruption of service	Loss of access to key services	Fishing: direct economic losses and loss of revenue	Traditional fishing equipment/ practices
Human and Social Aspects	External			Loss of Tourism	LoR from tourism	
	Local	Illness, injury and mortality		Loss of Jobs	Impact on Local Economy	

Table 4. Physical, Functional, Societal, Economic and Intangible impacts identified for the different exposed elements in the two selected sites; bold characters highlight the impacts peculiar to Albufera only.

The identified hazards (Table 1) are reported to affect all or some of the identified exposed elements (Table 2 and Table 3), potentially causing (with slight differences) the impacts identified in Table 4.

Risk analyses, implemented with different methods and levels of complexity (depending on the available data, knowledge, time, and personnel) will be needed to quantify the likelihood, level and extent of the expected impacts, as briefly indicated in the following section.

6.4. Outlook and implications for further risk analyses within ARCH

The Risk Profile Table identified several exposed elements for the two sites and different potential hazards that can cause cascading and interdependent impacts. As part of the ARCH project it will not be possible to analyse all identified issues with the same level of detail. While for some of them a simplified approach will likely be sufficient, for selected ones, detailed analyses will be conducted, e.g. supported by data collected through field sensors and measurements. A prioritisation for where to concentrate the attention might be based on the combination of multiple criteria, as an example:

- exposed cultural heritage at higher risk,
- potential for cascading effects,
- high social and cultural value of cultural heritage,
- weaker resilience essentials. See discussion in chapter 7.
- Local municipal and regional stakeholder's prioritisation based on standing strategies and plans as will be reported in the forthcoming deliverable D3.2 (Local partnership and work plan).

In further detail, the prioritisation could be conducted as follows:

- Identification of the cultural heritage at higher risk via a detailed risk analysis aimed at providing insights into the interactions of the identified hazards with the exposed elements and with all dimensions of their vulnerabilities (physical, environmental, social, economic and cultural), including the likelihood (more or less probable) of the hazards and the level (more or less severe) of the expected impacts on each exposed element. Workshops or structured interviews with the local stakeholders might be conducted for filling out qualitative risk matrices, similar to the one represented in Figure 57 below.

		CONSEQUENCE				
		Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
LIKELIHOOD	Almost Certain 5	low	medium	high	extreme	extreme
	Likely 4	low	medium	high	extreme	extreme
	Possible 3	low	medium	high	high	extreme
	Unlikely 2	low	medium	medium	high	extreme
	Rare 1	low	low	medium	medium	high

Figure 57. Example of qualitative risk matrix identifying the Risk severity (with qualitative terminology from low to extreme and associated couloirs, as a function of hazard likelihood and severity of impacts/consequences (from insignificant to Catastrophic) from ISO31000 ⁴⁰.

- Identify cascading and interrelated impacts, e.g. by using an adapted impact chain methodology (see e.g. [96] or [97] defined as part of the RESIN project).
- Assess the social and cultural value of cultural heritage with local stakeholders and communities by identifying non-quantifiable values of their tangible and intangible cultural heritage elements (Figure 58) using an online questionnaire or app (for further details, also see Section 6 of Camerino's baseline report).
- Identify weaker resilience essentials, using the ARCH Resilience Assessment Framework currently in development in work package 7.

40 Standards Australia (2009). AS/NZS ISO 31000:2009 Risk Management – Principles and guidelines

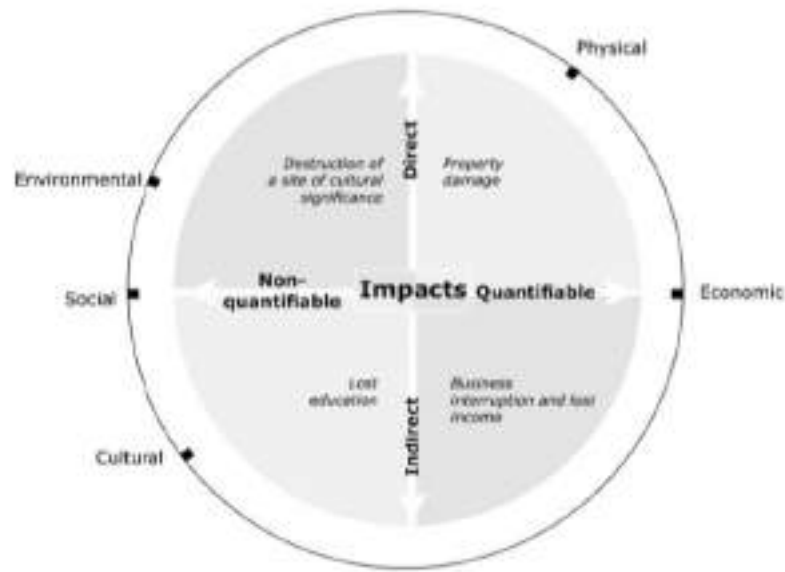


Figure 58. Direct and indirect impacts of disasters according to [98].

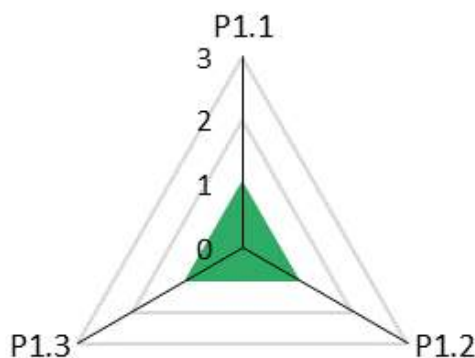
To support the above-mentioned steps the ARCH DSS could be employed as a participatory WebGIS tool to support stakeholder engagement using visualisations and geospatial information on hazards and impacts that Valencia might have already available.

7. Preliminary resilience assessment

The following resilience assessment was developed using the preliminary version of the UNDRR Disaster Resilience Scorecard for Cities [99]. The preliminary assessment was conducted within the framework of a webinar between Las Naves, Tecnia, and Fraunhofer on January 13, 2020. As the original Scorecard is aimed at city-level, not all questions were immediately applicable on the level of historic areas or single heritage assets. Wherever possible, answers were provided for the historic areas under examination (e.g. with regard to hazard scenarios). For all other questions, answers were provided on city-level (e.g. with regard to city masterplans). The results give a first indication of the overall resilience of the city with some – but not exclusive – focus on the historic areas examined by ARCH. In addition, the application of the Scorecard will be used as input for the development of the ARCH Resilience Assessment Framework specifically focused on historic areas. Lastly, the preliminary resilience assessment results presented in the baseline reports should not be employed to develop resilience action plans, as not all necessary stakeholder groups were involved in the assessment process.

It should also be noted that due to the scope of the Scorecard and the particularities of Valencia historic areas in relation to the rest of the city cases, the resilience of Huerta and Albufera might not be fully reflected on the assessment.

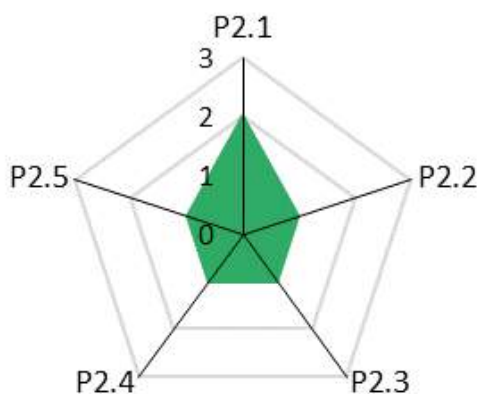
7.1. Essential 01: Organise for resilience



P1.1	Does the City master plan (or relevant strategy/plan) adopt the Sendai Framework?	1
P1.2	Is there a multi-agency/sectoral mechanism with appropriate authority and resources to address disaster risk reduction?	1
P1.3	Is resilience properly integrated with other key city functions / portfolios?	1

Regarding Essential 01 València achieves a resilience score of 3/9. The city has no overall city master plan compliant with the Sendai Framework, but instead has several sectoral plans that partially comply with the Framework (score of 1 for P1.1). Among these plans are the *SECAP*, the *PATRICOVA* action plan for flood risk prevention, and the municipal ordinance for the use of beaches and adjacent areas. Organisation and coordination for disaster risk reduction could be improved; the different city teams connected to DRR have authority, however inter-agency support for DRR is lacking (score of 1 for P1.2). Lastly, resilience is only integrated in key city functions on an ad hoc basis, however an action plan for climate change adaptation is currently being drafted which may improve the situation (score of 1 for P1.3).

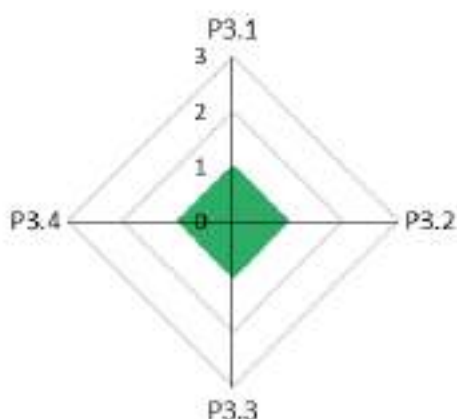
7.2. Essential 02: Identify, understand and use current and future risk scenarios



P2.1	Does the city have knowledge of the key hazards that the city faces, and their likelihood of occurrence?	2
P2.2	Is there a shared understanding of risks between the city and various utility providers and other regional and national agencies that have a role in managing infrastructure such as power, water, roads and trains, of the points of stress on the system and city scale risks?	1
P2.3	Are their agreed scenarios setting out city-wide exposure and vulnerability from each hazard, or groups of hazards (see above)?	1
P2.4	Is there a collective understanding of potentially cascading failures between different city and infrastructure systems, under different scenarios?	1
P2.5	Do clear hazard maps and data on risk exist? Are these regularly updated?	1

For Essential 02, València achieves a resilience score of 6/15. The city understands the main hazards affecting it, but currently has no defined process for updating this information (score 2 for P2.1). Individual system risks – at least for water management and flooding – are known, but not systematically shared among relevant stakeholder groups in order to understand cascading effects (score of 1 for P2.2). Disaster scenario information is only available for some hazards, with an aim to provide more information on these as part of the climate change adaptation action plan (score of 1 for P2.3). As a result, from P2.2 and P2.3, the understanding of cascading effects is limited (score of 1 for P2.4). Lastly, hazard maps currently only exist for heat waves and flooding in the urban environment (score of 1 for P2.5).

7.3. Essential 03: Strengthen financial capacity for resilience

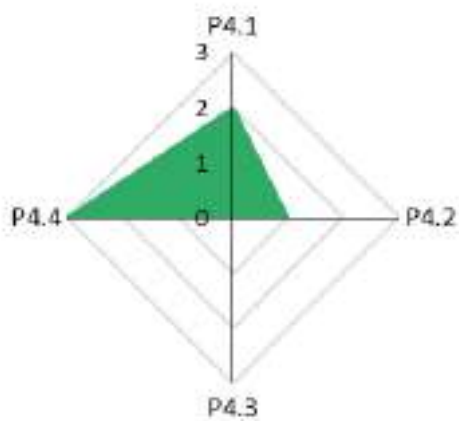


P3.1	The city / lead agencies understand all sources of funding, and the “resilience dividends”, are well connected, understand all available routes to attract external funding and are actively pursuing funds for major resilience investments.	1
P3.2	Does the city have in place a specific ‘ring fenced’ (protected) budget, the necessary resources and contingency fund arrangements for local disaster risk reduction (mitigation, prevention, response and recovery)?	1
P3.3	What level of insurance cover exists in the city, across all sectors – business and community?	1
P3.4	What incentives exist for different sectors and segments of business and society to support resilience building?	1

Regarding Essential 03 València achieves a resilience score of 4/12, which leaves significant room for improvement. Currently, there is only limited knowledge about available funding approaches for resilience measures (score of 1 for P3.1) and no coordinated, dedicated budget for local disaster risk reduction exists. However, there are regional/national emergency funds available (score of 1 for P3.2). In addition, the level of insurance coverage varies significantly

across sectors (score of 1 for P3.3), and only a limited number of incentives to promote resilience building exists (score of 1 for P3.4).

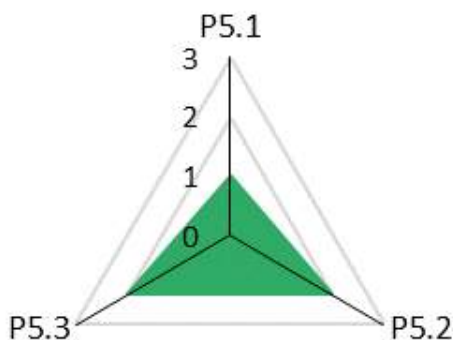
7.4. Essential 04: Pursue resilient urban development



P4.1	Is the city appropriately zoned considering, for example, the impact from key risk scenarios on economic activity, agricultural production, and population centres?	2
P4.2	Are approaches promoted through the design and development of new urban development to promote resilience?	1
P4.3	Do building codes or standards exist, and do they address specific known hazards and risks for the city? Are these standards regularly updated?	0
P4.4	Are zoning rules, building codes and standards widely applied, properly enforced and verified?	3

Regarding Essential 04 València achieves a resilience score of 6/12. There exist zoning plans for the whole city as well as the Huerta that incorporate hazard and risk mapping, but no systematic process for updating these plans (score of 2 for P4.1). Resilience approaches for new urban developments are not promoted in a consistent way, although a number of strategic documents related to this topic exist (score of 1 for P4.2). While building codes and standards exist, these do not address specific hazards or risks the city faces⁴¹ (score of 0 for P4.3). However, existing building codes are compulsory and enforced by the city (score of 3 for P4.4).

7.5. Essential 05: Safeguard natural buffers to enhance the protective functions offered by natural ecosystems



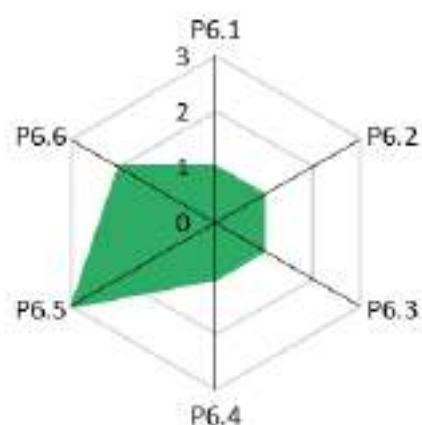
P5.1	Beyond just an awareness of the natural assets, does the city understand the functions (or services) that this natural capital provides for the city?	1
P5.2	Is green and blue infrastructure being promoted on major urban development and infrastructure projects through policy?	2
P5.3	Is the city aware of ecosystem services being provided to the city from natural capital beyond its administrative borders? Are agreements in place with neighbouring administrations to support the protection and management of these assets?	2

For Essential 05 València achieves a resilience score of 5/9. The city and key stakeholders are becoming more aware of the functions provided by their key natural assets, especially the

⁴¹ Present building codes and standards (e.g. EN ISO 15927-1-6 or EN ISO 52000-1) consider historic/present climate and not future climate in their calculations. Furthermore, building codes and standards are out of the scope of local governments, having little margin of manoeuvre

Huerta, but this awareness is still incomplete (score of 1 for P5.1). At the same time, green and blue infrastructure is promoted heavily and several studies and strategies in this area exist. However, guiding material for practitioners could still be improved (score of 2 for P5.2). Related to P5.1, the city is becoming more aware of the functions provided by natural capital beyond the city administrative borders, with the new Huerta law aiming to create a common forum with neighbouring municipalities (score of 2 for P5.3).

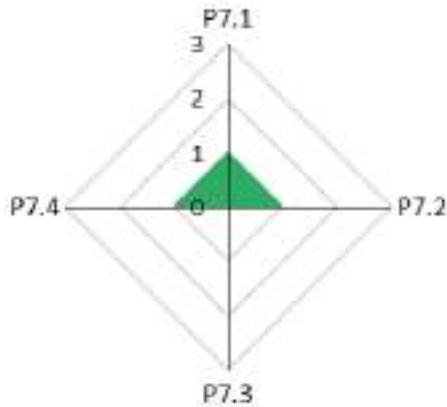
7.6. Essential 06: Strengthen institutional capacity for resilience



P6.1	Does the city have clear access to all the skills and experience it believes it would need to respond to reduce risks and respond to identified disaster scenarios?	1
P6.2	Does a co-ordinated public relations and education campaign exist, with structured messaging and channels to ensure hazard, risk and disaster information (that can be understood and used) are properly disseminated to the public?	1
P6.3	Extent to which data on the city's resilience context is shared with other organizations involved with the city's resilience.	1
P6.4	Are there training courses covering risk and resilience issues offered to all sectors of the city including government, business, NGOs and community?	1
P6.5	Are training materials available in the majority of languages in common use in the city?	3
P6.6	Is the city proactively seeking to exchange knowledge and learn from other cities facing similar challenges?	2

Regarding Essential 06 València achieves a resilience score of 9/18. While the city can access most of the skills and resources necessary to respond to identified disaster scenarios, gaps still exist (score of 1 for P6.1). Some programmes and channels exist for disseminating hazard, risk, and disaster information, but at most 25% of the population is reached, leaving significant room for improvement (score of 1 for P6.2). In addition, only a limited number of available data layers are shared within the city / other organisations, and the data shared is usually raw and requires interpretation (score of 1 for P6.3). Only a limited number of training courses for government employees, business owners, NGOs, and community members covering risk and resilience issues exist (score of 1 for P6.4). However, the existing training material is usually available in all languages commonly used in the city, namely Valencian and Castilian Spanish (score of 3 for P6.5). Lastly, the city understands the importance of knowledge sharing and seeks networking opportunities to exchange on lessons learned (score of 2 for P6.6).

7.7. Essential 07: Understand and strengthen societal capacity for resilience

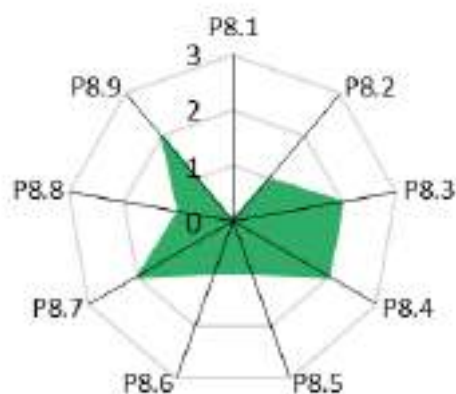


P7.1	Are “grassroots” or community organizations participating in risk reduction and post-event response for each neighbourhood in the city?	1
P7.2	Are there regular training programmes provided to the most vulnerable populations in the city?	1
P7.3	What proportion of businesses have a documented business continuity plan that has been reviewed within the last 18 months?	0
P7.4	How effective is the city at citizen engagement and communications in relation to DRR?	1

For Essential 07 València achieves a resilience score of 3/12. While grassroots organisations help with awareness raising for disaster risk reduction, their involvement in risk reduction and post-event response could be intensified (score of 1 in P7.1). Similarly, only some channels for citizen engagement related to disaster risk reduction exist (score of 1 for P7.4). In addition, while a mapping of vulnerable population groups exists, they do not receive any specific disaster training (score of 1 for P7.2). Lastly, no information about the proportion of businesses with a documented and regularly reviewed business continuity plan is available (score of 0 for P7.3).

7.8. Essential 08: Increase infrastructure resilience

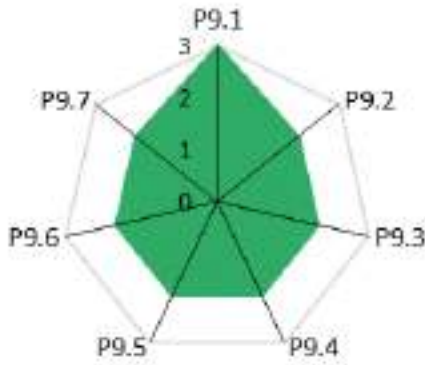
Regarding Essential 08 València achieves a resilience score of 12/27. There are no plans or forums to tackle critical infrastructure resilience (score of 0 for P8.1), and only a limited number of protective infrastructure exist (score of 1 for P8.2), such as shelters in the case of flash flooding or heavy rain. Because the information on potential disaster scenarios is limited, the city expects some loss of service for the water and energy systems under the “most severe” scenario (score of 2 for P8.3 and P8.4) and some loss of service for the transport and communication systems under the “most probable” scenario (score of 1 for P8.5 and P8.6). More than 90% of major injuries can be treated within 24 hours under the “most severe” scenario (score of 2 for P8.7). In addition, up to 10% of teaching facilities are likely at risk under the “most probable” scenario (score of 1 for P8.8). Lastly, equipment levels of first responders are estimated to be adequate for the “most severe” scenario, although this might require relying on mutual aid arrangements (score of 2 for P8.9).



P8.1	Is critical infrastructure resilience a city priority, does the city own and implement a critical infrastructure plan or strategy?	0
P8.2	Is existing protective infrastructure well-designed and well-built based on risk information?	1
P8.3	Would a significant loss of service for these two essential services be expected for a significant proportion of the city under the agreed disaster scenarios?	2
P8.4	Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would energy infrastructure corridors remain safe (i.e. free from risk of leaks, electrocution hazards etc.)?	2
P8.5	Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would transport infrastructure corridors remain safe (i.e. free from risk of flood, shocks etc) and passable?	1
P8.6	Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event?	1
P8.7	Would there be sufficient acute healthcare capabilities to deal with expected major injuries in 'worst case' scenario?	2
P8.8	% of education structures at risk of damage from "most probable" and "most severe" scenarios	1
P8.9	Will there be sufficient first responder equipment, with military or civilian back up as required?	2

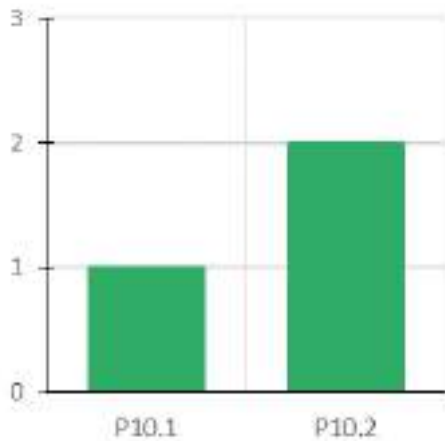
7.9. Essential 09: Ensure effective disaster response

For Essential 09 València achieves a resilience score of 15/21. The city estimates that it will reach more than 90% of its population with its early warning systems (score of 3 for P9.1) and has a comprehensive disaster management plan. However, this plan contains gaps (score of 2 for P9.2). The local disaster risk management authority has enough staff to cover all neighbourhoods within 24 to 48 hours in case of a surge event scenario (score of 2 for P9.3) and equipment/supply needs are defined and linked to disaster scenarios (score of 2 for P9.4). Similarly, emergency food and basic relief items should be sufficient under the "most severe" scenario (score of 2 for P9.5). There also exists a local emergency operations centre with hardened / redundant communications that should withstand the "most severe" scenario. However, only the most essential agencies for disaster risk management participate in crisis management (score of 2 for P9.6). Lastly, the city conducts annual drills involving both the public and professionals in a limited number of test scenarios (score of 2 for P9.7).



P9.1	Does the city have a plan or standard operating procedure to act on early warnings and forecasts? What proportion of the population is reachable by early warning system?	3
P9.2	Is there a disaster management / preparedness / emergency response plan outlining city mitigation, preparedness and response to local emergencies?	2
P9.3	Does the responsible disaster management authority have sufficient staffing capacity to support first responder duties in surge event scenario?	2
P9.4	Are equipment and supply needs, as well as the availability of equipment, clearly defined?	2
P9.5	Would the city be able to continue to feed and shelter its population post-event?	2
P9.6	Is there an emergency operations centre, with participation from all agencies, automating standard operating procedures specifically designed to deal with "most probable" and "most severe" scenarios?	2
P9.7	Do practices and drills involve both the public and professionals?	2

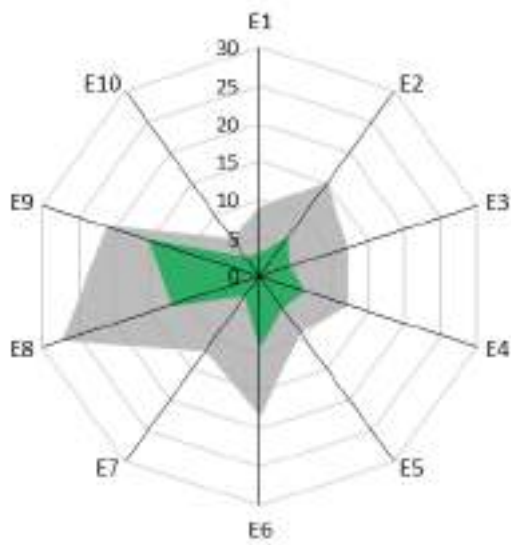
7.10. Essential 10: Expedite recovery and build back better



P10.1	Is there a strategy or process in place for post-event recovery and reconstruction, including economic reboot, societal aspects etc.?	1
P10.2	Do post-event assessment processes incorporate failure analyses and the ability to capture lessons learned that then feed into design and delivery of rebuilding projects?	2

For Essential 10, València achieves a resilience score of 3/6. Some post-recovery plans exist, but these are not comprehensive and are not understood by relevant stakeholders (score of 1 for P10.1). In terms of lessons learnt, there are clear processes in place to capture lessons from previous failures for coping post-event, but the mechanism to transfer these lessons to the design and delivery of future rebuilding projects needs improvement (score of 2 for P10.2).

7.11. Overall resilience of València



Overall, València achieves a resilience score of 66/141 with significant room for improvement in most Essentials. The exception to this is Essential 09, due to the large reach of València's early warning system, its comprehensive disaster risk management plan, good coverage in terms of emergency staff and food supply, and the existence of a local emergency operations centre.

The city achieves its lowest score in Essential 07, because grassroots movements are not sufficiently involved in disaster risk management processes, vulnerable population groups do not receive tailored training for disasters, no information about the coverage of business continuity plans is

available, and only a limited number of channels exists for citizen engagement.

8. Conclusion

The protection of both the Huerta and Albufera, as cultural heritage landscapes and ARCH focus sites, is of high importance for the local economy, culture and biodiversity in Valencia. From the perspective of cultural heritage, risk management and adaptation to climate change, it seems that the junction between them has not yet been sufficiently explored in Valencia, neither in general terms, nor in regard to the ARCH focus sites. According to this first analysis, at local level, it seems that climate change is not yet proactively considered in existing approaches to managing and protecting cultural heritage. Conversely, DRR also seems to be not focused on heritage protection yet. This has yet to be confirmed by means of several meetings with relevant stakeholders, for instance in order to verify the degree in which the Guidelines for the Autonomous Communities from the NPERMCH are being implemented. No reference has been found in relation to the works that should be developed under these guidelines, such as the elaboration of the Map of Cultural Heritage Risks in the Comunitat Valenciana and subsequent steps (such as the definition of measures or emergency intervention proposals). If those lines of action, research and documentation are indeed not being developed, this should be considered a major gap in the governance framework for heritage management and protection. In addition, it is of note that the NPERMCH does not explicitly consider natural heritage, which is at the core of the recognised heritage values shared by the Huerta and Albufera cultural peri-urban landscapes.

From the climate adaptation perspective, heritage protection is considered in the Regional Strategy and local *SECAP*, precisely in relation to the mentioned measures and actions involving the Huerta and Albufera. However, as mentioned previously, the lack of budget allocation to such measures and actions restricts their application, unless external funding can be secured or new budget lines made available, for instance after the passing of the new key pieces of legislation currently being drafted, such as the future national and regional Climate Change Laws. These regulations had been placed on hold at the time of writing due to the state of emergency arising from the COVID-19 pandemic.

The key strategies that will determine the alignment of the ARCH project's outcomes with Valencia's vision and policies are those developed by the municipal and regional departments of agriculture and climate change, and can be found in key documents such as the city's *SECAP* and the regional *Climate Change Strategy 2020-2030*. However, some gaps have been identified in relation to the basic scientific knowledge which should be available prior to developing any resilience strategy for Huerta and Albufera, such as a more detailed vulnerability analysis, or impact modelling on agriculture, aquatic and forest ecosystems, in order to be able to better assess the several meteorological, climatological, hydrological, biological and human-induced hazards identified. Due to the complexity and size of both geographical areas, further discussion with stakeholders is also needed in order to prioritize specific support needs which might be addressed via the ARCH project.

For this and other reasons, during the ARCH project's timeline an improved coordination of the stakeholders from Huerta and Albufera is envisioned. It is expected that improved coordination and cooperation among stakeholders, together with the knowledge that will be shared with Valencia city staff as part of the project, would improve Valencia's social, physical and economic resilience against climate hazards. It is also anticipated that collecting and

promoting evidence of the extent to which the Huerta and Albufera are able to mitigate the effects of climate change within the city may serve to highlight their importance and as such to further protect these and other natural (heritage) sites.

In addition, given that Valencia City already promotes a management discourse that recognises the role of green and blue infrastructure in responding to the current context of climate emergency, there is an opportunity here for the ARCH project to align with this agenda and support its realisation through decision support tools focused on the Huerta and Albufera.

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10. Annex

10.1. Key documents governing cultural heritage management (see Chapter 3)

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update	Link (if available)
Convention for the Safeguarding of the Intangible Cultural Heritage	Convention	International	Non-binding	United Nations Educational, Scientific and Cultural Organization (UNESCO)	2003	The Convention established (Article 16) a Representative List of Intangible Cultural Heritage of Humanity.	No relevant timelines for the Convention itself have been identified. The created list of intangible heritage elements is annually updated.	Convention: https://ich.unesco.org/en/convention List of Intangible Cultural Heritage https://ich.unesco.org/en/00011?type=00002#tabs
Report of the 39th Session of the Conference of FAO	Report	International	Non-binding	Food and Agriculture Organization of the United Nations (FAO)	2015	The Conference endorsed the Globally Important Agricultural Heritage Systems (GIAHS) initiative as FAO Corporate programme.	No relevant timeline for the GIAHS initiative itself has been identified. Proposals to join the initiative are evaluated several times a year by the programme Scientific Advisory Group.	http://www.fao.org/3/a-mo153e.pdf

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update	Link (if available)
European Framework for Action on Cultural Heritage	Commission staff working document	International	Non-binding	European Commission	2018	Framework of continued action for Europe's cultural heritage based on a holistic, mainstreaming and integrated approach, multi-stakeholder cooperation. Five areas of action: inclusiveness, sustainability, resiliency, innovation and reinforcement of global partnerships.	Implementation of the Framework will be monitored by the Cultural Heritage Forum, an informal Commission expert group meeting at least annually since 2019.	https://ec.europa.eu/culture/content/european-framework-action-cultural-heritage_en

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update	Link (if available)
European Landscape Convention	Agreement	International	Binding	Council of Europe	2000	Promotes the protection, management and planning of the landscapes and organizes international co-operation on landscape issues. Aware that the landscape contributes to the formation of local cultures and that it is a basic component of the European natural and cultural heritage, contributing to human well-being and consolidation of the European identity.		https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/143

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update	Link (if available)
Convention Concerning the Protection of the World Cultural and Natural Heritage	Agreement	International	Binding	UNESCO	1972	Provides a permanent framework – legal, administrative and financial – for international cooperation in safeguarding humankind’s cultural and natural heritage and introduces the specific notion of a “world heritage” whose importance transcends all political and geographic boundaries.		https://whc.unesco.org/en/convention-text/
European Convention on the Protection of the Archaeological Heritage (Revised)	Agreement	International	Binding	Council of Europe	1995	This revised Convention updates the provisions of a previous Convention adopted by the Council of Europe in 1969. The new text makes the conservation and enhancement of the archaeological heritage one of the goals of urban and regional planning policies.		https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/143

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update	Link (if available)
Law 16/1985 on Historical Heritage	Law	National	Binding	Head of State	1985	Protection, increase and transmission to future generations of Spanish Historical Heritage.		https://www.boe.es/eli/es/l/1985/06/25/16/con
Law 42/2007 on Natural Heritage and Biodiversity	Law	National	Binding	Head of State	2007	Basic legal framework of Spanish biodiversity and natural heritage conservation, sustainable use, improvement and restoration. National transposing legislation of several specific international regulations and recommendations.	The timeline of the first implementation plan of the Law (Plan Estratégico del Patrimonio Natural y la Biodiversidad) was 2011-2017. However, the second implementation plan has not yet been approved.	https://www.boe.es/buscar/act.php?id=BOE-A-2007-21490&p=20180721&tn=0
Law 4/1998, of 11 June, on Valencian Cultural Heritage	Law	Regional	Binding	Presidency of the Regional Government	1998. Several amendments and revisions since then.	Basic legal framework at regional level for public and private action in relation to the protection, conservation, dissemination, promotion, research and enhancement of the Valencian cultural heritage.		http://www.dogv.gva.es/es/disposicio-consolidada?signatura=1137/1998&idioma=es&L=1&url_lista=

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update	Link (if available)
General inventory of Valencia's cultural heritage	Inventory	Regional	Binding	Regional Department of Education, Culture and Sport	1998	List of cultural interest goods, goods of local relevance, movable goods of heritage relevance and intangible goods of local relevance.	Continuous updating	http://www.ceice.gva.es/es/web/patrimonio-cultural-y-museos/inventario-general
Law 5/2018 of the "Huerta" of Valencia	Law	Regional	Binding	Presidency of the Regional Government	2018	Basic regulatory framework of the "Huerta", including aspects such as land use, agricultural activity management and funding, improvement of living and working conditions of the people engaged in cultural activities and the preservation of the "Huerta".	Several time limits established in the law regarding the application of different provisions. Two years deadline for the own regional government in order to pass the necessary provisions to ensure the effective execution of the law.	http://www.dogv.gva.es/es/disposicion-consolidada?signatura=002588/2018&url_lista=

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update	Link (if available)
Regional Plan for the "Huerta" of Valencia	Plan	Regional	Binding	Regional Department of Housing, Public Works and Organisation of the Territory	2018	Land use plan in the "Huerta" of Valencia, including: report, maps, protection catalogue, norms, and landscape analysis.	Indefinite duration meanwhile not reviewed. To be updated at least every 4 years.	http://politicaterritorial.gva.es/es/web/planificacion-territorial-e-infraestructura-verde/pat-horta-de-valencia
Valencian Government Decree 71/1993, concerning the Albufera Natural Park legal regime	Regulation	Regional	Binding	Regional Department of the Environment	1993. Several amendments and revisions since then.	Natural Park designation and establishment of its basic legal framework.		http://www.dogv.gva.es/es/disposicio-consolidada?signatura=1546/1993&idioma=es&L=1&url_lista=

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update	Link (if available)
Valencian Government Decree 164/2016 designating Albufera traditional activities as intangible cultural heritage	Regulation	Regional	Binding	Regional Department of Education, Research, Culture and Sport	2016	Designation of artisan fishing and lateen sailing as intangible cultural heritage and establishment of arrangements for its protection and safeguarding.		http://www.dogv.gva.es/es/disposicio?sig=008555/2016&&L=1
Master Plan for the Use and Management of the Albufera Natural Park	Plan	Regional	Binding	Regional Department of Land and Housing	2004	Albufera Natural Park detailed use and management norms, including zoning.	Latest review process started in February 2020.	http://www.dogv.gva.es/es/disposicio?sig=5268/2004&&L=1
Regional tree heritage law	Law	Regional	Binding	Presidency of the Regional Government	2006	Establishment of a regulatory framework aiming at the conservation, dissemination, promotion, research and growth of the regional tree heritage of the Valencian Region.	An advisory committee is established, and should meet at least once per year.	http://www.dogv.gva.es/es/disposicio-consolidada?signatura=2845/2006&idioma=es&L=1&url_lista=

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update	Link (if available)
Regional inventory of heritage and notable trees	Inventory	Regional	Binding	Regional Department of Agriculture, Rural Development , Climate Emergency and Ecological Transition	2012. Several amendments and revisions since then.	List of trees and groups of trees protected because of age, size or local relevance reasons.	Continuous updating	http://www.agroambient.gva.es/documentos/20551003/163052224/Cat%C3%A0leg+d%27Arbres+Monumentals+i+Singulars+de+la+Comunitat+Valenciana/dc68cb0f-1b57-4a81-bc5d-b4415e328cc2
Catalogue of Protected Goods and Areas	Part of the city Masterplan simplified review	Local	Binding	Valencia City Council	2012	Protected goods and areas catalogue, required by existing land management laws (including: reports, maps, protection catalogues, norms, and summary sheets).		https://www.valencia.es/ayuntamiento/urbanismo.nsf/vDocumentosTituloAux/59554911F786991DC125798F003A1AB1?OpenDocument&bdOrigen=ayuntamiento%2Furbanismo.nsf&idapoyo=693E082FE52C3836C125798F0039D4DB&lang=1

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update	Link (if available)
Local ordinance regarding the Albufera Lagoon boat register	Regulation	Local	Binding	Valencia City Council	2002	Navigation regulation in the Albufera Lagoon, which is only allowed to traditional boats, including the establishment of a local register and the related administrative procedures.		https://sede.valencia.es/sede/download/doc/DOCUMENT_1_ORD0014_C

10.2. Table 2: Governance framework governing disaster risk reduction (see Chapter 4)

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
Sendai Framework	Agreement	International	Non-binding	United Nations Office for Disaster Risk Reduction (UNDRR)	2015	Establishment of a global framework for action to prevent new and reduce existing disaster risks, based on 7 targets, 4 priorities for action with supporting rationale and 13 guiding principles.	Valid until 2030. UNDRR is in charge of follow-up and review of the Sendai Framework by preparing periodic reviews on progress, among other actions.	http://www.unisdr.org/we/inform/publications/43291

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
Decision No. 1313/2013/EU	Policy / strategy	International	Binding	The European Parliament and The Council of The European Union	2013	Defines the various mechanisms that should promote solidarity and should support, complement, and facilitate coordination of Member States' actions in the field of civil protection with a view to improving the effectiveness of systems for preventing, preparing for and responding to disasters. Prevention is of key importance for protection against disasters and requires further action.		https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:347:0924:0947:EN:PDF
Decision 420/2019/EU	Policy / strategy	International	Binding	The European Parliament and The Council of The European Union	2019	Amendments to Decision No 1313/2013/EU on a Union Civil Protection Mechanism.		https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019D0420&from=EN

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
Directive 2007/60/EU	Guideline	International	Binding	The European Parliament and The Council of The European Union	2007	The purpose of this Directive is to establish a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods in the Community. It should be read together with Act no. 7/2010 Coll. on flood protection,		https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32007L0060

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
National Plan for Emergencies and Risk Management in Cultural Heritage (NPERMCH)	Plan	National	Non-binding	Department of Education, Culture and Sport	2015	Definition and implementation of preventive and remedial actions for cultural heritage protection against hazards, including risk identification, and programs and lines of action.	Valid for a period of 10 years. Objectives should be revised in 2020. A monitoring committee was established, and yearly monitoring reports should be published.	http://www.culturaydeporte.gob.es/planes-nacionales/planes-nacionales/emergencias-y-gestion-riesgos.html https://sede.educacion.gob.es/publiventa/descarga.action?f_codigo_agc=15107C
Albufera Natural Park Forest Fire Prevention Plan	Plan	Regional	Non-binding	Regional Department of Land and Housing	2006	Guiding document in relation to forest fire prevention in the Albufera Natural Park. Includes the analysis and diagnostic of current conditions, action plans for fire prevention and control, an economic and financial report, and specific cartography.	The economic and financial report was based on a 10-year timeframe since its approval/publication.	http://www.agroambient.gva.es/es/web/prevencion-de-incendios/planes-de-prevencion-de-incendios-forestales-de-la-red-de-espacios-naturales-prottegidos/-/asset_publisher/J8VsgHcswUqD/content/albufera

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
Lliria forest managment zone Forest Fire Prevention Plan	Plan	Regional	Non-binding	Regional Department of Government and Housing	2015	Guiding document in relation to forest fire prevention in the Lliria forest management zone. Includes the analysis and diagnostic of historical and current conditions, action plans for fire prevention and control, technical standards and instructions, an economic and financial report, and specific cartography.	2030	http://www.agroambient.gva.es/es/web/prevencion-de-incendios/planes-de-prevencion-de-incendios-forestales-de-demarcacion/-/asset_publisher/G7Yr70d2P4Cc/content/lliria?redirect=http%3A%2F%2Fwww.agroambient.gva.es%2Fes%2Fweb%2Fprevencion-de-incendios%2Fplan

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
Regional flood risk management plan (PATRICOVA)	Plan	Regional	Partially binding	Regional Department of Territorial Policy, Public Works and Mobility	2015	Sectoral plan for flood risk reduction including, among other, specific regulations, an action Plan, a list of high flood risk municipalities, cartography and an Implementation Guide.	Monitoring and implementation reports every two years. Future update once it is considered adequate according to the monitoring process.	http://politicaterritorial.gva.es/es/web/pla-nificacion-territorial-e-infraestructura-verde/patricova-plan-de-accion-territorial-de-caracter-sectorial-sobre-prevencion-del-riesgo-de-inundacion-en-la-comunitat-valenciana
Specific operating procedure regarding wildfires in the Devesa del Saler	Guideline	Local	Binding	Valencia City Council	2017	Definition of the resources and work plan involved in reaction to emergencies due to wildfires in the Devesa del Saler area of the Albufera.		http://www.valencia.es/ayuntamiento/bo-mberos.nsf/0/6DBD12EB83938BD7C125827A003B276F/\$FILE/PROCOP%2011%20INCENDIOS%20FORESTALES%20EN%20LA%20DEVESA%20DEL%20SALER.pdf?OpenElement&lang=1

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
Valencia city ordinance in relation to fire protection	Regulation	Local	Binding	Valencia City Council	2007	General and detailed standards in relation to fire protection, regime of sanctions.		https://sede.valencia.es/sede/download/doc/DOCUMENT_1_ORD0013_C

10.3. Table 3: Governance framework for climate adaptation (See Chapter 5)

Note: Strategies, policies, action plans etc. relevant for climate adaptation may also be found in plans developed for other purposes, e.g. master plans, environmental plans, and health plans.

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
Paris Agreement	Agreement	International	Binding	UNFCCC	2015-2016	The Paris Agreement builds upon the Convention and for the first time brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. As such, it charts a new course in the global climate effort.		https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
United Nations Framework Convention on Climate Change	Agreement	international	binding	The United Nations	1992	The ultimate objective of the Convention is to stabilize greenhouse gas concentrations at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system. It states that such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner		https://unfccc.int/process-and-meetings/the-convention/what-is-the-united-nations-framework-convention-on-climate-change

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
EU Climate Change Adaptation Strategy	Strategy	International (Europe)	Non-binding	European Commission	2013	Framework and mechanisms for improving the EU's preparedness for current and future climate impacts.	Last evaluated in 2018 (see report below). Update likely 2021.	https://ec.europa.eu/clima/policies/adaptation/what_en#tab-0-1
Evaluation of the EU strategy on adaptation to climate change	Report	International (Europe)	Non-binding	European Commission	2018	This report examines the process and the results of the evaluation of the strategy COM/2018/738, including the lessons learned from its implementation.		https://ec.europa.eu/clima/policies/adaptation/what_en#tab-0-1

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
National Climate Change and Energy Transition Law	Law	National	Binding	Department of Ecological Transition and Demographic Challenge	To be passed in 2020.	Basic national regulatory framework for climate change mitigation and adaptation.	Currently under final stages of drafting, prior to parliamentary procedure.	https://www.miteco.gob.es/es/prensa/ultimas-noticias/la-ley-de-cambio-clim%C3%A1tico-y-transici%C3%B3n-energ%C3%A9tica-entra-en-la-recta-final-de-su-tramitaci%C3%B3n-administrativa/tcm:30-506983
National Plan for Adaptation to Climate Change (PNACC)	Plan	National	Non-binding	Department of the Environment and Rural and Marine Affairs	2006	Reference framework for the coordination of public administrations in the development of activities regarding impact and vulnerability assessments and climate change adaptation in Spain.	Second PNACC to be adopted in 2020, including major updates.	https://www.miteco.gob.es/es/cambio-climatico/temas/impactos-vulnerabilidad-y-adaptacion/plan-nacional-adaptacion-cambio-climatico/

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
Third PNACC Work Programme (TPT)	Work Programmes	National	Non-binding	Department of the Environment and Rural and Marine Affairs	2014	In December 2013 the Third Work Programme was approved, which seeks to address climate change adaptation in a comprehensive manner.	The development of the PNACC is monitored through the elaboration of the Progress Reports, published in 2008, 2011, 2014 and 2018.	https://www.miteco.gob.es/es/cambio-climatico/temas/impactos-vulnerabilidad-y-adaptacion/3PT-PNACC-enero-2014_tcm30-70397.pdf
Strategy for adaptation to climate change on the Spanish coast	Strategy	National	Non-binding	Department of Agriculture, Fisheries, Food and the Environment.	2016	Adaptation strategy including a current diagnosis of the coast, setting of specific objectives, general guidelines and proposed measures, as well as an implementation and monitoring plan.	The development of adaptation actions until 2050 is proposed.	https://www.miteco.gob.es/es/costas/temas/proteccion-costa/estrategiaadaptacionccaprobada_tcm30-420088.pdf

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
Valencian Climate Change Strategy 2020-2030	Strategy	Regional	Non-binding	Regional Department of Agriculture, Rural Development , Climate Emergency and Ecological Transition	2019	Regional mitigation and adaptation strategy, including a list of potential measures and actions as well as a monitoring system.	2030. Monitoring system established, based on several indicators to be tracked via a new software application.	http://www.agroambient.gva.es/es/web/cambio-climatico/2020-2030

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
Territorial Plan for Green Infrastructure in the Coastline (PATIVEL)	Plan	Regional	Partially binding	Regional Department of Territorial Policy, Public Works and Mobility	2018	Coastline land use plan, based on several criteria such as climate change adaptation, including: Information and explanatory report, planning maps, landscape assessment, regulations, economic report, strategic environmental and territorial reports, beach inventory and its regulations, proposal of coastline regional path, protections catalogue.	Indefinite duration meanwhile not reviewed. To be updated at least every 20 years or earlier, according to a list of specified criteria.	http://politicaterritorial.gva.es/es/web/planificacion-territorial-e-infraestructura-verde/plan-de-accion-territorial-de-la-infraestructura-verde-del-litoral
Valencia Region Forest Plan (PATFOR)	Plan	Regional	Partially binding	Regional Department of Infrastructures, Land and the Environment	2013	Forest regional plan, including, among other, an analysis of the Valencian forest ecosystems climate change adaptation potential and a proposal of potential adaptation guidelines.	Indefinite duration. To be reviewed at least every 15 years.	http://www.dogv.gva.es/es/disposicio?sig=004345/2013&&L=1 http://www.agroambient.gva.es/es/web/medio-natural/patfor

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future evaluation/update)	Link (if available)
Valencia Sustainable Energy and Climate Action Plan (SECAP)	Plan	Local	Non-binding	Valencia City Council	2019	Developed within the framework of the Covenant of Mayors initiative, the SECAP includes, <i>inter alia</i> , an action plan including mitigation and adaptation actions.	2030	https://www.covenantofmayors.eu/about/covenant-community/signatories/overview.html?scity_id=11935
Climate Change Adaptation Plan Valencia 2050	Plan	Local	Non-binding	Valencia City Council	2017	The Valencia Adaptation Plan has been structured around 4 strategic objectives (adapting people, promoting a sustainable green economy, responsible management, and designing an attractive and efficient city) that will be implemented through 14 goals.		https://www.valencia.es/ayuntamiento/energias.nsf/0/8B7F4BFFA988C100C12581AF003BE403/\$FILE/PACCV_20170127.pdf?OpenElement&lang=1



D3.3 ARCH city baseline report - Hamburg

17 December 2021



Deliverable No.	D3.3
Work Package	WP3
Dissemination Level	PU
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Due date	2020-03-31
Actual submission date	2020-12-17
Status	For submission
Revision	3.0 (2021-12-17)
Reviewed by (if applicable)	Katherine Peinhardt (ICLEI)

This document has been prepared in the framework of the European project ARCH – Advancing Resilience of Historic Areas against Climate-related and other Hazards. This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 820999.

The sole responsibility for the content of this publication lies with the authors. It does not necessarily represent the opinion of the European Union. Neither the REA nor the European Commission are responsible for any use that may be made of the information contained therein.

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This project has received funding from the European Union’s Horizon 2020 research and innovation programme under Grant Agreement no. 820999.

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1. City profile

This section profiles the Free and Hanseatic City of Hamburg in general terms, and introduces the local areas where the ARCH focus sites are located. Information is provided at a city-wide level, in terms of land use, population demographics and economy, followed by a closer look at the area(s) in the immediate vicinity of the focus sites.

The *Free and Hanseatic City of Hamburg*, one of the 16 states of the German federation, is the second largest city in Germany with 1.8 million inhabitants. In terms of formal governance, it is both a municipality and a city-state within the Federal Republic of Germany. There is no distinction between these administrative levels, meaning that the city-wide government of Hamburg is organised at the state-level. Furthermore, the city consists of seven districts with their own local parliaments who make decisions in matters of local importance (see Figure 1 below).



Figure 1. The seven districts of Hamburg (above map indicates size in hectares). Source: Bodenflächen in Hamburg am 31.12.2018 nach Art der tatsächlichen Nutzung; Published Oct. 2019; Statistisches Amt für Hamburg und Schleswig Holstein (<https://www.statistik-nord.de/fil>)

1.1. Land use

In total, Hamburg covers a surface area of 755.09 km². The size of the city is continuously growing.

In 2018, 46.4% of Hamburg's land area consisted of settlement areas, of which the largest part, 22.2%, is used for housing. Industrial and commercial areas account for 8.9% in Hamburg, while recreational areas in the city as a whole account for 6.6% and sports and leisure areas for 1.8%. Cemeteries account for 1.1% of Hamburg's total land area, the largest being the Ohlsdorf Park Cemetery. The remaining vegetation covers a total area of 24,833

hectares and accounts for 32.9% of the total area. These are primarily agricultural areas, which represent 23%, while forests make up 5.3% and woody plants 2.6%.

At a total of 9447 hectares, transportation routes in Hamburg account for 12.5% of the total land area. General roads account for 8.8% and other transport routes for a further 0.8%, while public squares account for 0.22%. Rail lines take up 1.41% of the space, airports 1.26%, and shipping infrastructure outside the waterways 0.01%.

A significant proportion of Hamburg is made up of water bodies, with 6157 hectares of the total area, a total of 8.1%. Of this, 5.7% is all watercourses and just under 1% is the harbour basin. Standing water accounts for just under 1% and the share of the sea is just over 0.5%.¹

1.2. Demographic features

1.2.1. Population growth

The population of Hamburg had fallen from 1.7 million in 1939 to about 1.0 million by the end of the Second World War, but climbed up to 1.5 million already again by the end of 1948. This rapid growth comprised of refugees from the East German territories, returning evacuees from the countryside and former prisoners of war.² By 1970, just under 1.8 million inhabitants were living in Hamburg again. In the years that followed until the mid-1980s, the population fell to around 1.6 million, and from then on grew steadily (including a significant increase in residents from other countries in 2016), reaching 1,841,179 in total in 2018.³

A further increase in population is forecasted for the future. The estimated growth of the population through 2040 depends on different calculation models: With low immigration models, it is estimated that 1.949 million people will be living in Hamburg by 2040; with moderate immigration up to 1.988 million; and with a high immigration rate 2.051 million. Beyond 2040 the future prospective growth rates are declining for all scenarios, due to a lower birth rate than cases of death.

The rate of growth of the population is different depending on age groups, so the structure of ages among the population is expected to change in the future. While more young and elderly people are expected, the number of people who are able to work will decline in the scenarios for low and moderate immigration.⁴

¹ Bodenflächen in Hamburg am 31.12.2018 nach Art der tatsächlichen Nutzung; Published Oct. 2019; Statistisches Amt für Hamburg und Schleswig Holstein (https://www.statistik-nord.de/fileadmin/Dokumente/Statistische_Berichte/andere_statistiken/A_V_1_H_gebiet_flaeche/A_V_1_j18_HH.pdf)

² Geschichtsbuch Hamburg; Nachkriegszeit und Fünfziger Jahre; <https://geschichtsbuch.hamburg.de/epochen/nachkriegszeit/>

³ Handelskammer Hamburg: Entwicklung der Bevölkerung in Hamburg; <https://www.hk24.de/produktmarken/beratung-service/konjunktur-statistik/hamburger-wirtschaft-zahlen/bevoelkerung-3676958>

⁴ Homepage Statistikamt NordSource: https://www.statistik-nord.de/fileadmin/Dokumente/Presseinformationen/SI19_089.pdf, last visited Jan. 15, 2020

1.2.2. Age and sex

Hamburg's growing population of roughly 1.8 million is made up of slightly more females than males (902,048 male and 939,131 females as of August 2019).

The map in figure 2 illustrates where people aged 65 and over were living in Hamburg in 2014. Most were located on the outskirts of Hamburg in the north and west parts of the city. The number of people aged 80 and over is predicted to grow between 2017 and 2040 from 99,000 (about 5.34% of the population) up to 135,000 people, i.e. roughly an increase of a third (corresponding to a slight proportional increase to make up 6.92% of the overall population, based on the conservative growth scenario outlined above), which can be partly attributed to expected increases in life expectancy (i.e. among newborn boys by 3.4 and among girls by 2.8 years).⁵ The life expectancy of boys born in Hamburg increased since a previous calculation from 1986/1988 up to 5.8 years until 2011. It increased for girls who were born in Hamburg up to 4.1 years within the same period (1986/1988 – 2011). In 2011 (latest update in Hamburg) the life expectancy for newborn boys was 77.6 years and for newborn girls 82.7 years.⁶

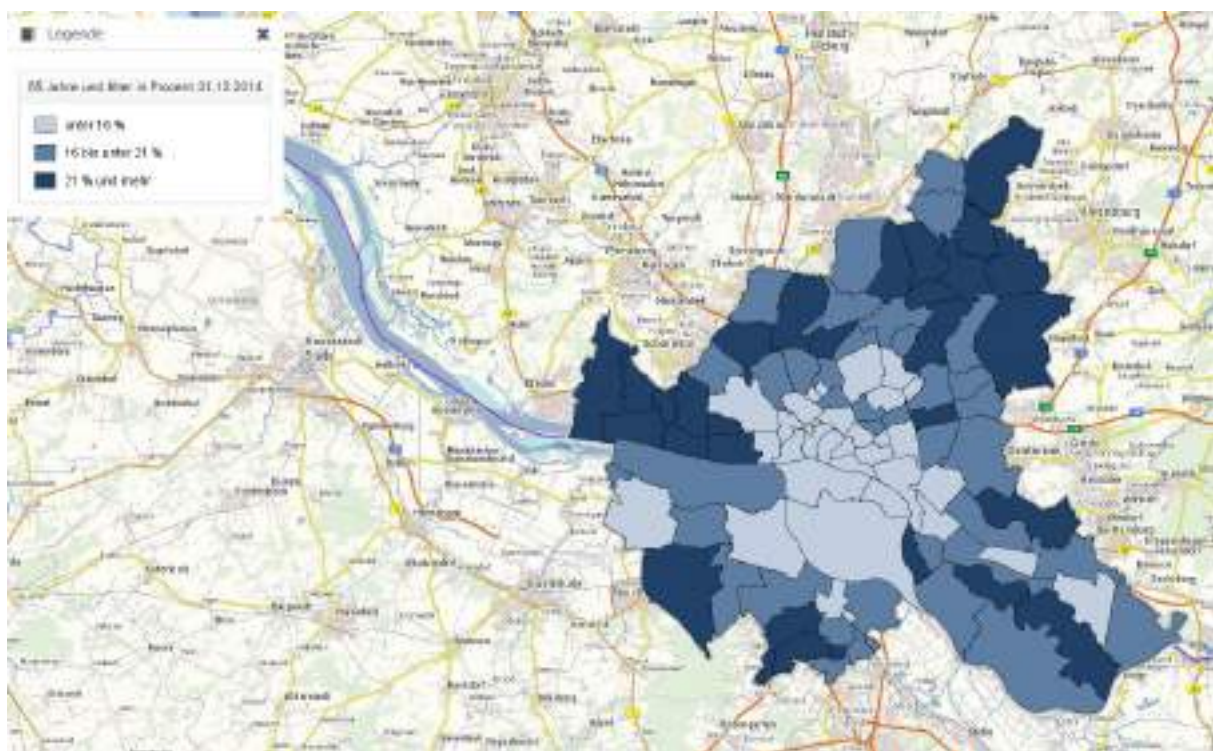


Figure 2 Population distribution of people 65 years old and over; Geoportal Hamburg <https://geoportal-hamburg.de/Geoportal/geo-online/#>

⁵ Homepage Statistikamt NordSource: https://www.statistik-nord.de/fileadmin/Dokumente/Presseinformationen/SI19_089.pdf, last visited Jan. 15, 2020

⁶ Source: Statistikamt Nord 2015 based on Census 2011

Inhabitants in 2019	Sex	Age bracket										
		In total	0 - 3	3 - 6	6 - 12	12 - 18	18 - 20	20 – 30	30 – 45	45 – 60	60 – 65	65 - <
District	male	158 250	5 133	4 428	7 893	7 735	2 988	26 381	41 871	34 441	8 048	19 332
Hamburg-Mitte	female	143 296	4 785	4 305	7 313	7 138	2 705	24 570	35 002	26 893	7 085	23 500
	All	301 546	9 918	8 733	15 206	14 873	5 693	50 951	76 873	61 334	15 133	42 832
Percentage rate	%	15.9										
District	male	133 004	4 573	4 625	8 432	7 805	2 619	16 000	30 710	30 503	6 812	20 925
Altona	female	142 261	4 396	4 374	7 932	7 439	2 495	16 394	32 647	31 084	7 264	28 236
	All	275 265	8 969	8 999	16 364	15 244	5 114	32 394	63 357	61 587	14 076	49 161
Percentage rate	%	14.5										
District	male	127 671	4 338	4 065	6 780	6 043	2 169	16 925	31 168	28 170	6 425	21 588
Eimsbüttel	female	139 382	4 028	3 800	6 339	5 710	2 148	19 411	33 060	28 807	7 363	28 716
	all	267 053	8 366	7 865	13 119	11 753	4 317	36 336	64 228	56 977	13 788	50 304
Percentage rate	%	14.0										
District	male	151 279	5 237	4 279	6 811	6 020	2 240	23 723	41 783	32 851	7 215	21 120
Hamburg-Nord	female	163 316	4 968	4 150	6 561	5 623	2 134	27 836	42 237	32 248	7 975	29 584
	all	314 595	10 205	8 429	13 372	11 643	4 374	51 559	84 020	65 099	15 190	50 704
Percentage rate	%	16.5										
District	male	213 697	6 894	6 861	12 725	12 620	4 482	26 198	43 693	47 232	12 399	40 593
Wandsbek	female	227 318	6 563	6 685	12 309	11 655	4 319	25 180	45 082	47 770	13 310	54 445
	all	441 015	13 457	13 546	25 034	24 275	8 801	51 378	88 775	95 002	25 709	95 038
Percentage rate	%	23.2										
District	male	64 184	2 198	2 238	3 946	3 946	1 380	8 623	13 593	14 036	3 762	10 462
Bergedorf	female	66 076	2 030	2 072	3 743	3 728	1 371	7 712	13 435	14 081	4 025	13 879
	all	130 260	4 228	4 310	7 689	7 674	2 751	16 335	27 028	28 117	7 787	24 341
Percentage rate	%	6.8										
District	male	85 553	3 022	2 829	5 136	4 800	1 943	13 920	19 498	17 044	4 315	13 046
Harburg	female	83 873	2 886	2 793	4 736	4 653	1 722	11 917	17 297	16 221	4 525	17 123
	all	169 426	5 908	5 622	9 872	9 453	3 665	25 837	36 795	33 265	8 840	30 169
Percentage rate	%	8.9										
Hamburg	male	933 638	31 395	29 325	51 723	48 969	17 821	131 770	222 316	204 277	48 976	147 066
In total	female	965 522	29 656	28 179	48 933	45 946	16 894	133 020	218 760	197 104	51 547	195 483
	all	1 899 160	61 051	57 504	100 656	94 915	34 715	264 790	441 076	401 381	100 523	342 549
Percentage rate	%	100	3.2	3.0	5.3	5.0	1.8	13.9	23.2	21.1	5.3	18.0

Table 1 Population figures staggered by districts, age groups and sex in Hamburg (2019) (Source: Statistikamt Nord, Statistischer Bericht AI / S 1 – j 19 HH; S. 4ff.; (https://www.statistik-nord.de/fileadmin/Dokumente/Statistische_Berichte/bevoelkerung/A_I_S_1

1.2.3. Population density

Population density is distributed very differently among the seven districts and 105 quarters of the city of Hamburg. The district of Wandsbek in the north-west is the most densely populated, containing 23.2% of the total population (see Figure 3 below). In terms of land area, Wandsbek is the second largest of Hamburg's seven districts after Bergedorf. As Figure 3 shows, according to the colour gradation of grey, Wandsbek is much more densely populated than Bergedorf in the south-west, where only 6.8% of all Hamburg residents live and where most of the agricultural activity in the state is carried out. The map also shows the port area of Hamburg along the Elbe. There, correspondingly, large industrial areas along the waterways predominate, which is why only 8.9% of all Hamburg residents live in the large southern district of Harburg.⁷



Figure 3 Population density distribution in the 105 Hamburg city quarters (2019); Statistikamt Nord, Statistischer Bericht AI / S 1 – j 19 HH; S. 3; https://www.statistik-nord.de/fileadmin/Dokumente/Statistische_Berichte/bevoelkerung/A_I_S_1_j_H/A_I_S1_j19.pdf)

⁷ Statistikamt Nord, Bevölkerungszahlen Hamburg vom 31.12.2019; https://www.statistik-nord.de/fileadmin/Dokumente/Statistische_Berichte/bevoelkerung/A_I_S_1_j_H/A_I_S1_j19.pdf

1.2.4. Vulnerable groups

In Germany, the poverty rate in 2018 averaged 15.5% of the total population. If we look at Hamburg in the chart comparing the individual federal states (Table 2 below), the city with a rate of 15.3% is thus in the top third of those federal states with the lowest poverty rate. However, this positive picture conceals the fact that Hamburg, compared with the other federal states, has seen the third-highest increase in the poverty rate over the past ten years from 2008 to 2018 (after Hesse and North Rhine-Westphalia), at over 16%. According to the 2019 Poverty Report of the Paritätischer Gesamtverband, the following groups in society in general are particularly threatened by poverty in Germany:

*"These are children and young adults under 25 years of age, women, single-person households, single parents, couple households with three or more children, unemployed persons, pensioners, persons with low qualification levels as well as persons without German citizenship and persons with migration background"*⁸

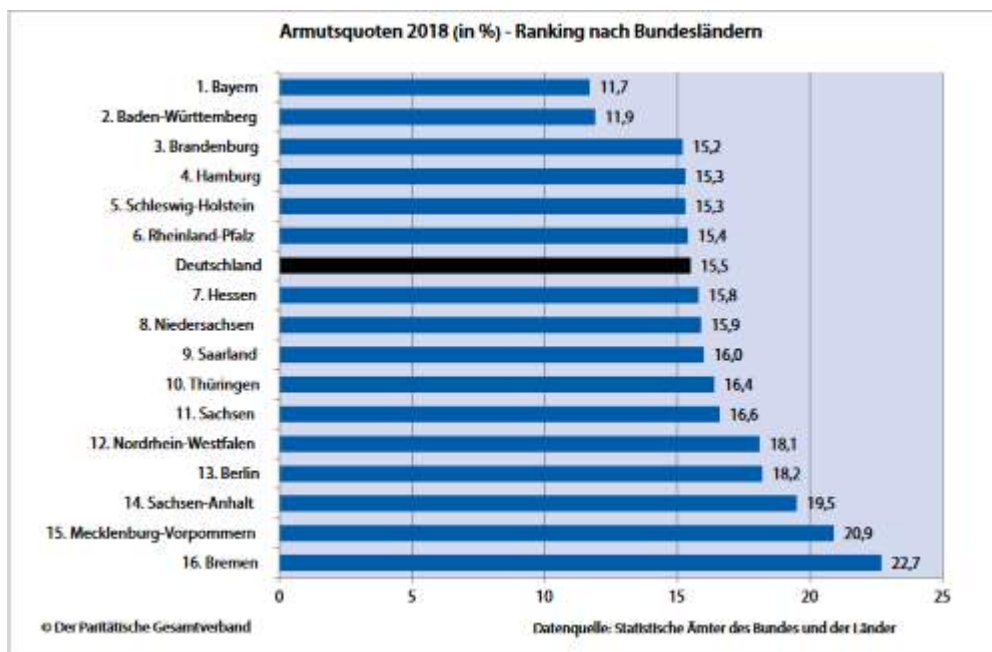


Table 2 Poverty Index Ranking of all federal states in Germany 2018: Der Paritätische Gesamtverband - Armutsbericht 2019, P. 9 <http://www.der-paritaetische.de/armutsbericht/>

By the end of 2019, 4% more senior citizens in Hamburg were also dependent on so-called "basic social security" than in the previous year. This basic provision is intended to enable senior citizens who have reached statutory retirement age to cope with the daily costs of living by means of additional state benefits if the individual old-age pension alone does not make this possible. At the end of 2019, this age was 65 years and 8 months. It will be increased by one month every year. According to the Northern Statistical Office, it was primarily women

⁸ Pieper, Schneider, Schröder, Stilling: Der Paritätische Gesamtverband - Armutsbericht 2019, P. 34 <http://www.der-paritaetische.de/armutsbericht/>

(54%) who were dependent on a basic pension. More than half of the men and women in Hamburg who were dependent on basic social security were previously unemployed.⁹

According to the dissertation of Giedrion Kaveckis (Hamburg, 2017) vulnerable population groups from the perspective of climate impacts can be defined in many different ways. People in a community may be exposed to the risk of an environmental hazard (e.g. a landslide, or air pollution) or a climatic hazard (e.g. flooding or extreme heat). However, not everyone is vulnerable to the same extent. A range of factors affect a person's vulnerability, including access to support networks (e.g. friends, family, social services), income (especially risk of poverty), age, ability, health and gender – some of which may in turn determine where someone lives, as restrictions on financial freedom or mobility are likely to limit options. Where one lives, and the particular characteristics of that area (e.g. the degree to which it is protected from extreme weather such as flooding or heat), can in turn be a key determinant of vulnerability, even if a person spends the day at other locations for work or other reasons.¹⁰

In the case of the ARCH focus areas in Hamburg, which are its Speicherstadt and the Kontorhausviertel, housing is not permitted at all, and only a low number of households are located in close proximity, suggesting that the climatic and environmental risks of relevance to this area, as well as any measures planned to address these, are unlikely to impact directly upon resident vulnerable groups. Nonetheless, both areas are in regular use by people working in commercial buildings, as well as visitors to public spaces who access and use these spaces in different ways, and their needs warrant consideration. In addition, impacts and associated risk mitigation measures within this area may have significant indirect consequences for other parts of the city, e.g. redirection of stormwater to prevent flooding in Speicherstadt may cause flooding elsewhere. Taking a broader view of these sites in the context of the wider city itself, made up of a number of inter-linked systems, can help to ensure the recognition of these connections and aim for more holistic and integrated planning.

Kaveckis defined the vulnerable areas of the city of Hamburg according to a range of indicators, including population characteristics and access to healthcare facilities: "In most of the cases, the eastern areas of Hamburg City would experience the highest relative vulnerability, mainly due to higher concentration of older population and welfare recipients. Along the outskirts of Greater Hamburg, the eastern and southern areas would also be vulnerable, because of higher monthly average minimum, maximum temperatures and the long distance to the closest healthcare facility. The sensitivity analysis has shown that climate data from other global climate models would cause 225% higher average vulnerability, meanwhile the increase of older population by 0,5 of standard deviation would cause higher average vulnerability by only 18%."¹¹

⁹ Statistikamt Nord: https://www.statistik-nord.de/fileadmin/Dokumente/Presseinformationen/SI20_109.pdf

¹⁰ Kaveckis, G.: Modelling future population's vulnerability to heat waves in Greater Hamburg; (2017), pg. 7; <http://ediss.sub.uni-hamburg.de/volltexte/2017/8738/>

¹¹ Kaveckis, G.: (2017), pg. iii of the abstract; <http://ediss.sub.uni-hamburg.de/volltexte/2017/8738/>

Aside from scientific studies such as Kaveckis's dissertation above, and a vulnerability study concerning storm surges, inland flooding and heavy rains by the Hamburg Institute of International Economics (HWWI) in 2015 (<http://hdl.handle.net/10419/119458>), no official information or spatial mapping concerning specific vulnerable population groups in relation to climate change hazards or effects on the city of Hamburg was identified for this study. But especially concerning any kind of flooding events Hamburg provides a huge range of information.

1.2.5. Income structure in Hamburg

In Hamburg there is a much greater gap in the distribution of income among the population than in other major German cities. This is reflected less clearly in a calculated poverty quotient than in the morphology of the different city districts / quarters. According to the Statistics Office North, there was an annual taxable income discrepancy between the city districts "from 13 777 euros to 120 716 euros per taxable person"¹² in 2013 (a married couple assessed jointly for tax purposes is deemed to be one taxable person). "As the map shows, the five city districts with the highest values each have an average income of at least 93 310 euros per taxpayer. These are the three Elbe suburbs Nienstedten (120,716 euros), Blankenese (117,139 euros) and Othmarschen (108,258 euros) as well as Harvestehude (111,088 euros) and Wohldorf-Ohlstedt (94,234 euros)".¹³ The city districts with the apparently lowest incomes are located in the city centre and belong to the major districts of Hamburg-Mitte and Harburg. Some of them are directly adjacent to our study area, which for the most part belongs to the HafenCity district.¹⁴ However, the city districts of Kleiner Grasbrook, Steinwerder and Veddel also have either very few residents or none at all due to their industrial character.

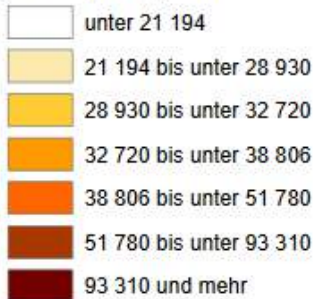
¹² Statistikamt Nord; https://www.statistik-nord.de/fileadmin/Dokumente/Statistik_informiert_SPEZIAL/SI_SPEZIAL_VIII_2017.pdf

¹³ Statistikamt Nord; https://www.statistik-nord.de/fileadmin/Dokumente/Statistik_informiert_SPEZIAL/SI_SPEZIAL_VIII_2017.pdf

¹⁴ Statistikamt Nord; https://www.statistik-nord.de/fileadmin/Dokumente/Statistik_informiert_SPEZIAL/SI_SPEZIAL_VIII_2017.pdf

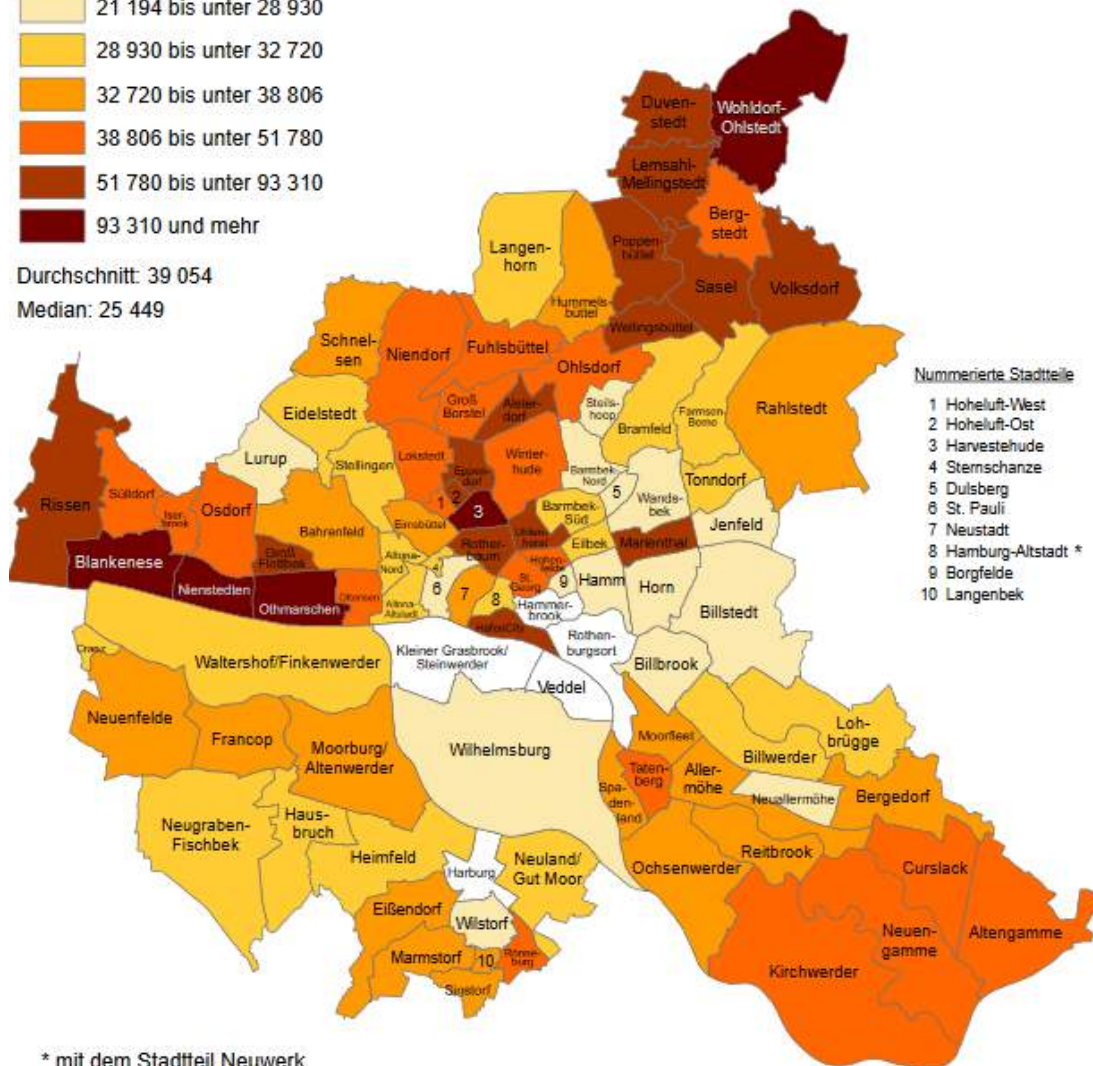
Durchschnittliche Einkünfte in den Hamburger Stadtteilen 2013

Gesamtbetrag der Einkünfte
je Steuerpflichtigen in Euro



Durchschnitt: 39 054

Median: 25 449



* mit dem Stadtteil Neuwerk

Quelle: Lohn- und Einkommensteuerstatistik 2013

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Figure 4 Average income in the Hamburg city districts; Statistikamt Nord 2013; https://www.statistik-nord.de/fileadmin/Dokumente/Statistik_informiert_SPEZIAL/SI_SPEZIAL_VIII_2017.pdf

1.2.6. Economic features

The gross domestic product of Hamburg in 2018 was around 118.91 billion euros.¹⁵ The average annual economic growth rate in Hamburg was rounded to 2.8%, based on calculations of the Ministry of Economy, Transport and Innovation.¹⁶ Gross value added at market prices for the year 2018 was composed of the following economic sectors:

- o Trade, transport, hospitality, information and communication
- o Financial and business services, real estate
- o Public and other services, education and health care system
- o Manufacturing industry, excluding construction.¹⁷

Services in Hamburg make by far the largest contribution to gross value added (as of 2018) with 12.2%. Overall, the share of services in the total gross value added in current prices in Hamburg amounts to 73.6%.¹⁸

Employed persons in 2018 in Hamburg (per 1000 persons)

Employed persons in total:	1260.1	100%
Self-employed persons:	117.4	9.32%
Employees:	1142.6	90.68%
Whereof marginal employed persons:	109.7	8.71%
Agriculture and Forestry, Fisheries:	1.7	0.13%
Production industry without construction industry:	119.7	9.50%
Whereof manufacturing industries:	105.4	8.36%
Construction Industry:	40.0	3.17%
Trade, transport, hospitality industry, information and communication:	408.7	32.34%
Financial and corporate service providers, real estate sector:	319.4	25.35%
Public and other service providers, education, health:	370.6 ¹⁹	29.41%

¹⁵ Homepage Statista: <https://de.statista.com/statistik/daten/studie/5014/umfrage/entwicklung-des-bruttoinlandsprodukts-von-hamburg-seit-1970/>

¹⁶ Homepage Statistische Ämter des Bundes und der Länder: <https://www.statistik-bw.de/VGRdL/tbls/tab.jsp?rev=RV2019&tbl=tab01&lang=de-DE#tab02>

¹⁷ https://www.statistik-nord.de/fileadmin/Dokumente/Statistische_Berichte/wirtschaft_und_finanzen/P_I_1_j_H/P_I_1_2_j18_HH.pdf page 6

¹⁸ Arbeitskreis "Volkswirtschaftliche Gesamtrechnungen der Länder" im Auftrag der Statistischen Ämter der 16 Bundesländer, des Statistischen Bundesamtes, Statistik und Wahlen: Bruttoinlandsprodukt, Bruttowertschöpfung in den Ländern der Bundesrepublik Deutschland 1991 bis 2019, Reihe 1, Länderergebnisse Band 1, Frankfurt a.M., März 2020; from data sheet 2.4 onwards. <https://www.statistik-bw.de/VGRdL/tbls/RV2019/R1B1.zip>

¹⁹ Source: https://www.statistik-nord.de/fileadmin/Dokumente/Statistische_Berichte/wirtschaft_und_finanzen/P_I_1_j_H/P_I_1_2_j18_HH.pdf

In 2019 the city of Hamburg had in total an unemployment rate of 6.1%.²⁰ In the specific area of the World Heritage Site, which belongs partly to the so called HafenCity, the rate was less than 4.11% in 2014.



Figure 5 Rate of unemployment is less than 4.11% in the HafenCity quarter (centre of the figure) and comparably low to its surroundings. Map: <https://geoportal-hamburg.de/Geoportal/geo-online/#>

In June 2020 the youth unemployment rate of young people from 15 to under 25 years old was 8.7% in Hamburg. It is unclear whether this rate is already influenced by the Covid-19-pandemic impacts on the economy of the city.²¹

1.3. Around the focus sites: Speicherstadt and Kontorhausviertel

The historic areas in focus for the ARCH project are UNESCO World Heritage Sites: the Speicherstadt and the Kontorhausviertel. The Speicherstadt, which borders the Hamburg city centre, is a former warehouse complex of the port of Hamburg, and has been part of the newly developed HafenCity district since 2008. Overall, this area is characterised by retail and offices, gastronomy and cultural facilities, and it is one of the most important areas in the entire city, particularly in terms of tourism.

The public space is mainly characterised by the water of the port of Hamburg and the numerous canals that run through the city and this area. Green areas exist only in very small numbers in this urban environment. Park-like zones do not exist in this district.

²⁰ Homepage Statista <https://de.statista.com/statistik/daten/studie/762326/umfrage/arbeitslosenquote-in-hamburg/>

²¹ Agentur für Arbeit, Monthly report, June 2020, page 14 https://www.arbeitsagentur.de/datei/arbeitsmarktbericht-juni-2020-_ba146561.pdf



Figure 6 The number of households surrounding our research area are less than 2000. The inscribed World Heritage Site (Kontorhausviertel and Speicherstadt) are in the centre of the figure marked as a light brown coloured layer. Map: <https://geoportal-hamburg.de/>

In neighbouring HafenCity, there were a total of 2121 households with 4592 inhabitants as of December 31, 2018. Of these, 47.6% of residents were female and 52.4% male. According to estimates, 45.8% have a migration background, while the number of residents with dual citizenship was 1,326 in 2018.

The population structure of HafenCity is made up as follows: The group of people up to 17 years of age numbers 908 (19.8%), the 18-24 year olds make up 405 (8.8%) and the 25-29 year olds 468 (10.2%). Meanwhile, the population structure of HafenCity is dominated by the 30 - 49 year olds, who make up 1736 (37.8%), which means that the average age of the population in this part of town is 35.7 years. The 50 - 64 year olds make up 651 inhabitants (14.2%) and those over 65 years of age make up 424 inhabitants (9.2%).

This means that in 2018 the birth rate in this district, with 68 live births, was significantly higher than the death rate of 9 deceased people overall.²²

Less than 10% of the residents of the HafenCity quarter are older than 65 years and about twenty percent of the households have children, up to 17 years of age.

²² Homepage Regionaldaten für HafenCity: <http://region.statistik-nord.de/detail/10000000000000/2/1715/227679/>

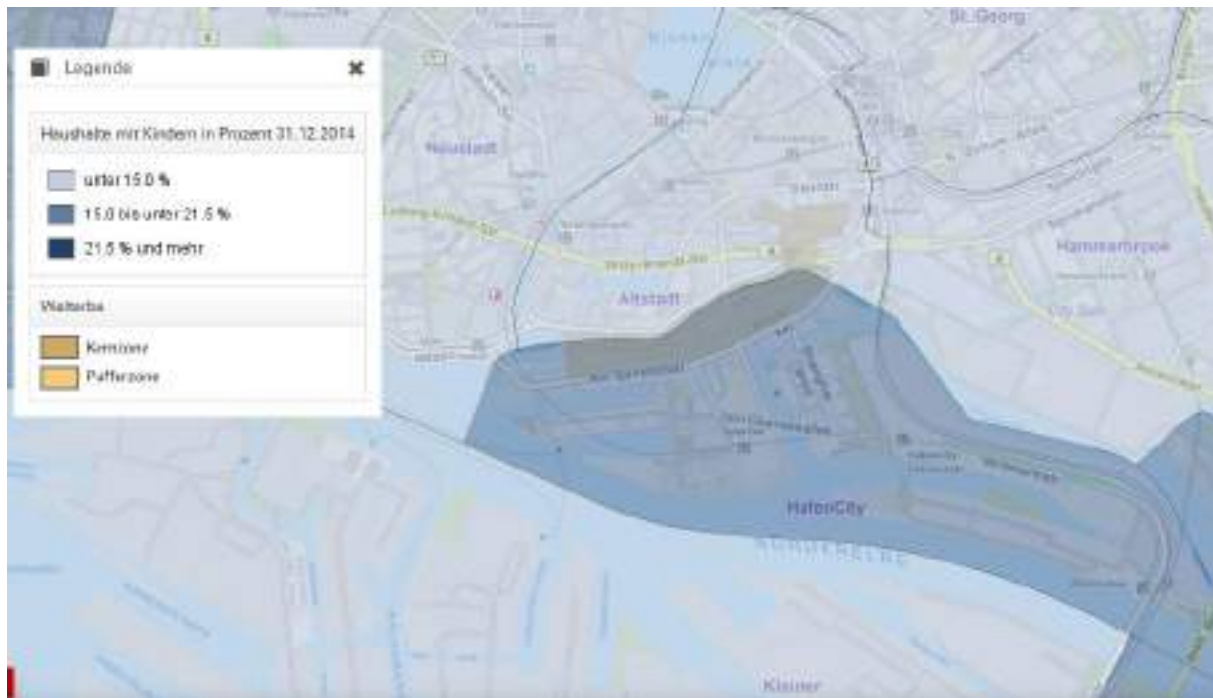


Figure 7 Households with children in the nearby surroundings of our focus area make up about 20% of all households. Map: <https://geoportal-hamburg.de/Geoportal/geo-online/#>

Besides the small number of residents living in the vicinity, these historic sites receive many visitors on a daily basis. Among them are also people of all ages, including seniors and children, but there are no numbers available. The whole area is open and free to enter for everybody. Regular daily visitors include employees working in the area.

1.4. Overview of existing local framework for disaster risk reduction, climate adaptation and cultural heritage management

The boxes ticked below provide a preliminary overview of the local policy framework in regard to disaster risk reduction, climate adaptation and cultural heritage management (specifically, which information has already been mapped), which will be expanded upon in Chapters 3, 4 and 5.

- ☒ *Emergency response procedures and responsibilities in the city*
- ☒ *Existing adaptation measures, strategies and key legislation in the city*
- ☒ *Existing cultural heritage protection measures, strategies and key legislation in the city*
- ☒ *Existing databases on climate risk information for the city*
- ☒ *Decision-making structures in the city regarding adaptation*
- ☒ *Decision-making structures in the city regarding cultural heritage protection*
- ☒ *Inventory of heritage assets and their condition*

2. Target historic areas identified for ARCH

2.1. Overview

Speicherstadt and the adjacent Kontorhausviertel, the two target historic areas that have been identified for focus as part of the ARCH project, are two densely-built, central urban areas.

2.1.1. Description of the physical area

Speicherstadt, originally developed on a 1.1 km-long group of narrow islands in the Elbe River between 1885 and 1927 (and partly rebuilt from 1949 to 1967), is one of the largest unified historic port warehouse complexes in the world, at a total area of 300,000 m². The adjacent Kontorhausviertel is a cohesive, densely-built area made up mainly of eight very large office complexes that were built from the 1920s to the 1950s to house businesses engaged in port-related activities. Together, these neighbouring districts represent an outstanding example of a combined warehouse-office district associated with a port city. Speicherstadt, the “city of warehouses,” includes 15 very large warehouse blocks that are inventively historicist in appearance but advanced in terms of the technical installations and equipment that they house. The area also includes six ancillary buildings and a connecting network of streets, canals and bridges. Anchored by the iconic Chilehaus, the Kontorhausviertel’s massive office buildings stand out for their early Modernist brick-clad architecture and their unity of function. The Chilehaus, Messberghof, Sprinkenhof, Mohlenhof, Montanhof, former Post Office Building at Niedernstrasse 10, Kontorhaus Burchardstrasse 19-21 and Miramar-Haus attest to architectural and city-planning concepts emerging in the early 20th century. The effects engendered by the rapid growth of international trade at the end of the 19th century and the first decades of the 20th century are illustrated by the outstanding examples of buildings and ensembles that are found in these two functionally complementary districts.²³

The design of the Speicherstadt is a uniform structure with slight differences between individual building structure types, long stretches of brick and clinker buildings with landside access and waterside access via canals. The foundation consists of approximately 1.2 million pine piles with a depth of up to 12 metres in the ground. The construction is mostly based on a skeleton construction, initially an iron grid structure, which was changed to a wooden beam structure with oak supports due to danger of collapse in the event of fire. During the third phase of construction, concrete-encased iron pillars were used, while in reconstruction and new construction after World War II reinforced concrete was used.²⁴ For an entire overview of the physical area please visit <https://welterbefest.hamburg/>.

²³ Homepage UNESCO: <https://whc.unesco.org/en/list/1467/>

²⁴ Homepage Hamburg World Heritage Site with Press releases: <https://www.hamburg.de/welterbe/10055086/presse-unesco/>



Figure 8 Official World Heritage Site area with Kontorhausviertel, canals and Speicherstadt marked by brown coloured layer (May 2020). Source: <https://geoportal-hamburg.de/Geoportal/geo-online/#>

Dark red: Buildings of heritage value

Light brown area: Inscribed UNESCO World Heritage Site (ARCH-relevant zone)



Figure 9 Impression of the illuminated Speicherstadt with Wasserschloss in the middle (source: City of Hamburg, Heritage Preservation Department)

2.2. Stakeholders

There are various stakeholders involved in different and/or overlapping aspects concerning the maintenance of the World Heritage Site, along with its buildings and infrastructure, including:

- Department of Heritage Conservation / Urban Heritage Conservation, City of Hamburg
- Ministry of Urban Development and Housing, City of Hamburg
- Ministry of Environment and Energy, City of Hamburg
- Ministry of Economy, Transport and Innovation, City of Hamburg
- Ministry of Internal Affairs and Sports, City of Hamburg
- Projekt – Realisierungsgesellschaft mbH (City-owned company)
- Owner of most of the warehouse district buildings: HHLA (Hamburger Hafen und Logistik AG)
- Borough of Hamburg Mitte
- Hamburg Port Authority
- Agency for Roads, Bridges and Waters in Hamburg, Germany

These and other key stakeholders have been mapped by the authors (see Table 3 below) and more detail will be provided in forthcoming report, *Local Partnership and Work Plan* (D3.2).

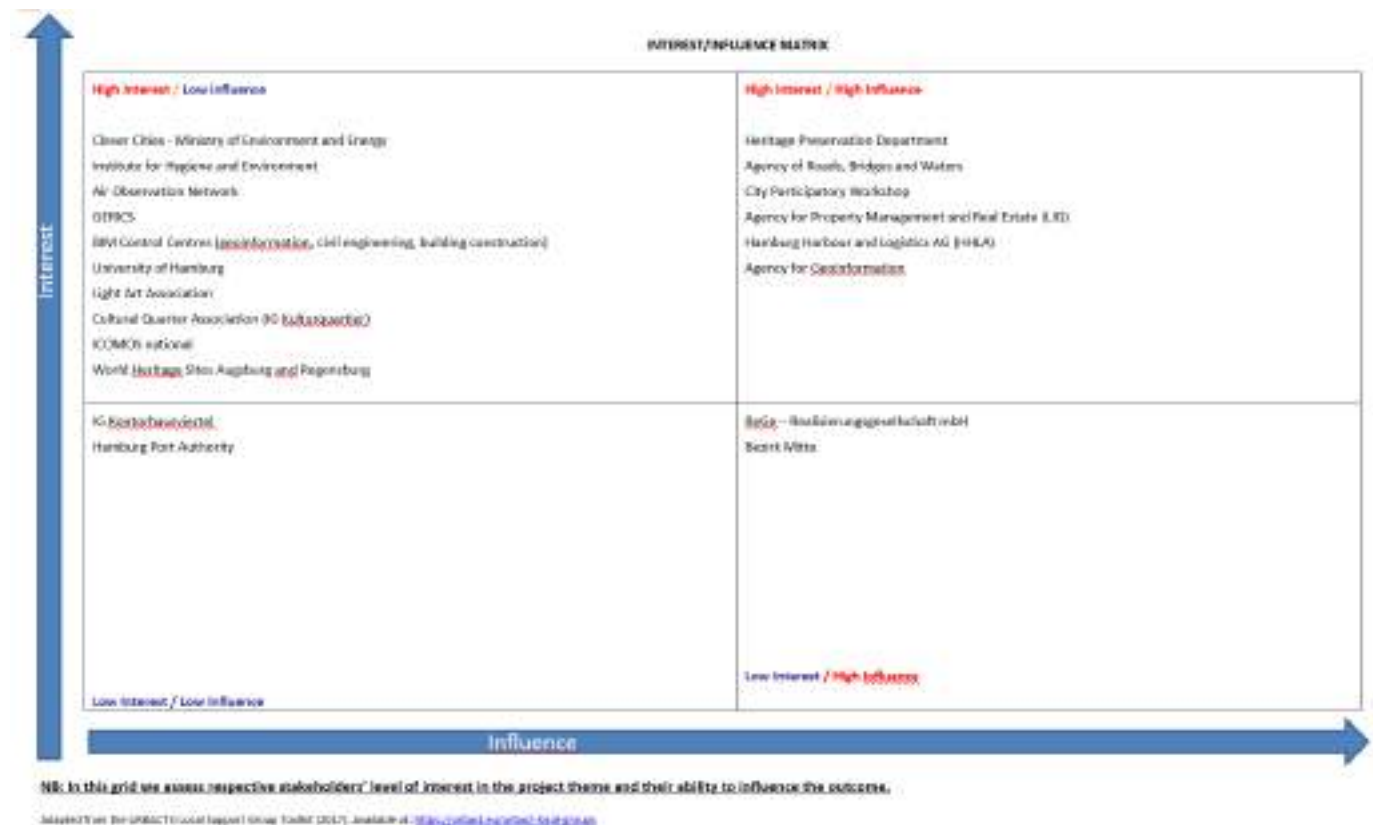


Table 3 Local Stakeholder matrix for the city case Hamburg

2.3. Hazards affecting the site

The particular hazards faced by the World Heritage Site result, on the one hand, from its geographical location, and on the other from the consequences of climate change in Hamburg. The Speicherstadt, which was built at the end of the 19th century on wooden piles into the Hamburg port area on the Elbe, may be threatened by the expected general rise in sea level. In the period from October to March every year, the area is also threatened by severe storms and storm surges, which can also lead to an increased occurrence of flooding in the inner-city area, which can also affect the Kontorhausviertel.

The average temperature has also risen between 1881 and 2013 by about 1.4°C in the Metropolitan region of Hamburg. In the future, rising temperatures and more “tropical nights,” especially within the inner-city centre, are expected during the summer period. Depending on the future CO₂ emission rate, the average temperature throughout the year may increase by 1°C, or as much as 5°C. Extremely dry summer periods and heat waves may have a long-term effect on the building construction and the building materials used, which are sometimes exposed to a constant change between humid and dry environments.

In the winter, more frequent (and heavier) rainfall is expected, based on a specific study regarding vulnerability to storm surges, inland flooding and heavy rainfall that was carried out by the Hamburg Institute of International Economics (HWWI) in 2015²⁵.

Moreover, as a metropolis on the waterfront, Hamburg is confronted with the effects of sea level rise. At the level Cuxhaven Steubenhöft (German Bight) measurements have been carried out from 1981 – 2019 and the results already show a sea level rise of 20 cm per century. The *IPCC-special report on the ocean and the cryosphere within a changing climate* (SROCC) predicts a business as usual emission scenario of major sea rise on a global level. This suggests corresponding increases in the risk of storm surges as well as the upstream-directed transport of sediment, with implications for flood protection and future sediment management. Moreover, the brackish water zone, a mixed zone of saltwater and fresh water, will move further upstream as well.

Therefore, Hamburg needs to prepare for the inescapable consequences of climate change. As a foundation for this task, Hamburg is developing a monitoring programme to document the effects of climate change and to assess in how far adaptation measures undertaken so far have been effective.²⁶

With respect to the effect of these climatic changes as they specifically impact the Speicherstadt and Kontorhausviertel, limited information was found in the course of developing this report. It follows that this limitation also applied to finding any corresponding measures to address these effects. In the past years, various investigations have been carried out by building owners and operators with regard to preservation and maintenance in general, however details were not available at the time of writing, and it is believed that these did not

²⁵ Rose, Julia; Christina B. Wilke: Climate change vulnerability in cities: The case of Hamburg; HWWI Research Paper 167, 2015 <http://hdl.handle.net/10419/119458>

²⁶ Erste Fortschreibung Hamburger Klimaplan, S. 6f (First revision of the Hamburg Climate Plan.; <https://www.hamburg.de/klimaplan/nofl/13278658/c-7-downloads/>)

specifically concern the impacts of climate change. In general, the authors believe that several different local stakeholders would be interested in addressing this knowledge gap.

2.4. Gaps, needs and actions

Due to the complex situation in Hamburg, gaps and needs in the city administration's ability to support the resilience of the Kontorhausviertel and Speicherstadt – and corresponding supporting actions – can only be fully understood in direct exchange with the various project participants. However, based on the information available at the time of writing, the following scenarios for possible support from ARCH scientific partners are conceivable:

- Screening and monitoring of possible decomposition or corrosion effects acting on building masonry, supporting pile foundation or bridge abutments.
- Monitoring of the pile foundation and the subsoil with regard to the permanent load-bearing capacity of the foundation.
- Long-term measurements regarding facade structure and possible long-term changes such as cracks in the masonry, which can be caused by a variable load distribution of horizontal and vertical loads and changes in the foundation.
- Almost 50 bridges exist within this district. Many of them are currently in poor condition. Specific monitoring might help to identify methods for adequate bridge refurbishment in the historic district as well as how far the climate change impact might be responsible for the current state of the bridge construction (e.g. acceleration of decomposition processes).
- There is already a city administration-led plan to build a 3D-model of an important historic bridge in another location, with help of BIM (Building Information Modelling). Although outside the ARCH target historic area, the application of this method is relevant for the further management of the Speicherstadt and Kontorhausviertel, and hence the opportunity for ARCH scientific partners to integrate their tools and methodologies with this planned project should be explored. Collecting relevant data on building deterioration in connection with climate change might be a very valuable support for long-term analysis and anticipation of future impacts.

Monitoring of weather conditions with respect to an increased UV-/ or CO₂-level at the public squares of the World Heritage Site may also be useful, with a view to providing relevant advice to people visiting these areas. These aspects can possibly be addressed with the help of the various scientific institutions and their experts involved in the ARCH project. Furthermore, the ARCH project can hopefully serve as a catalyst for raising awareness of the basic topic in Hamburg. It would also be desirable for the project to play a coordinating role between the various stakeholders involved in the co-creative process.

3. Governance framework for cultural heritage management

This section looks at the governance framework for cultural heritage relevant to Hamburg's identified sites. It elaborates existing policies, strategies, visions and action plans for the management, protection and use of cultural heritage in Hamburg at different governance levels – international, national, regional, local, and site level. Sections 3.3 and 3.5 in particular reflect on the interlinkages between the regional and site levels with key international governance instruments created by UNESCO.

The cultural heritage values of the Speicherstadt and Kontorhausviertel are protected through binding legal regulations, and the city administration observes several regional, national and international recommendations and regulations. These are outlined below. This chapter draws heavily on the Nomination Dossier (2014) and Management Plan therein (2013)²⁷, edited by the City of Hamburg as part of the nomination of the Speicherstadt and Kontorhausviertel for World Heritage status. Both can be found here: <http://whc.unesco.org/en/list/1467> and <http://welterbe.hamburg>.

3.1. International

The following international policies and declarations are particularly relevant for the conservation of monuments in the Federal Republic of Germany and for the World Heritage site "The Speicherstadt and the Kontorhausviertel": UNESCO World Heritage Convention and UNESCO Recommendation on the Historic Urban Landscape. The Federal Republic of Germany is a signatory to all of these internationally important declarations.

3.1.1. World Heritage Convention

The Speicherstadt and the Kontorhausviertel were designated with World Heritage status in 2015, and therefore the **World Heritage Convention is an important tool in the safeguarding of the site**. The Convention is based on the idea that "parts of the cultural or natural heritage are of outstanding interest and therefore need to be preserved as part of the world heritage of [hu]mankind as a whole" (preamble to the World Heritage Convention).

An important step towards achieving this was made when the new Heritage Protection Act of Hamburg came into force in 2013, stating that:

„All measures and plans must take into account the obligation to protect the cultural heritage in accordance with the Convention Concerning the Protection of the World Cultural and Natural Heritage of 16 November 1972 (German Federal Law Gazette (BGBl), 1977 II, p. 215)“

²⁷ Kloos, M.; Ritscherle, M.; Wachten, K. et al: UNESCO World Heritage Management Plan: The Speicherstadt and Kontorhaus District with Chilehaus (2013), <http://whc.unesco.org/en/list/1467> and <http://welterbe.hamburg>, and hendrik Bäßler verlag, Berlin, 2017.

(Heritage Protection Act of 5 April 2013 of the Free and Hanseatic City of Hamburg, Official Hamburg Gazette, p. 142).

The **Operational Guidelines** for the Implementation of the World Heritage Convention, 8 July 2015, are an essential basis for achieving these objectives. They aim to facilitate the implementation of the World Heritage Convention. For this purpose, the procedures for the following operations were determined in particular:

- the inscription of World Heritage sites on the World Heritage List and the List of World Heritage sites in danger;
- the protection and conservation of World Heritage sites;
- the granting of International Assistance under the World Heritage Fund;
- the mobilisation of international support in favour of the World Heritage Convention.

The Operational Guidelines are periodically revised to reflect the decisions of the World Heritage Committee. They define the principal approaches towards managing the World Heritage site.

3.1.2. Charters and Declarations

The following international charters and documents issued by UNESCO and ICOMOS are of particular relevance to the “Speicherstadt and Kontorhausviertel with Chilehaus” (for more information on these charters and conventions please refer to www.icomos.org):

- the Venice Charter,
- the Florence Charter,
- the Washington Charter,
- the Nara Document on Authenticity,
- the Burra Charter,
- and the more recent Recommendation on the Historic Urban Landscape.

Of these, the Recommendation on the Historic Urban Landscape (HUL), adopted in 2011, is of particular interest for urban environments and hence for the ARCH focus areas. The approach adopted by the Recommendation is based on existing declarations and charters, and takes account of the fact that World Heritage sites in urban areas are part of a larger ‘urban ecosystem’ and subject to continuous change. It also recognises the role of communities living in and around urban World Heritage sites in the preservation and sustainable development of these places. By extension, people in these communities must be fully involved in developing and implementing strategies to protect and manage World Heritage sites in the interest of ongoing sustainable development. This approach is well-aligned with the ARCH project’s thematic intersection of cultural heritage management, disaster risk reduction and climate adaptation – since understanding the risks faced by sites of cultural heritage significance demands attention to a broader landscape of risk and vulnerability, and in the case of Hamburg, recognition that these sites are part of a complex wider city system.

3.2. National level

Alongside the above international guidelines, general frameworks for urban development and construction are provided for at both national and regional level.

Due to the federal setup of Germany, many regulations and laws that are normally found on a national level are delegated to the *Länder* (states). Hamburg, being a City-state, is therefore responsible for heritage legislation.

For the Speicherstadt and the Kontorhausviertel, legislation at national and regional levels, along with urban planning, landscape planning, and monument conservation instruments all play a role in their protection and sustainable further development. Supporting legislation includes the Construction Code (*Baugesetzbuch*), the Federal Nature Conservation Act (*Bundesnaturschutzgesetz*, BNatSchG), the Hamburg Act for the Implementation of the Federal Nature Conservation Act (*Hamburgisches Gesetz zur Ausführung des Bundesnaturschutzgesetzes*, HmbNatSchG) the Landscape Programme (*Landschaftsprogramm*), the Zoning and Land-use Plan (*Flächennutzungsplan*) and the Local Development Plan (*Bebauungsplan*).

3.2.1. Federal Construction Code

The Construction Code of the Federal Republic of Germany (*Baugesetzbuch*), last amended on 28 March 2020, forms the legal basis of urban development planning in Hamburg. The provisions of the Construction Code therefore also play a decisive role in regulating urban building development in the Speicherstadt and the Kontorhausviertel, as well as the surrounding buffer zone. At the same time, the Construction Code appoints the instruments for their protection: i.e. urban development planning, ordinances on conservation and design, and further levels of action.

Significant for the ARCH target historic areas are the zoning and land-use plans (preparatory urban development planning) and the local development plans (binding urban development planning). The city state Hamburg does not have a spatial plan, which is unlikely. Here, the zoning and land-use plan instead serve the direct functions of the (usually) higher-ranking land use planning.

3.3. Regional level

Being a City-State, Hamburg is a regional authority and has ministerial competences. The *Ministry of Culture and Media (BKM)* holds the responsibility for the Speicherstadt and Kontorhausviertel UNESCO World Heritage site. In doing so, the BKM organises and coordinates all measures in this area, starting from communication activities, and including holding a Heritage Preservation Office and most importantly coordinating all activities planned and/or implemented there. Activities are governed by a Management Plan, which anticipates possible risks to the cultural heritage values of the area, as well as possible measures to deal with them, and provides guidance to the city administration on appropriate responses.

3.3.1. Hamburg Building Code

The most relevant regulation for all buildings in the area (protected and non-protected) is the Hamburg Building Code of 14 December 2005 (as last amended on 15 December 2009). The code establishes the legal rules governing plots of land and their development, and contains general building regulations as well as provisions on design and construction products and methods, e.g. walls, ceilings, roofs, escape routes and technical building equipment. It also stipulates the purposes for which buildings may be used.

3.3.2. Zoning and Land-use Plan

In accordance with Section 1, Paragraph III, and Section 5, Paragraph ff, of the Federal Construction Code, the Free and Hanseatic City of Hamburg has produced a zoning and land-use plan for the entire city (including the Speicherstadt and Kontorhausviertel and surrounding buffer zone) as part of a general development and construction framework. This plan establishes the essential guidelines for land use and building developments for the entire city centre. The most recent version of the zoning and land-use plan for the Free and Hanseatic City of Hamburg, which was published on 22 October 1997 (Official Hamburg Gazette, p. 485), still classifies the Speicherstadt area as part of the “port”. The zoning and land-use plan is being amended in parallel with the relevant local development plan, and in the future the area concerned will be classified as “mixed-use development”.

3.3.3. The Hamburg Heritage Protection Act

The Heritage Protection Act of the Free and Hanseatic City of Hamburg protects architectural monuments, ensembles, garden monuments and archaeological monuments, as well as movable heritage assets. Both the Speicherstadt and Kontorhausviertel are protected under this act.

Heritage Council: The Regional Ministry of Culture is assisted by a Heritage Council which acts as an independent advisory board on heritage protection and preservation.

The **Heritage Protection Act of Hamburg** came into force in 2013. According to the Act, the task of monument protection and preservation includes the scientific research of monuments. It remains unclear whether this research targets the complex layering of urban settlements, as suggested in the UNESCO Recommendation on the Historic Urban Landscape (HUL Recommendation). As described in the Act, monument protection should ensure that monuments are included in urban development, spatial planning and land management²⁸. This reflects the HUL Recommendation to some extent, as heritage protection is to be integrated into various policy instruments and implemented by these means (Recommendation on the Historic Urban Landscape, p. 5). In addition, there is an obligation to maintain the monument within the bounds of what is considered to be reasonable action to protect it from hazards and to repair it. However, protection against specific natural hazards (e.g. climate change) and the inclusion of disaster risk management are not explicitly listed in the Act. The Act stipulates that measures and planning are subject to the obligation to preserve cultural heritage in accordance with the Convention Concerning the Protection of the World Cultural and Natural Heritage of 16 November 1972. Germany has ratified the Convention Concerning the Protection of the World Cultural and Natural Heritage²⁹.

The Heritage Council acts as an independent advisory board and is composed of specialists (e.g. in heritage protection, history and architecture) as well as citizens/residents. Every two years the senate reports to the citizens on the work of the Monument Council. In terms of the Heritage Protection Act of Hamburg, the involvement of citizens/residents does not go further than this. Other instruments of heritage protection allow for more extensive citizen participation, which would be more in line with the participatory approach of the HUL Recommendation.

3.3.4. The Management Plan for the Speicherstadt and Kontorhausviertel

A Management Plan aimed at safeguarding the potential Outstanding Universal Value of the Speicherstadt and Kontorhaus District with Chilehaus, its authenticity, and its integrity, and protecting its proposed buffer zone, entered into force on 28 May 2013.

²⁸ Heritage Protection Act of 5 April 2013 of the Free and Hanseatic City of Hamburg, Official Hamburg Gazette, p. 142

²⁹ The Federal Republic of Germany ratified the Convention Concerning the Protection of the World Cultural and Natural Heritage in 1976. After the union of the two German States to one Sovereign State, they agreed that the treaties and agreements to which the Federal Republic of Germany is a contracting party remain in force and that their respective rights and obligations be applied to the whole territory of Germany (<https://whc.unesco.org/pg.cfm?cid=246>).

The Plan manages the property under market economy conditions (as a site of living heritage, the preservation of the buildings should be self-sufficient in terms of financing), as this is vital for the preservation of the large number of buildings, according to the nomination dossier. The objective of the Plan is therefore “to reconcile safeguarding the ‘outstanding universal value’ of the World Heritage site on the one hand, with taking the necessary measures to provide for its sustainable further development, on the other.”

The Plan is a strategic document that defines objectives for preservation and sustainable development, assesses the work that needs to be done, identifies areas of conflict and potential synergies, and establishes priority measures and projects (see Figure 10 below)³⁰.

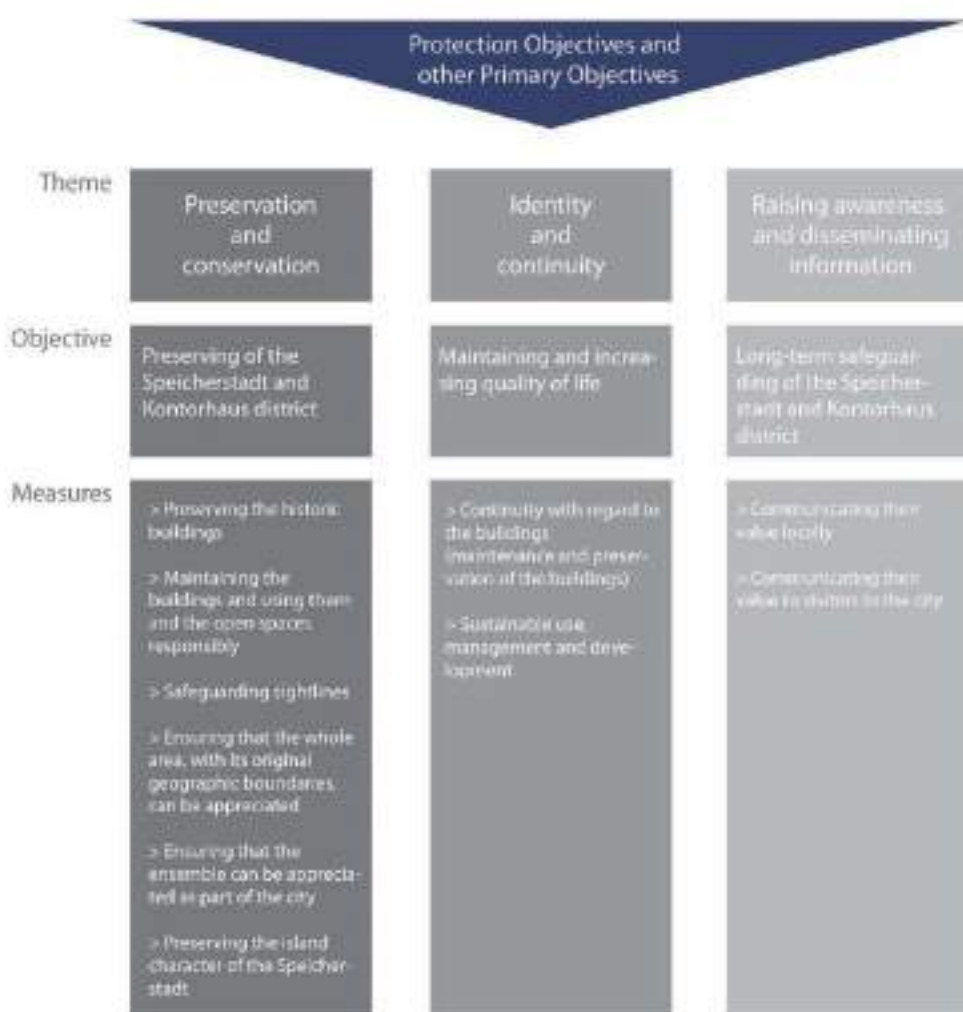


Figure 10 Three-pillar model of the protection objectives – and corresponding measures – planned for the “Speicherstadt and Kontorhaus district with Chilehaus”. Source: M. Kloos, M. Ritscherle, and K. Wachten, “Management Plan: The Speicherstadt and Kontorhaus District with Chilehaus,” 2015.

The objective of the current **Management Plan for the Speicherstadt and Kontorhausviertel** is protecting the ‘outstanding universal value’ of the World Heritage site

³⁰ <https://www.hamburg.de/bkm/unesco-speicher-kontore/10531874/praktisches-download-bereich-en/>

and providing for its sustainable further development. This consideration of economic factors and developments is relevant for the long-term preservation of the World Heritage site as mentioned in the HUL Recommendation (p. 3). The Management Plan identifies several charters relevant to the UNESCO World Heritage site: Venice Charter, Washington Charter, Nara Document on Authenticity, Burra Charter, and the aforementioned HUL Recommendation.

The three-pillar model of the protection objectives, as published in the Management Plan for the Speicherstadt und Kontorhausviertel, includes the theme of raising awareness. This fits in with the HUL Recommendation, which emphasizes the involvement of different stakeholders to safeguard their heritage and promote sustainable development.

Although no other international frameworks, agreements or treaties are explicitly mentioned in the Management Plan, disaster risk management and climate adaptation issues are considered to some extent.

Potential risks to World Heritage caused by things like flooding or tourism, are listed in chapter eight of the Management Plan and their impact potential is assessed as relatively low. However, flooding has occurred more frequently in the Speicherstadt in the past. These floods do not pose a threat to the substance of the buildings. However, for residential or hotel use, the introduction of area-wide flood protection as well as appropriate escape routes is prescribed by law (p. 78). Overall, disaster prevention and climate adaptation could be included even more comprehensively in the Management Plan. Parts of the Pplan will be updated in the years to come (scheduled for 2025 at the time of writing) and there is an opportunity for the ARCH project to contribute to this update by proposing the inclusion of climate change-related measures that have, thus far, played only a small part in the current version. A more in-depth consideration of possible further natural and human-made risks than in the current Management Plan makes sense for the protection of heritage in the long term – and this consideration is in progress by means of the ARCH project.

3.4. Local (district level)

3.4.1. Land-use plans (Flächennutzungsplan)

Land-use plans are prepared on the basis of the zoning and land-use plan and regulate the type and extent of construction and other uses of the ground or the properties. Their preparation follows a process in accordance with the Federal Construction Code (BauGB).

The Speicherstadt was removed from the scope of the Port Area Development Act (Hafenentwicklungsgesetz) on 10 October 2012, paving the way for the development plan (concept) specific to the Speicherstadt to be drawn up (see Part 3.5.1 below).

3.4.2. City Centre Concept³¹

For the larger area of the Hamburg inner city, a local development concept has been in place since 2010 (revised 2014) that outlines future use and development priorities for public spaces, transport, housing, etc. This concept is the main guidance tool for the overall social and infrastructure layout of the inner city (Hamburg Mitte).

Meanwhile, the City Centre Concept seeks primarily to integrate the new HafenCity development, which lies to the south of the city centre, in the neighbouring city centre district. The concept is intended to enable Hamburg's historic core and its new maritime district to grow together. Given the location of the Kontorhausviertel and Speicherstadt, with the city centre immediately to the north, and the HafenCity immediately to the south, it is clear that they play an important role in the City Centre Concept ³².

3.5. Site level (Speicherstadt)

3.5.1. Speicherstadt Development Concept (2012)³³

The Development Concept (*Entwicklungskonzept*) for Hamburg's Speicherstadt, hereinafter referred to as the Speicherstadt Development Concept, was drafted by the then-Regional Ministry of Urban Development and the Environment (BSU, today BSW) in cooperation with the Hamburger Hafen- und Lagerhaus-Aktiengesellschaft (HHLA), other ministries in Hamburg and the district authorities and came into force in 2012. One of the main reasons for drafting it was the Speicherstadt's nomination for inscription on the World Heritage List. In addition, the Speicherstadt Development Concept is intended to serve as a basis for a local land use plan for the Speicherstadt (currently under development – see above), given that the Speicherstadt has been removed from the scope of the Port Area Development Act (*Hafenentwicklungsgesetz*). The Speicherstadt Development Concept is therefore of central importance, and complements the Management Plan mentioned earlier (see Part 3.3.4 above), because it summarises the facts, general conditions and guidelines, which are essential for fulfilling the preservation and sustainable development of the Speicherstadt.

When the new HafenCity development is completed, the Speicherstadt will constitute a link between it and the city centre. One of the challenges presented by this new status is that the Speicherstadt has hitherto been separated from the rest of the city and was built on an east-west axis. Historically, north-south through-routes played a subordinate role, but they are now becoming increasingly important and will be more actively used, presenting a risk to the historic integrity of the Speicherstadt area.

³¹ Only available in German (most recent edition 2015, original text 2010: Innenstadtkonzept - <https://www.hamburg.de/konzepte-strategien/>)

³² For more information on the City Centre Concept and the guiding principles see: <https://www.hamburg.de/innenstadtkonzept/> (only available in German).

³³ Entwicklungskonzept Speicherstadt (only available in German): <https://www.hamburg.de/contentblob/4056088/42fc628d89757fee90432b0b23cb224c/data/download-konzept.pdf>

Additional challenges which are identified in the Speicherstadt Development Concept include recent changes in how the warehouses are used, specifically:

- A decline in transshipment and logistics, while an increasing number of service companies, trade operations and cultural attractions are establishing themselves there.
- Increased interest in living in the Speicherstadt. Large-scale residential use is, however, only possible if there is comprehensive flood protection³⁴.
- A need to maintain the quality of public spaces.
- A need to ensure that the heads of the wooden piles on which the Speicherstadt is built remain structurally stable.

While taking appropriate account of the Speicherstadt's World Heritage value, the Speicherstadt Development Concept also seeks to highlight opportunities for change and further development that can be undertaken without threatening the area's existing character. A concept has been drafted for transport infrastructure and the design of public spaces within the Speicherstadt, however at the time of writing there were no designs yet completed.

The Speicherstadt Development Concept contains planning and design guidance on the following aspects relevant to future development (bearing in mind that all changes require the permission of the heritage protection authorities):

- Allowed uses and changes of use (storage and trade, services, residential use, cultural institutions)
- Flood protection
- Safeguarding of the wooden piles supporting the quay walls and warehouses
- Transport (access, parked vehicles, design of parking areas, bridges)
- Open spaces and their design
- Lighting
- Existing flora and fauna

One of the main characteristics of the Speicherstadt is its aforementioned position between the historic urban centre and the new HafenCity. Its role within the urban area and potential to create a lively and urban district are emphasized by the Speicherstadt Development Concept. In order to achieve this aim, a mixed-use approach should be implemented – including cultural offerings, recreational use, showrooms and offices. This integrated approach is in line with the HUL Recommendation, which adopts the approach that World Heritage sites in urban areas are influenced by their surrounding areas and part of a larger urban system. According to the

³⁴ As part of the process of drafting the Development Concept for the Speicherstadt, a flood protection concept was also produced. However, it has not yet been assessed for its impact on heritage protection (Internal Memorandum 20/4388, p. 4). And the solution was abandoned due to the technical complexity of the implementation.

HUL Recommendation, there is an inherent, constant change of the urban system. This ongoing urban development also influences World Heritage sites like the Speicherstadt and Kontorhausviertel with Chilehaus. In order to preserve this World Heritage site, the Speicherstadt Development Concept includes different current and possible future uses in its vision. Already two thirds of the Speicherstadt has been converted and is now repurposed for different uses/users, such as offices and service providers.

The Speicherstadt Development Concept is primarily a synthesis of expert reports that were established in order to evaluate possible concepts for an area that was in full transition from an industrial harbour site and custom-free zone to an integrated urban area. The concept was presented, discussed and voted on in the City Council. In view of today's approaches, a larger public participation that has since become standard in Hamburg does stand out as missing in this particular case.

As mentioned before, the Speicherstadt Development Concept incorporates and recognises the possible necessity for flood protection. The current status, possible flood protection options, and the legislation for such measures are outlined in the concept. Multiple benefits are listed in the Development Concept, which highlights the necessity for integrating the Speicherstadt into the flood protection system of the inner city centre and the HafenCity (p. 33 ff.). According to the Sendai Framework for Disaster Risk Reduction, the potential risks for the World Heritage site caused by flooding should be assessed in all their dimensions. However, the Speicherstadt Development Concept is not the appropriate document to incorporate a detailed assessment of the vulnerability, capacity, and exposure of heritage. Furthermore, the need for in-depth investigations to finally determine the best flooding protection measures and the rather high costs of the analysed flood protection measures are mentioned in the document and are currently under research by the administration³⁵.

³⁵ Entwicklungskonzept Speicherstadt (only available in German): <https://www.hamburg.de/contentblob/4056088/42fc628d89757fee90432b0b23cb224c/data/download-konzept.pdf>
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3.5.2. Ordinance on the Design of the Speicherstadt (2008)

The Ordinance on the Design of the Speicherstadt stipulates that any alterations to warehouses must be compatible with heritage protection. It contains provisions on:

- Façades,
- roofs,
- building technology,
- advertising and vending machines, and
- the design of the surrounding external space.

3.5.3. Design Manual for the Speicherstadt (*Gestaltungshandbuch Speicherstadt*) (2002)

While it is not legally binding, the The Design Manual for the Speicherstadt is regularly used by the Hamburger Hafen- und Lagerhaus- Aktiengesellschaft (HHLA), which owns all property in the Speicherstadt, to guide design and development decisions.

Overall, the management of the Speicherstadt and Kontorhausviertel works well based on the procedures, guidelines, charters, legal provisions and other elements outlined above. Nevertheless, climate change and the effects of related hazards were not a main priority in the current Management Plan (with the exception of some provisions for flooding), nor in the different ordinances. Gaps and needs (along with possible corresponding actions of relevance to the ARCH project) can be summarised as follows:

- Integration of climate change and related hazards could be an integral part within the future revised Management Plan and associated periodic reporting to UNESCO in the years to come. A related objective is to identify the different plans the City has in this respect, as well as to examine the Management Plan for gaps with respect to resilience-building and propose potential actions and strategies for inclusion in a future update of the Plan.
- Tools and procedures already exist to support management of data about the existing historic built fabric, and ongoing remedial or development measures, but these could be expanded and improved. For example, by constructing digital 3D models of existing structures using Building Information Modelling (BIM).
- Cooperation with archaeological department concerning research about remains of the industrial heritage of the late 19th/ early 20th century is currently limited and could be strengthened.
- Greater awareness raising regarding the relevance of climate change to the Speicherstadt and Kontorhausviertel is desirable, and there is an opportunity to design and implement events in the context of the ARCH project.

4. Governance framework for disaster risk reduction

4.1. International

This section examines the governance framework for disaster risk reduction (DRR) with relevance to Hamburg's identified sites. It elaborates the relevant policies, strategies, visions, and action plans for disaster risk reduction in Hamburg at different governance levels. Among these, the Sendai Framework is of particular interest at the international level, and reflection on it with regard to local strategies is presented at the end of this section.

At the international level, there are three main types of governance frameworks for disaster risk reduction: global, European, and other bi- or multilateral frameworks of several nations.

4.1.1. Global frameworks

Global frameworks for disaster risk reduction are implemented by international organisations like the United Nations (UN) and the World Health Organisation (WHO)³⁶. Most relevant for inclusion in this report is the United Nations Office for Disaster Risk Reduction (UNDRR, formerly UNISDR). The mission of UNDRR is to “bring[s] governments, partners and communities together [to] reduce disaster risk and losses to ensure a safer, sustainable future”.

UNDRR supports:

- coordination mechanisms like the Global Platform for Disaster Risk Reduction³⁷ and the National Platforms for Disaster Risk Reduction,
- the implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030³⁸, and
- other institutions, including governments and civil society.

For Europe, the European Forum for Disaster Risk Reduction 2015-2020 published a Roadmap for the Implementation of the Sendai Framework in 2016³⁹.

The Sendai Framework is based on four priorities:

- (1) Understanding disaster risk,
- (2) Strengthening disaster risk governance to manage disaster risk,
- (3) Investing in disaster risk reduction for resilience, and
- (4) Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and construction.

³⁶ World Health Organisation: <https://www.who.int> (last visited 13.5.2020)

³⁷ UN Global Platform for Disaster Risk Reduction, a biennial multi-stakeholder forum: <https://www.unisdr.org/conference/2019/globalplatform/about> (last visited 13.5.2020)

³⁸ Sendai Framework: <https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030> (last visited 13.5.2020)

³⁹ Roadmap for the Implementation of the Sendai Framework: <https://www.undrr.org/publication/european-forum-disaster-risk-reduction-efdr-roadmap-2015-2020> (last visited 13.5.2020)

A tool for supporting implementation of the Sendai Framework is the Disaster Resilience Scorecard for Cities⁴⁰: a set of assessments that allow staff working in local government to monitor and review progress and challenges in the implementation of the Sendai Framework, and assess their city's disaster resilience. The Scorecard is structured around UNDRR's Ten Essentials for Making Cities Resilient and is also being used in the ARCH project's city cases (also see preliminary assessment using the Scorecard at Part 7 below).

4.1.2. European frameworks

At the level of the European Union, the Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG ECHO) is in charge of actions in the domains of civil protection and humanitarian aid. The overview of the legal framework⁴¹ lists more than 30 elements. Here, we will focus on the most important ones.

The **European Civil Protection Mechanism** is an instrument for strengthening the collaboration between the EU member states, six other participating countries, and the United Kingdom during its transition phase, in the domain of civil protection. If a disaster or emergency exceeds the response capacity of a participating country, it may ask for assistance via this Mechanism. The delivery of such assistance is coordinated via another element, the Emergency Response Coordination Centre (ERCC). The resources for disaster assistance come from the European Civil Protection Pool, the European Medical Corps, and the new rescEU element. The latter provides firefighting planes and helicopters and medical evacuation planes, as well as a stockpile of medical equipment and field hospitals that can respond to health emergencies, and chemical, biological, radiological, and nuclear incidents. DG ECHO is also active in the domain of preparedness and prevention.

4.1.3. Multilateral frameworks

Support for civil protection for European countries is provided by North Atlantic Treaty Organisation (NATO), a multilateral military alliance between 30 European and North American countries. This is done both in the areas of prevention and preparation and in operations. NATO's principle is not to develop parallel structures to existing civilian capacities (e.g. of the UN and EU). In the field of civil protection, NATO works closely with its partner nations. The responsible operative divisions at the NATO headquarters in Brussels are "Civil-Military Planning and Support" (CMPS) and "Euro-Atlantic Disaster Response Coordination Centre" (EADRCC). Civil protection prevention and preparedness are mainly the responsibility of CMPS, while the EADRCC takes care of operational issues like joint international trainings of emergency responders.

NATO partner countries also collaborate in the area of civil emergency planning. For that purpose, NATO has established the Committee for Civil Emergency Planning (CEPC) and

⁴⁰ UNDRR Disaster resilience scorecard for cities: <https://www.undrr.org/publication/disaster-resilience-scorecard-cities> (last visited: 13.05.2020)

⁴¹ DG ECHO Legal Framework: https://ec.europa.eu/echo/who/about-echo/legal-framework_en (last visited: 13.05.2020)

several subordinate planning groups: Civil Protection, Transport, Public Health, Food and Water, Industrial Resources and Communications.

Directive on the Assessment and Management of Flood Risks (2007/60/EC)

The Directive on the Assessment and Management of Flood Risks (2007/60/EC), or the Flood Risk Management Directive establishes a common framework for dealing with flood risk within the EU, with the aim of reducing the adverse consequences of floods for four protected areas: human health, environment, cultural heritage and economics.

This risk is particularly high in Hamburg, where the metropolis' close ties to water meet with the metropolitan agglomeration of residential, commercial and industrial areas.

The EC directive also requires that not only frequent and medium-frequency, but also rare or extreme flood events be considered. Their possible effects should be shown in hazard and risk maps.

As a third step, the EC directive requires the development of a transnational management plan for dealing with the hazards and risks of floods.

This framework is implemented in Hamburg through a Flood Management Plan, with associated risk assessments (including mapping of flood risks) updated every 6 years. The first cycle was completed with the preparation of the Management Plan in December 2015. The second implementation cycle started with the review of the risk assessment, the results of which were published on December 22, 2018. The updated hazard and risk maps were published on December 22, 2019.⁴²

4.2. National

In Germany, civil protection is a shared responsibility at several levels of the national governance structure. A unique feature of this shared responsibility is the distinction between civil protection on one hand and disaster management and prevention on the other. These shared responsibilities are ruled by a single German national law: the Civil Protection and Disaster Assistance Act. Civil protection in its meaning of civil defence is a sub-area of the overall defence of the Federal Republic of Germany and thus a focus task at the national level. The responsible agency is the Federal Office of Civil Protection and Disaster Assistance (BBK)⁴³, established in 2004 within the remit of the Federal Ministry of the Interior. Disaster management and prevention in peacetime, on the other hand, are duties of the federal states, carried out under federal contract administration. Since the Free and Hanseatic City of Hamburg is a federal state, it is thus responsible for disaster management and prevention in its territory, as explained in the next section.

The BBK's duties at the national level are ruled by the national law establishing the Federal Office of Civil Protection and Disaster Assistance. Its tasks include, but are not limited to,

⁴² Homepage of City of Hamburg: <https://www.hamburg.de/hwrm-rl/2102808/hochwasserrisikomanagement/> (last visited 26.08.2020)

⁴³ Home page of BBK: https://www.bbk.bund.de/EN/Home/home_node.html (last visited 12.05.2020)

informing residents living in Germany on aspects of disaster preparedness (including issuing warnings as needed), protecting cultural heritage, implementing measures for health protection, and providing an emergency supply of drinking water. For conveying warnings and other official information, the BBK has launched the warning app NINA for mobile devices. This app, for instance, can be used to read about current rules for behaviour regarding the Covid-19 pandemic. The BBK also conducts training for crisis managers and first responders in its academy for crisis management and national cooperation: AKNZ. The BBK has also established a Joint Reporting and Situation Centre, the GMLZ (Gemeinsames Melde- und Lagezentrum von Bund und Ländern) which gathers situation information from distributed situation centres at the national level (federal ministries and agencies) and the federal state level (state ministries and agencies) and redistributes the combined information to all sources.

Practical disaster assistance is provided by national organisation Bundesanstalt Technisches Hilfswerk (THW), Federal Agency for Technical Relief, which is ruled by national THW Law (see Annex 10.2). For disasters involving fire, the national Fire Service regulation FwDV 100 implements standards of uniformity in terms of response capacity across all federal states and municipalities in Germany.

Last but not least, disaster prevention and management may also refer to non-binding guidelines such as “Flood and heat prevention through urban development” and the “Implementation plan CRITIS of the National Plan for the Protection of Information Infrastructures”. Critical infrastructure protection (CIP), which overlaps with disaster risk reduction, is addressed by German sector-specific laws such as the IT Security Act (IT-Sicherheitsgesetz⁴⁴).

4.3. Regional

Civil defence at the state level comprises the preparation and implementation of all civil defence measures for the Free and Hanseatic City of Hamburg. The Ministry of the Interior and Sport is responsible for implementation at the state level. The legal basis is found in the Basic Law, supplemented by the provisions of the Emergency Constitution, the Federal Benefits Act, the Security Acts (e.g. on food and drinking water supply, transport organisation), the Civil Protection and Disaster Relief Act (ZSKG) and the implementing ordinance to the ZSKG. There are also numerous contracts and agreements in the NATO area.

The tasks of these bodies include, in particular:

- civil defence,
- maintenance of state and government functions (including civil alert planning),
- supply of essential goods and services to the civilian population, and
- support of the armed forces.

⁴⁴ IT-Sicherheitsgesetz, information at BSI: https://www.bsi.bund.de/DE/Themen/KRITIS/IT-SiG/it_sig_node.html (last visited 13.05.2020)

The regulatory framework for disaster protection in Hamburg is the respective state law, the Hamburg Disaster Protection Act (Hamburgisches Katastrophenschutzgesetz⁴⁵, last revised on 24.01.2020). The framework is compliant with national and EU law. The Hamburg Disaster Protection Act specifically mentions several EU directives, including DIRECTIVE 2012/18/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC. In case of a major disaster, Hamburg may receive support from the national level, including more than 110 supplemental disaster protection vehicles and 1,400 trained staff for manning these vehicles, provided by relief organisations such as Arbeiter-Samariter-Bund (ASB), Deutsche Lebensrettungsgesellschaft (DLRG), Deutsches Rotes Kreuz (DRK), Johanniter Unfallhilfe (JUH) and Malteser Hilfsdienst (MHD).

Beside the more general Hamburg Disaster Protection Act, Hamburg as a sea harbour city has also adopted several specific acts and regulations that contribute to prevention and management of disasters (also see Annex 10.2). These include:

- Hamburg Water Act,
- Hamburg Dyke Regulation,
- Hamburg Polder Regulation,
- Flood Protection Ordinance HafenCity, and
- Storm surge protection in the Hamburg harbour.

4.4. Local

4.4.1. Organisation

Civil protection is the task of all ministries and departments of the Free and Hanseatic City of Hamburg. A special position in civil protection is held by the Ministry of Internal Affairs. Its State Councillor, as the head of the entire disaster management unit, is responsible for the uniform control of all defensive measures in the city. Its task is to set tactical, political and administrative goals.

In case of need, the State Councillor is authorised to issue instructions to all Hamburg Ministries and has the authority to issue Senate resolutions by way of disposition. This enables the Councillor to take necessary measures (e.g. driving ban) immediately and with minimal administrative delay. In the interest of effective hazard prevention, this deviates from the rule laid down in the Hamburg constitution that the Senate makes decisions in its entirety (collegial principle). The Head of Disaster Management is supported and advised by the Central Disaster

⁴⁵ Hamburg Disaster Protection Act (in German): <http://www.landesrecht-hamburg.de/jportal/portal/page/bshaprod.psml?showdoccase=1&doc.id=jlr-KatSchGHArahmen&st=lr> (last visited 12.05.2020)

Service Staff (ZKD) of the Ministry of Internal Affairs.

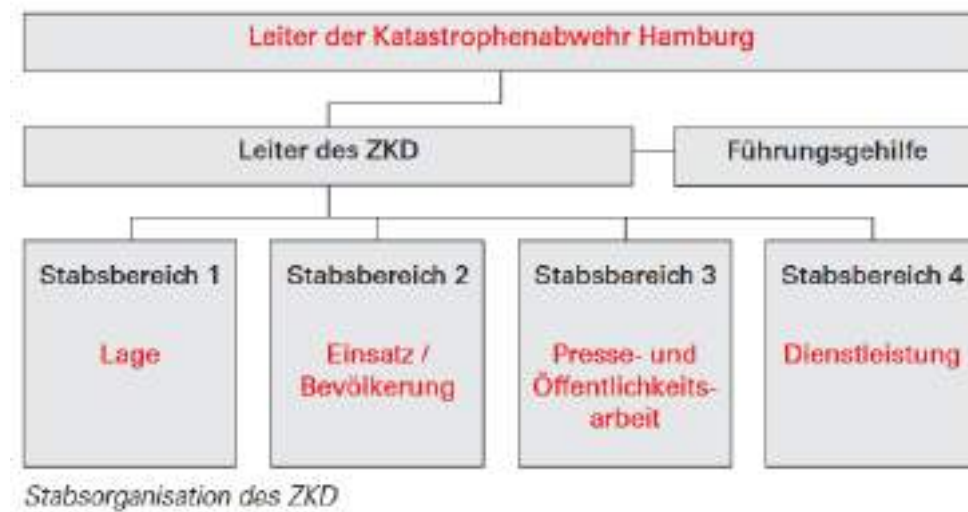


Figure 11 Organisation of the Central Disaster Management of the Ministry of Internal Affairs, Hamburg: Overall management is the responsibility of the State Councillor, who is advised by the head of the central disaster management unit. The four staff divisions 1 - 4 (situation, operation/population, press and public relations and services) are coordinated from there. The head is supported by a management assistant.

Source: <https://www.hamburg.de/contentblob/104268/c7b87c1603af71835412577d0f902830/data/broschuere-katastrophenschutz.pdf>

The Central Disaster Management Unit (ZKD in German):

- coordinates the Hamburg-wide measures of all participants,
- prepares decision bases and solution proposals for the head of disaster control,
- controls the orders placed and monitors their execution,
- makes additional resources accessible if required,
- maintains contact with the bodies involved and any neighbouring federal states (Lower Saxony and Schleswig-Holstein) that may be affected,
- undertakes central press and public relations work,
- initiates nationwide information provision, including the issue of warnings, e.g. through radio reports, the establishment of a personal information centre, and the operation of a public hotline.

In addition to the Ministry of Internal Affairs, other Ministries are involved, including those responsible for:

- Urban development / Building
- Environment
- Health

- Economics

The competent port authorities and the district authorities also perform special tasks both during operation and in the context of planning.

4.4.2. Specialist staff and regional disaster service staff

Specialist staff are employed at the competent authorities in the event of an emergency. They advise the ZKD on the following areas of responsibility:

- Dike construction and flood protection
- Operation of bridges, tunnels and roads
- Water and environmental protection
- Nuclear Technology
- Dangerous goods in producing, handling and storing companies
- Healthcare, Hospitals
- Supply and disposal
- Shipping and air traffic

The regional disaster service units formed at the district departments are responsible for all planning and measures relating to the population. They guarantee issuance of regional warnings and information; and the accommodation, care and support of the population during evacuation.

4.4.3. Fire brigade and Police

The General Guideline for Civil Protection also regulates the distribution of tasks and responsibilities at the site of damage.

All defensive measures required at the site of the damage are directed or carried out by the fire brigade until the primary hazards (e.g. major fire, explosion hazard) have been eliminated.

The fire brigade provides the overall emergency response manager at the site of the damage. If necessary, representatives of the police and / or other specialists are added. In this way, the specialist knowledge required to deal with the damage situation is bundled on site.

The police take over the command of the operation in the vicinity of the place of damage. Here, they take on all tasks for the protection of the population and enable the forces working on the scene to work unhindered.

4.4.4. Force potential

With around 8,000 employees, the forces of the daily service of the fire brigade and police form the basis for effective emergency response in the Free and Hanseatic City of Hamburg.

These task forces are supported by experts from other disaster control authorities as well as by volunteers from voluntary fire brigades, aid organisations, the Federal Agency for Technical Relief, the Hamburg Dike Guard and the German Federal Armed Forces.

Up to 5,800 volunteers are available to the Hamburg Disaster Control Department when needed. The volunteers are an integral and indispensable part of Hamburg's disaster response and are integrated into existing planning accordingly.



Figure 12 Overview of all parties which are involved into disaster risk management in Hamburg; Left column, order from the top: Ministry of Internal Affairs > Fire Brigades and volunteering Fire Brigades > Police subdivided into Security Police and Water Security Police; Column in the middle: different Aid Organisations; Right column, order from the top: Further Forces > District Offices > Dike Guardancy > Ministries of the City state > German Armed Forces

Source: <https://www.hamburg.de/contentblob/104268/c7b87c1603af71835412577d0f902830/data/broschuere-katastrophenschutz.pdf>

4.4.5. Tasks of the emergency services on site

The diverse range of tasks of the emergency services includes: Dike defence; Warning and information of the population; Provision and operation of shelters, Support and care of the population; Registration; Information on persons; Health protection / Vaccinations; Rescuing people; Recovering objects; Technical damage control; Firefighting; Measuring and sensing; Decontamination; Traffic control and guidance; Harbour pilotage and lockage; Investigation of causes⁴⁶.

4.4.6. Specific Disaster Scenario Planning

The Hamburg authorities have prepared themselves for the following possible scenarios and have drawn up guidelines that regulate the cooperation of all parties involved in an emergency:

⁴⁶ Brochure on the organisation of disaster control in Hamburg, in German: <https://www.hamburg.de/contentblob/104268/c7b87c1603af71835412577d0f902830/data/broschuere-katastrophenschutz.pdf> page 4 - 9

- Storm surges;
- Oil spills;
- Emergencies in establishments whose facilities may pose hazards (e.g. refineries);
- Aircraft accidents;
- Railway accidents;
- Genetic engineering;
- Toxic gases;
- Biohazards.

Of course, existing plans for certain events cannot cover all conceivable dangers. They are therefore based on the risk potential defined for Hamburg and the probability of its occurrence. All measures to be initiated by the civil protection authorities in the event of a storm surge are planned in particular detail. Graduated according to expected possible water levels of the Elbe, the existing plans range from dike defence, traffic control and regulation to measures for warning and protection as well as evacuation, care and supply of the population if necessary.

For example, in the event of a very severe storm surge with a water level of 7.30 m above sea level, the deployment of more than 3,000 helpers and the evacuation of about 20,000 people is planned. This occurrence is unlikely, but cannot be ruled out.

4.4.7. General disaster planning

In addition to planning for specific disaster events, there are also guidelines that apply to all such events. The guidelines include preliminary planning for measures to be taken regardless of the type of loss event.

According to the Staff Directive, the disaster control authorities have each appointed a head of disaster control, set up disaster service staff according to uniform guidelines and defined their availability and reporting channels in dedicated alarm calendars. The evacuation and care guidelines include detailed planning to protect the population. They regulate the course of possible evacuations as well as the accommodation, care and support of evacuees in the district emergency shelters (usually schools). The pre-planning ensures that people in the affected area can be evacuated promptly if necessary. The Directive on the establishment and operation of a Person Information Office (PAST) defines its tasks and functions. All information on the whereabouts of people who have been evacuated, or are missing, injured or deceased, can be recorded in the system. The PAST receives enquiries about missing persons and provides information to their relatives. Overall, Hamburg has a comprehensive crisis management system that has proven its worth in numerous missions and exercises in recent years. It has been shown that the existing plans for concrete damage events meet the special requirements of the city state. The pre-planned procedures and the cooperation of all parties involved are optimally adapted to the existing structures.

Administration and politics cannot prevent the occurrence of a disaster. The authorities responsible in Hamburg are, however, optimally prepared for an emergency. They continually update their plans and adapt them to current requirements.⁴⁷

4.4.8. Informing the public

The storm surge information sheet of the Department of the Interior contains important information for the population in the Elbe tidal area.⁴⁸ A total of eight regional editions provide information on the correct behaviour in the event of a storm surge for the following areas: Altona; Hamburg-Mitte; Innenstadt; HafenCity; Finkenwerder; Wilhelmsburg; Harburg, Süderelbe and harbour; Bergedorf and Vier- und Marschlande.

The information sheets are available from the district departments. With the exception of the regional editions for Altona and HafenCity, the leaflets are also available there in the following foreign language translations: Polish; Turkish; Serbo-Croatian; English; Russian.⁴⁹

The Sendai Framework warrants some consideration here as the main international framework for action to prevent new and reduce existing disaster risks. The framework is based on seven targets, four priorities for action with supporting rationale, and 13 guiding principles. Although a global framework, there are particular strategies outlined under the four priorities that target local authorities. The four priorities are:

Priority 1: Understanding disaster risk

Priority 2: Strengthening disaster risk governance to manage disaster risk

Priority 3: Investing in disaster risk reduction for resilience

Priority 4: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction⁵⁰

At the local level, different plans and strategies addressing disaster risk reduction were identified by the authors of this report. Overall, the management of disaster risk by the municipality of Hamburg can be rated as comprehensive and fairly detailed. This is underscored by the continuous updates of the plans. The involvement of various parties in disaster risk reduction – parties which are in charge of specific tasks – makes for a well-structured approach to disaster management. As already mentioned, this disaster management system has proven its functionality in numerous missions and exercises in recent years. Overall, especially priorities 1 and 2 of the Sendai Framework are met to a great extent based on the authors’ perception. The following excerpt from the Sendai Framework highlights

⁴⁷ Brochure on the organisation of disaster control in Hamburg, in German; page 11f.

⁴⁸ Brochure on the organisation of disaster control in Hamburg, in German: <https://www.hamburg.de/contentblob/3425452/45daab7ca53950c90e21de9c8bc49400/data/sturmflut-download-sturmflutschutz.pdf>

⁴⁹ Brochure on the organisation of disaster control in Hamburg, in German; page 16

⁵⁰ Sendai Framework for Disaster Risk Reduction 2015–2030: <https://www.preventionweb.net/files/resolutions/N1516716.pdf> page 8.

the role of stakeholders and their encouragement to participate in reducing disaster risk by states:

States should encourage the following actions on the part of all public and private stakeholders: Civil society, volunteers, organized voluntary work organizations and community-based organizations to participate, in collaboration with public institutions, to, inter alia, provide specific knowledge and pragmatic guidance in the context of the development and implementation of normative frameworks, standards and plans for disaster risk reduction;

The crisis management system in Hamburg draws on a large number of volunteers (as mentioned above). In the event of an emergency, experts are formed at the competent authorities, whose knowledge and experience are integrated by advising the ZKD. Furthermore, civil society is informed about risks and hazards (e.g. a storm surge) as well as the correct behaviour in different languages (as mentioned above). This selection of involvement and information of different actors in crisis prevention and management shows that Hamburg appears to meet the demands of the Sendai Framework on the city level, as far as this can be assessed by the authors. However, no information has been found that concerns disaster response for the Speicherstadt and Kontorhausviertel in the report. The effectiveness of the engagement with the civil society, volunteers and community-based organisations cannot be assessed based on the report. Furthermore, it remains unclear how volunteers are trained and if there are deficiencies in certain parts of the city.

5. Governance framework for climate change adaptation

This section looks at the governance framework for climate change adaptation of relevance to Hamburg. It identifies the relevant policies, strategies, visions and action plans for climate change adaptation in Hamburg at different governance levels. It concludes with a reflection on the extent to which local governance of climate change adaptation takes into consideration key international governance instruments like the 2015 Paris Agreement (see Part 5.4).

5.1. International

The international community recognised early on the need for adapting to the consequences of climate change: In the 1990s, under the [UN Framework Convention on Climate Change](#) (UNFCCC) the global community - Germany included - committed to initiate measures for adaptation to climate change.

Adaptation to climate change is a relevant topic at the European level too, and has been integrated into the further development of the European Climate Change Programme. On 29 June 2007, the European Commission published the Green Paper ["Adapting to Climate Change in Europe - options for EU action"](#), which makes suggestions for first approaches to address the impacts of climate change. Following a comprehensive public consultation on the Green Paper, the European Commission has compiled proposals for joint action in a White

Paper. The White Paper [Adapting to climate change: Towards a European framework for action](#), published on 6 April 2009, proposes laying the groundwork for a Europe-wide adaptation strategy in a first phase up to 2012, and implementing it as early as the beginning of 2013.

The aim of the White Paper is to specify in a step-by-step process an adaptation strategy which will allow decision makers to react to the consequences of climate change in a timely manner all over Europe and to thus mitigate them.

The White Paper advocates action in four areas:

Creating a knowledge base. The focus is on gathering knowledge about the consequences of climate change and the costs and benefits of potential measures. For this purpose, a Clearing House Mechanism is envisaged which will provide structured access to information, data and examples from Member States and EU institutions. Another aim is to develop, by 2011, methods, models, data sets, prediction tools and indicators to monitor the consequences of climate change.

Integrating the aspect of adaptation into important policy areas of the EU, for example by means of appropriate infrastructural measures in coastal or marine areas and changes to agricultural and forestry practices.

Ensuring the effective implementation of the adaptation process by making use of market-oriented instruments and public-private partnerships.

Intensifying international cooperation on the adaptation process by making use of market-oriented instruments and public-private partnerships.⁵¹

5.2. National

In 2008 the German Federal Cabinet adopted the *German Strategy for Adaptation to Climate Change*: a national framework for adapting to the impacts of climate change⁵². The German Adaptation Strategy (DAS) aims to reduce vulnerability to climate change impacts, sustaining or enhancing the adaptive capacity of natural, societal and economic systems. In Germany, adaptation to climate change is a permanent task established along an agreed and politically-adopted institutional and methodological framework. Scientific research programmes, participation and consultation processes as well as the establishment of ongoing reporting systems have been set up. On the national level, nearly all federal ministries are represented in the “Inter-ministerial Working Group on Adaptation to Climate Change” (IWG Adaptation), led by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. To coordinate adaptation activities with the federal states, the Conference of Environmental Ministers established in June 2009 a standing committee for adaptation to climate change impacts.

An Adaptation Action Plan (APA) has followed on from the DAS, and specifies how the Strategy will be implemented: i.e. current and future measures on the federal level to adapt to climate change, as well as links with other national processes. The implementation of the measures described in the APA is in the responsibility of the relevant ministries.

The APA is informed by a **climate impact and vulnerability analysis (KWVA)**, which identifies in which fields of action, which climate impacts exist and which regions are

⁵¹ German Federal Ministry of the Environment: <https://www.bmu.de/en/topics/climate-energy/climate/adaptation-to-climate-change/>

⁵² German Federal Ministry for the Environment: <https://www.bmu.de/en/topics/climate-energy/climate/adaptation-to-climate-change/>

particularly affected, with a corresponding strong need for preventive action. The first KWVA was developed in 2015. An update is planned every six years. The Strategy and its implementation are evaluated every four years, according to a methodology adopted by the inter-ministerial working group on adaptation, and results in a monitoring report. The APA is updated every five years.⁵³ In 2015, the Federal Government of Germany adopted the first progress report of the DAS. This report gives an overview of the primarily federal activities since the adoption of the DAS in 2008 and the Adaptation Action Plan APA I (2011).

5.3. Regional and local

In July 2013, Hamburg adopted the first Action Plan on Adaptation to Climate Change in the Senate and brought it to the community's attention (Bürgerschafts-Drucksache 20/8492).

In 2015, a dedicated Climate Plan was published, bringing together both climate mitigation and climate adaptation measures.

A climate impact monitoring framework for Hamburg is being developed on an ongoing basis. It consists of indicators in three categories: state, impact and response. The first set of 'impact' indicators have been defined and the results are available online at <https://www.hamburg.de/klimafolgen-monitoring/>. Climate impact monitoring is being continuously expanded and is currently being supplemented by definition of the first 'response' indicators.

⁵³ Climate ADAPT, Sharing Adaptation Information Across Europe: <https://climate-adapt.eea.europa.eu/countries-regions/countries/germany> , country profile of Germany last updated Nov. 2019

In December 2019, an evaluated version of the 2015 Climate Plan was published and sets even higher requirements for a reduction of the CO₂ emission until 2030 and 2050. As an extract of the climate plan reflects:

“Goals for reducing emissions were already adopted by the Hamburg Senate in the 2015 Climate Plan. This stated that Hamburg's CO₂ emissions should be halved by 2030 in comparison with 1990 and reduced by at least 80 per cent by 2050.¹⁷ In light of the current findings of the Intergovernmental Panel on Climate Change, these goals must be developed further based on an appropriate contribution by Hamburg. The Senate takes its lead on this from the German Federal Government's national goals in order to achieve the 1.5 °C target. The Senate has therefore set the following new CO₂ reduction targets for Hamburg:

Time axis	CO ₂ reduction targets (with reference to the consumption account and the reference year 1990)	
	Previous target (2015 Climate Plan)	New target (2019 revision)
2030	50% CO ₂ reduction	55% CO ₂ reduction
2050	Minimum 80% CO ₂ reduction	Climate neutral i.e. min. 95% CO ₂ reduction

Table 4: New CO₂ reduction targets for 2030 and 2050 in Hamburg.

To reach these ambitious targets is a task for the entire city and only possible for the Senate as a collaborative effort in a process involving all Hamburg's citizens. The methodology for implementing the transformation paths and their measures described in the annex will be elaborated in the following section. The calculations for the CO₂ reduction targets in the sectors and transformation paths presented below show the reductions that it is currently possible to define. In some areas, reliable calculations on the CO₂ savings to be achieved can only be made in the course of implementation and further development. In terms of the long-term nature of the measures, these predictions also contain uncertainties. Assuming that additional measures will be introduced at Federal Government level, and that additional innovative benefits will arise from technical progress, the implementation of further research results and the scaling of projects which so far have only been feasible as pilots, then the proposed measures will be enough to reach the stated reduction targets.”⁵⁴

⁵⁴ First revision of the Hamburg Climate Plan; p. 14 (English version is attached) <https://www.hamburg.de/contentblob/13899086/749a6e50662c96eee81d370f1b0cb631/data/d-first-revision-hamburg-climate-plan.pdf>

Key messages regarding the Climate Plan include:

Since 1881, **temperatures** in the Hamburg metropolitan region have risen by about 1.4 degrees Celsius, of which about 1.2 degrees are attributable to the period after 1951. Depending on the success of global climate protection policy, by the end of the century (2071-2100) the temperature in Hamburg and northern Germany will have risen by a further one to five degrees Celsius compared with today (1961-1990).

The **amount of precipitation** has increased in Hamburg and northern Germany, especially in winter, and dry periods in spring now last longer than a few decades ago. For the future, significantly increased precipitation is expected, especially in the winter months. Heavy precipitation and rainy days may also increase.

So far, there is no evidence of systematically **stronger storms** throughout the year. Since the 1960s, a slight increase in storm frequency and intensity has been observed. In the long-term context (100 years), however, this is within the range of natural fluctuations.

In the **urban area of Hamburg**, it is on average about 0.1 degrees Celsius warmer than in the surrounding area, with local peaks of 1.2 degrees in the city centre. This urban effect is hardly changed by climate change. However, temperature limits are exceeded more quickly, so that hot days occur more frequently in the city than in the surrounding area. In addition, heavy precipitation can increase. This should be taken into account in future urban planning.

On the **German coasts**, the water surface temperature has risen in recent decades and the sea level has risen by 15 to 20 centimetres in the last century. The water on German coasts will continue to warm up in the future and sea levels may rise by a further 20 to 80 centimetres by 2100. As a result, slight storm surges may occur more frequently. In the Elbe, the consequences of climate change have so far been difficult to detect due to hydraulic engineering measures and natural dynamics.

In **terrestrial ecosystems** it is expected that beech will continue to be the predominant tree species in the North German forests. However, oak and spruce may become more prevalent if summer precipitation is significantly lower. In addition to climate change, the **aquatic ecosystems** are particularly affected by fishing.

Energy supply and climate change are interrelated. Currently, 82 percent of Hamburg's electricity is generated from fossil fuels. In response to climate change and in view of the Paris Climate Agreement, an expansion of renewable energies is to be expected. This would increase dependence on prevailing weather conditions (duration of sunshine, wind strengths, cloud formation, swell). These can change as a result of climate change, which in turn has an impact on energy production. Power plants on rivers can be affected by low water levels and high water temperatures.

In Hamburg, **drinking water** is obtained exclusively from groundwater. During prolonged periods of drought, the groundwater level can drop. It then becomes more difficult to obtain drinking water. In addition, heavy precipitation can impair water quality. Drainage systems should be geared to higher precipitation levels in future.

Hamburg's **sustainability policy** with a 20-year history offers approaches to link climate change and sustainable development. These can be further developed on the basis of scientific proposals.⁵⁵

Among four 'transformation paths' there is a path on climate adaptation with a particular focus on *RegenInfraStrukturAnpassung* (Rain InfraStructure Adaptation or RISA), and a table of corresponding measures in the following areas:

- Planning instruments: water plan and water management support plan
- Comprehensive implementation of tried and tested RISA measures
- Storm surge protection
- Inland flood protection
- Operational capability / disposal capacity of wastewater removal
- Security of supply in the drinking water supply
- Security of supply in the energy infrastructure
- Civil protection: disaster reduction and disaster management
- Green networking (with a focus on heat island prevention and the promotion of natural water cycles)
- Roof and façade greening
- Trees in the city
- Building-related measures
- New functions for public services

5.3.1. Responsibilities

The Ministry for Environment and Energy with its Centre for Climate Issues was charged by the Senate to assume a coordinating and controlling function over all ministries. This includes the compilation and evaluation of measures and financial controlling, and climate impact and CO₂ monitoring. The progress of the measures, details of funding and any CO₂ reductions achieved are reported annually. Reports with detailed information are required for measures which have been funded from the central programme of the Hamburg Climate Plan.⁵⁶

⁵⁵ Source of the Key Messages in German: <https://link.springer.com/book/10.1007/978-3-662-55379-4>

⁵⁶ First revision of the Hamburg Climate Plan; p. 12

5.3.2. Flood risk in Hamburg

Inhabitants of Hamburg are aware of flooding, especially during the period from September – April. But Hamburg is also confronted with storm surges – or rather storm tides – which cause substantial damage. Flooding turns into a storm tide in Hamburg when the level St. Pauli exceeds 3.40 metres above normal zero (NN). A level from 4.50 metres above NN upward is known as a heavy storm tide, and from 5.50 metres above NN, as a very heavy storm tide. Approximately 109,000 households and businesses belong to the areas of Hamburg affected by flooding. Disaster risk management is included in the tasks of all ministries and departments. Nevertheless the ministry of internal affairs and sport holds a special position in this area. In case of catastrophes, this ministry is responsible for any coordination of all defence measures.⁵⁷

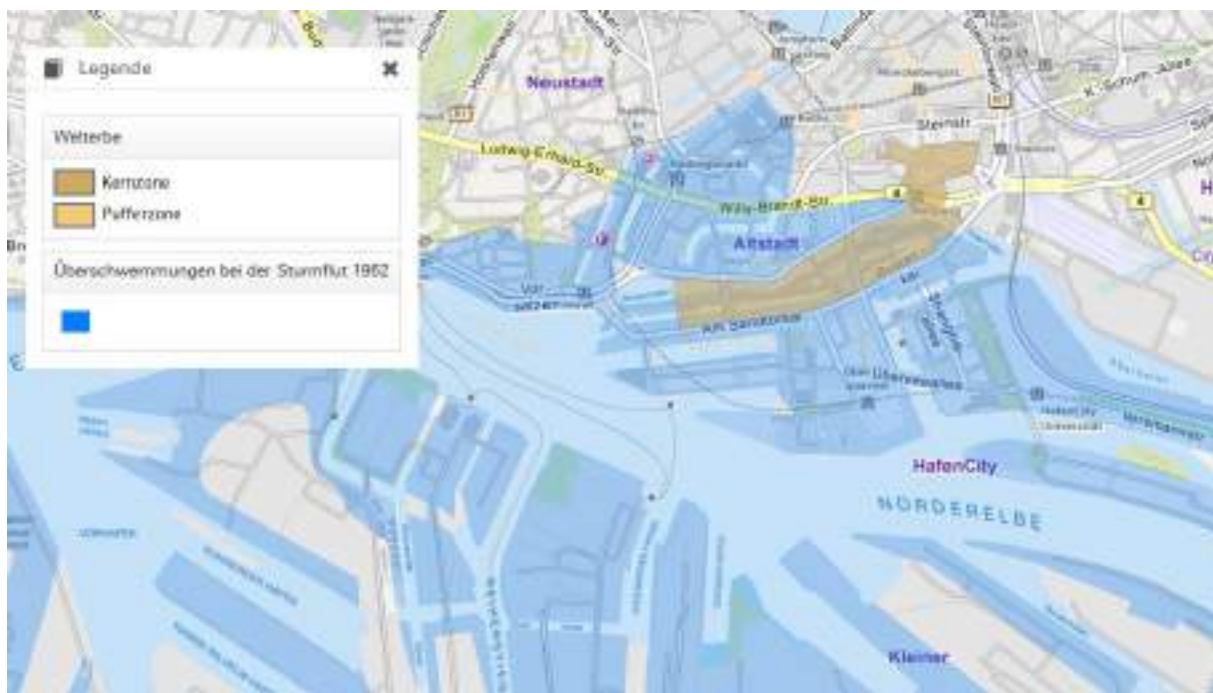


Figure 13 Storm flood from 1962 and its impact on the City of Hamburg and WHS with warehouse district (here marked in beige colour). <https://geoportal-hamburg.de/Geoportal/geo-online/#>

A storm tide from 1962 did not only shape the personal fates of many people, but also marks a turning point concerning the flood water protection of Hamburg. Because of the catastrophe, the topic became an issue of high priority for the city: many new structures were implemented and long-term running programmes were set up. Up to the night of February 16, 1962, inhabitants felt safe behind the dykes: the last extreme storm tide had been 107 years before. Since then, no damage had occurred by storm surges. This deceptive security led to the fact that dykes were not maintained properly and in bad shape by 1962. Moreover, it became usual that existing buildings got the priority to be preserved instead of erecting or enhancing the dyke. For some parts on the dykes themselves, buildings were erected or used as farming land.

⁵⁷ Source: <https://www.hamburg.de/sturmflut-1962/4357752/hochwasserschutz/>

The storm tide catastrophe from 1962 led to a massive investment and reorganisation of high water protection in Hamburg. All tasks concerning the public high water protection took the city over completely. During the past 50 years Hamburg worked almost constantly on the reinforcement of the public high water protective systems. Thanks to these efforts the threat from storm tides is lower than ever before in the history of the city. Since the year 1962 there were eight more storm tides with peak water levels higher than the one of February 16, that year. Yet no serious damage occurred at the main dyke line. Therefore, Hamburg has nowadays an effective protection against flooding events of all kinds. The public-owned flood protection line stretches for a length of 103 km, and many buildings forms the backbone of this flood protection system in Hamburg.

After a building period of more than 25 years the “building program flood protection for a measured water level of NN+ 7,30 metres at the level St. Pauli” was finished in 2018: The high water protective line was enhanced after new measured water levels were determined in 1991. A long building period like this describes how intensive and permanent the task is for Hamburg. Climate change and the expected sea level raise will keep the challenges high and make it a permanent job for the city for the future. This future task becomes even more important as city development makes progress in inner city close and lower areas. With projects like HafenCity and “Jump across the river Elbe” residential areas entered into the focus of the department for city planning, which have to be protected constantly against consequences of climate change.⁵⁸

5.3.3. Flood risk management – spatial mapping



Figure 14 Example scenario that shows the effect of medium heavy coastal flooding on the inner city.

⁵⁸ Source: <https://www.hamburg.de/sturmflut-1962/4357752/hochwasserschutz/>



Figure 15 Example scenario that shows the effect of extreme coastal flooding on the inner city.

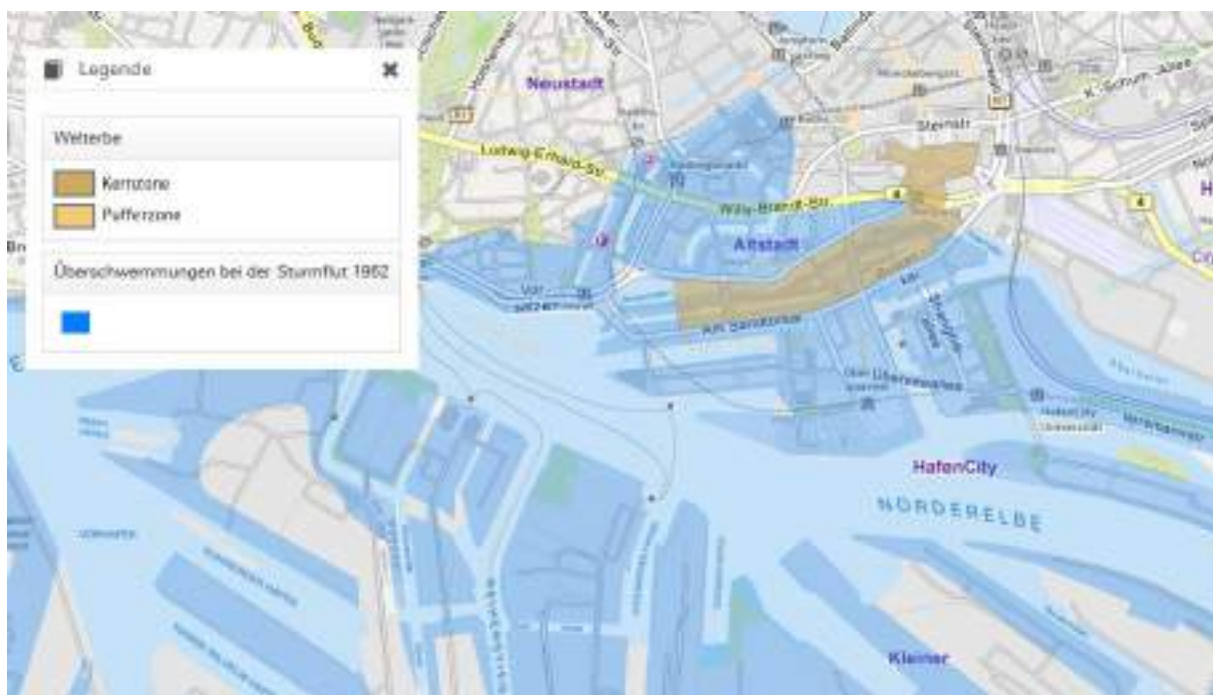


Figure 16 Storm flood from 1962 and its impact on the City of Hamburg and WHS with warehouse district (here marked in beige colour). All maps, if not otherwise indicated, come from: <https://geoportal-hamburg.de/Geoportal/geo-online/#>

Scenarios like the examples above can be created and modified individually at <https://geoportal-hamburg.de/hochwasserrisikomanagement/#> which is based on recent scientific models (2019) and was launched in January 2020. These hazard maps describe the impact of flooding events in its expansion throughout the city and the occurring depth of water. The risk maps display in which way the affected areas are normally in use, where industrial businesses and protected goods (Schutzgüter) are located as well as the number of potentially affected inhabitants. Both maps also display the built flood protection systems (e.g. dykes, privately owned polders and flood protection walls) and their effect. For detailed background

information about this online map portal see the Risk Map PDF (German only) which can be downloaded here (<https://www.hamburg.de/gefahren-risiko-karten/>).

Furthermore, to raise more awareness among tourists and inhabitants a simulation program has been developed. People standing or sitting on the newly-built dyke at Baumwall can use the program on their mobile devices and better appreciate the impact of flooding water events directly at that site. (<https://moinzukunft.smartvr.de/smartvr.html>)

5.4. Gaps and needs

In the context of Hamburg's governance framework for climate adaptation, the need to protect cultural heritage from climate change impacts is not adequately recognised, either by ministries or by scientific institutes that deal with one or the other topic mainly.

A comparable conclusion can be read in the latest conference publication of Fraunhofer IWM:

*"However, in-depth interdisciplinary and transdisciplinary research on how to adapt [cultural heritage] to climate change on local, regional, national and European levels continues to be lacking."*⁵⁹

This issue is not unique to Hamburg, but reflects a broader situation at other levels of governance and also in other European cities. Nevertheless, it has to be stated that cultural heritage preservation is neither mentioned as a topic nor as a challenge for the future within the revised Hamburg Climate Plan from 2019 (which includes both mitigation and adaptation measures). Clearly there is potential for cultural heritage sites to receive greater attention in terms of the City's specific plans to adapt to climate change.

The Paris Agreement sets out a framework of fundamental international significance for climate action at all levels of government, and hence warrants some reflection in terms of its relevance at the local level. It primarily targets climate mitigation, and directly addresses nation states, with a focus on nationally-determined contributions to emissions reduction by parties to the agreement. Article 7 and 8 of the agreement, however, deal explicitly with climate adaptation, and with the loss and damage associated with climate impacts.

Article 7 notes the following areas of cooperation between parties:

(a) Sharing information, good practices, experiences and lessons learned, including, as appropriate, as these relate to science, planning, policies and implementation in relation to adaptation actions;

(b) Strengthening institutional arrangements, including those under the Convention that serve this Agreement, to support the synthesis of relevant

⁵⁹ "However, in-depth interdisciplinary and transdisciplinary research on how to adapt [cultural heritage] to climate change on local, regional, national and European levels continues to be lacking." Editorial; Fraunhofer IMW: Cultural Heritage in Crisis – Cultural Heritage Research at European Level – Challenges in Times of Climate Change and Digitalization; April 2020, p.6; online accessible: https://www.imw.fraunhofer.de/content/dam/moez/de/documents/innovationsakzeptanz/Konferenzband_Villa_Vigoni_2020.pdf#page=14

information and knowledge, and the provision of technical support and guidance to Parties;

(c) Strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making;

(d) Assisting developing country Parties in identifying effective adaptation practices, adaptation needs, priorities, support provided and received for adaptation actions and efforts, and challenges and gaps, in a manner consistent with encouraging good practices; and

(e) Improving the effectiveness and durability of adaptation actions.

Article 8 notes that ‘areas of cooperation and facilitation to enhance understanding, action and support may include:

(a) Early warning systems;

(b) Emergency preparedness;

(c) Slow onset events;

(d) Events that may involve irreversible and permanent loss and damage;

(e) Comprehensive risk assessment and management;

(f) Risk insurance facilities, climate risk pooling and other insurance solutions;

(g) Non-economic losses; and

(h) Resilience of communities, livelihoods and ecosystems.

The above fields of action can be understood as a framework in which all nations that are party to the Paris Agreement are expected to take action. In that sense, they are of limited use as an implementation guide for local governments, however it can be assumed that such national governments are working to establish national policy frameworks for action that will in turn demand regional and local levels of government to implement complementary strategies. Although Hamburg has adopted various plans and action plans for climate mitigation and adaptation, cultural heritage sites are not explicitly included in them. Overall, the need to protect cultural heritage from climate change impacts is not adequately recognised yet. A greater focus can be placed on this in the future.

6. Expected impacts of climate change and environmental hazards

The purpose of this section is to report and review the preliminary collection of relevant information about hazards, exposed elements, as well as impacts provided by ARCH city partners in collaboration with their local research partners, in order to offer an initial overview of the risks that might affect the selected historic areas and their communities. This section is structured as follows: a description of the methodology is provided, followed by a Risk Profile Table, outlining hazards, exposed elements, impacts, and corresponding resilience-building measures already planned or implemented to date. Next follows a review, interpretation, and validation of the information provided in the Risk Profile Table. Finally, an outlook is provided concerning further risk analysis work in the context of the ARCH project.

6.1. Methodology

In order to elicit relevant information for risk analyses from city partners, ENEA, Fraunhofer, ICLEI, and TecNALIA developed a Risk Profile Table template (see Part 6.2 below) based on the central risk components identified in the 5th Assessment Report of the Intergovernmental Panel on Climate Change⁶⁰: hazards, exposed elements, impacts (physical, societal, functional, economic, and intangible), as well as corresponding resilience-building measures already planned or implemented to date. This template was filled out by city partners and provides a starting point from which to conduct more detailed risk analyses. Furthermore, it allows to provide a useful starting point for the data, models, methods, and tools to be developed during the project.

The information provided in the Risk Profile Table was reviewed and harmonised by ENEA in order to provide a comparable description across all city cases and ensure relevance to (and validity for) similar on-going and/or future initiatives and projects in the field of disaster risk reduction, climate change adaptation, and cultural heritage preservation.

The following standards, reference material, and tools were identified as most suitable for this exercise:

- The C40–city Climate Hazard Taxonomy for classification of hazards⁶¹;
- The UNDRR QRE Tool⁶² and ISO standard 37120⁶³ for the classification of exposed elements and impacts; and

⁶⁰ C40 Cities and Arup, “City climate hazard taxonomy,” 2015, [Online]. Available: <http://www.c40.org/researches/city-climate-hazard-taxonomy>

⁶¹ C40 Cities and Arup, “City climate hazard taxonomy,” 2015, [Online]. Available: <http://www.c40.org/researches/city-climate-hazard-taxonomy>

⁶² UNDRR, “Quick Risk Estimation (QRE) Tool.” <https://www.unisdr.org/campaign/resilientcities/toolkit/article/quick-risk-estimation-qre> (accessed Jul. 20, 2020)

⁶³ ISO, “ISO 37120:2018 - Sustainable cities and communities — Indicators for city services and quality of life.” 2018, Accessed: Jul. 20, 2020. [Online]. Available: <https://www.iso.org/standard/68498.html>

- The ICOMOS CCHWG classification⁶⁴ and INSPIRE directive⁶⁵ [6] for the classification of heritage assets;

Based on the harmonised information, initial proposals for risk analysis focus actions (e.g. which methods and tools to apply for which part/issue of a historic area) were formulated by ENEA. The initial proposals will be further defined during the co-creation process and in exchange with the relevant local stakeholders.

⁶⁴ Climate Change and Cultural Heritage Working Group International Council on Monuments and Sites, "The Future of our Pasts: Engaging cultural heritage in climate action," *International Council on Monuments and Sites*, pp. 1–96, 2019, [Online]. Available: <https://indd.adobe.com/view/a9a551e3-3b23-4127-99fd-a7a80d91a29e>

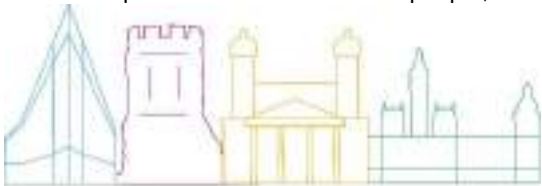
⁶⁵ INSPIRE Thematic Working Group Building, "Infrastructure for Spatial Information in Europe D2 . 8 . 1 . 2 Data Specification on Geographical Grid Systems – Technical Guidelines," 2011

6.2. Risk profile table

Heritage site (historic area)	Hazard ⁶⁶	Exposed element ⁶⁷ (e.g. buildings, people, intangible or tangible cultural heritage, road network, natural environment)	Impacts (Describe all impacts in the relevant category)					Corresponding resilience-building measure undertaken (planned or implemented. This may be a specific measure planned to address a specific hazard, e.g. construction of a flood protection barrier, or a general one that indirectly addresses the hazard, e.g. greening of paved surfaces)	Notes/Evidence (including source of the information e.g. historical data on previous hazardous events related to the damages and impacts caused, climate projections, risk assessment.)
			Physical	Societal	Functional	Economic	Intangible		
Speicherstadt	Tidal changes / prolonged low water	Tangible cultural heritage / Quay walls	Damage to wooden poles at the base of the buildings due to intrusion of wood destroying fungi; associated damage to buildings			Loss of tourism revenue and loss of business income due to damaged premises	Loss of cultural heritage value resulting from physical damage	S: Restoration of the wooden poles, barrages	Prolonged low water might result in (part of) the poles not being saturated with water anymore, which might result in built-up of wood destroying fungi. →This needs more examination.
Speicherstadt	Flooding	Tangible cultural heritage / Buildings (storehouses)	Damage to buildings;			Loss of tourism revenue and loss of business income due to damaged premises	Loss of cultural heritage value resulting from physical damage	S/G: Early warning system, disaster risk management plan for flooding,	
Speicherstadt	Flooding	Transport network	Damage to infrastructure	Loss of access to workplace or public space for leisure	Disruption of transport services	Loss of salary due to inability to work			
Speicherstadt	Flooding	Electricity network	Damage to infrastructure	Loss of use of workplace	Disruption of electricity services	Loss of business income			No emergency electricity system in Speicherstadt
Speicherstadt	Flooding	Communications network	Damage to infrastructure as a cascading effect of damage to electricity system						

⁶⁶ Note: the UN Office for Disaster Risk Reduction (UNDRR)'s Resilience Scorecard defines 'hazard' as 'a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation'. Of these, the ARCH project is addressing natural and climatic hazards.

⁶⁷ Note: the UN Office for Disaster Risk Reduction's Resilience Scorecard defines 'exposure' as 'the situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas'.



Heritage site (historic area)	Hazard ⁶⁶	Exposed element ⁶⁷ (e.g. buildings, people, intangible or tangible cultural heritage, road network, natural environment)	Impacts (Describe all impacts in the relevant category)					Corresponding resilience-building measure undertaken (planned or implemented. This may be a specific measure planned to address a specific hazard, e.g. construction of a flood protection barrier, or a general one that indirectly addresses the hazard, e.g. greening of paved surfaces)	Notes/Evidence (including source of the information e.g. historical data on previous hazardous events related to the damages and impacts caused, climate projections, risk assessment.)
			Physical	Societal	Functional	Economic	Intangible	Description (please indicate specific S or general G)	
Speicherstadt	Flooding	People		Injuries and/or death Health impacts due to interior mould growth Loss of livelihood (if materials/equipment/goods destroyed)		Loss of business income due to higher number of employees not able to work		S/G: Early warning system, disaster risk management plan for flooding,	
Speicherstadt	Storm surge	Tangible cultural heritage / Buildings	Damage to buildings;			Loss of tourism revenue and loss of business income due to damaged premises	Loss of cultural heritage value resulting from physical damage	S/G: Early warning system, disaster risk management plan for flooding,	No emergency electricity system in Speicherstadt
Speicherstadt	Storm surge	Transport network	Damage to infrastructure		Disruption of transport services				
Speicherstadt	Flooding	Electricity network	Damage to infrastructure		Disruption of electricity services				No emergency electricity system in Speicherstadt
Speicherstadt	Flooding	Communications network	Damage to infrastructure as a cascading effect of damage to electricity system						Communication emergency network in place
Speicherstadt	Storm surge	People		Injuries and/or death				S/G: Early warning system, disaster risk management plan for flooding,	
Speicherstadt	Sea level rise	Tangible cultural heritage / Buildings	Damage to buildings; Damage to critical infrastructure (e.g. electricity system)			Loss of tourism revenue and loss of business income due to damaged premises	Loss of cultural heritage value resulting from physical damage	S/G: Early warning system, disaster risk management plan for flooding,	For this instance, a long term solution with a barrage system is in planning (see Entwicklungskonzept Speicherstadt and Management Plan)
Speicherstadt	Extreme temperatures	Tangible cultural heritage / Copper roofs of the buildings	Damage to materials due to extreme heating						Question: Do copper roofs have an intensifying effect for heatwaves?

Heritage site (historic area)	Hazard ⁶⁶	Exposed element ⁶⁷ (e.g. buildings, people, intangible or tangible cultural heritage, road network, natural environment)	Impacts (Describe all impacts in the relevant category)					Corresponding resilience-building measure undertaken (planned or implemented. This may be a specific measure planned to address a specific hazard, e.g. construction of a flood protection barrier, or a general one that indirectly addresses the hazard, e.g. greening of paved surfaces)	Notes/Evidence (including source of the information e.g. historical data on previous hazardous events related to the damages and impacts caused, climate projections, risk assessment.)
			Physical	Societal	Functional	Economic	Intangible	Description (please indicate specific S or general G)	
Speicherstadt	Extreme temperatures	People		public spaces become hostile and abandoned		public spaces become hostile and abandoned	public spaces become hostile and abandoned		
Kontorhaus district	Flooding	Tangible cultural heritage / Buildings	Damage to buildings; Damage to critical infrastructure (e.g. electricity system)			Loss of tourism revenue and loss of business income due to damaged premises	Loss of cultural heritage value resulting from physical damage	S/G: Early warning system, disaster risk management plan for flooding,	
Kontorhaus district	Flooding	Transport infrastructure	Damage to infrastructure		Disruption of transport services			S/G: Early warning system, disaster risk management plan for flooding,	
Kontorhaus district	Flooding	People		Injuries and/or death				S/G: Early warning system, disaster risk management plan for flooding,	
Kontorhaus district	Storm surge	Tangible cultural heritage / Buildings	Damage to buildings; Damage to critical infrastructure (e.g. electricity system)			Loss of tourism revenue and loss of business income due to damaged premises	Loss of cultural heritage value resulting from physical damage	S/G: Early warning system, disaster risk management plan for flooding,	
Kontorhaus district	Storm surge	Transport infrastructure	Damage to infrastructure		Disruption of transport services			S/G: Early warning system, disaster risk management plan for flooding,	
Kontorhaus district	Storm surge	People		Injuries and/or death				S/G: Early warning system, disaster risk management plan for flooding,	
Kontorhaus district	Extreme temperatures	People		public spaces become hostile and abandoned		public spaces become hostile and abandoned	public spaces become hostile and abandoned		

6.3. Preliminary classification of hazards, exposed elements and impacts

The purpose of this section is to review, interpret, validate, and harmonize the information provided in the Risk Profile Table as a sound basis for the project to address Hamburg's risks for the two historical districts that will be examined, i.e. Speicherstadt and Kontorhaus district. This screening covers:

- a) hazards,
- b) elements exposed to those hazards, and
- c) impacts that the identified hazards might cause on the exposed elements.

A related purpose is to identify possible data gaps, and proposals for focus project actions in the context of the city case.

6.3.1. Hazards

The different hazard types recognised in the Risk Profile Table are classified in Table 5 according to the *C40 City Climate Hazard Taxonomy* that identifies 6 main hazard categories and breaks them down further into hazard types, and hazard sub-types.

Different hazards identified for Kontorhausviertel, i.e. extreme temperature, extreme precipitations and storm surges, are grouped under the meteorological category in Table 5 while flooding under the hydrological one; the same hazards are a concern for the Speicherstadt, and further than these, sea level rise and tidal changes are recognised as possible hazards and have been identified in Table 2 under the Climatological category.

Hazard categories	Hazard Types	Hazard sub-type
Meteorological	Extreme precipitation	Heavy rain
	Storm surges	Convective storms, rainstorm
	Extreme hot	Heatwave, drought
Climatological	Sea-level rise	Sea flooding, saline intrusion,
Hydrological	Flooding	coastal flood and flash floods
Biological	Pests and plagues	Bacteria, fungi

Table 5 Hazard categories, types identified for Speicherstadt and Kontorhaus district.

During the Hamburg meeting the bacteria attack to the timber-pile foundations, oak logs, of the Speicherstadt buildings (Figure 17), possibly worsened by the sudden and frequent tidal changes and/or by the polluted water of the channels (due to the numerous tourist boats) was mentioned as a possible concern. To reflect that Table 5 includes also the biological hazard category.



Figure 17 A cross-section view of the Speicherstadt from 1888 (source Wikipedia)

6.3.2. Exposed Elements

The elements exposed to the aforementioned hazards, identified within the Risk Profile Table for Speicherstadt and Kontorhausviertel have been reorganised in Table 6, according to the following categories:

- *Natural Environment*
- *Built Environment: critical Infrastructures and Buildings;*
- *Cultural heritage;*
- *Services (essential or basics and productive);*
- *Human and social aspects.*

In Table 6, the cultural heritage category subsumes all exposed elements that are in themselves heritage, i.e. exposed elements declared as heritage are only categories as such and not as any of the other.

Exposed Element Categories	Exposed Element Types
Natural Environment	Ecosystem
Built Environment	Buildings
	Road, railroad and other transport infrastructures (loading canals (German: <i>Fleete</i>).
	Electricity network
	Communications network
Cultural Heritage	Tangible and Intangible elements (see Table 4)
Services, essential and productive	Warehouses
	Offices
	Museums
	Touristic services (Boats and Launcher [Barge])
Human and Social Aspects	External people (e.g. tourists,)
	Local people

Table 6 Exposed elements identified for both Speicherstadt and Kontorhausviertel

Table 7 reports in further detail the exposed elements categorised as cultural heritage. Here, reference has been made to the six categories identified by the ICOMOS Climate Change and Cultural Heritage Working Group, CCHWG (2019). For Speicherstadt and Kontorhausviertel, four out of the six CCHWG categories are of particular relevance, i.e.: **Archaeological resources, Building and Structures, Cultural Landscapes and Intangible Heritage**. These cultural heritage categories have been broken down further into cultural heritage types (i.e.

Archaeological heritage and Associated and Traditional Communities) to provide a more detailed picture.

Exposed Cultural Heritage Categories	Exposed Cultural Heritage Types
Archaeological resources	archaeological materials (e.g. lifting tools for the warehouses)
	archaeological sites
	archaeological monuments (archaeological industry, archaeological electric power plant)
Buildings and structures	buildings, quay walls, warehouses, canals,
Cultural landscapes	combined works of nature and humankind
Intangible heritage	knowledge and skills to produce traditional crafts
	social practices
	cultural heritage value
	performing arts
	festive events
	knowledge and practices concerning nature and universe

Table 7 Categories and sub-categories of the cultural heritage exposed elements identified for Speicherstadt and Kontorhausviertel.

6.3.3. Impacts

Table 8 reports, in a succinct way, the different impacts identified for Speicherstadt and Kontorhausviertel under the five categories of impacts, included in the Risk Profile Table for the different exposed elements categorised according to the classification reported in Table 6.

		Impacts				
Exposed Elements		<i>Physical</i>	<i>Functional</i>	<i>Societal</i>	<i>Economic</i>	<i>Intangible</i>
Natural Environment	Ecosystem	Increase in existing pests /diseases. Costal Erosion. Physical damage to banks and quay walls. Evapotranspiration & eutrophication of canal water				
Built Environment	Buildings	Physical Damage			Direct Economic loss due to physical damage	
	Road, railroad, canal	Physical Damage	Loss/ disruption of service	Loss of access to key services		
	Electricity and communication network	Physical Damage	Loss/ Disruption of service	Loss of access to key services		
Cultural Heritage	Tangible and Intangible elements	Physical Damage	Loss/ Disruption of service	Loss of access to culture	Direct Economic loss due to physical damage and LoR* from Tourism sector	Loss of cultural heritage values
Services, essential and productive	Offices and Warehouses	Physical Damage	Loss/ Disruption of service	Loss of access to services	Direct economic loss & LoR*	
	Museums	Physical Damage	Loss/ Disruption of service	Loss of access to services	Tourism Sector: direct economic loss & LoR	Loss of traditional attraction
	Boats & Jetties	Physical Damage	Loss/ Disruption of service		Tourism Sector: direct economic loss & LoR	Loss of Traditional leisure activity
	Warehouse Equipment	Damage to Traditional lifting equipment				Loss of Traditional lifting practices and values
Human and Social Aspects	External	Illness (e.g. heatstroke), injury and mortality		Loss of Tourism	LoR from tourism sector	
	Local	Illness (e.g. heatstroke), injury and mortality		Loss of Jobs	Impact on Local Economy	

Table 8 Physical, Functional, Societal, Economic and Intangible impacts identified for the different exposed elements in the Speicherstadt and Kontorhausviertel.

Risk analyses, implemented with different methods and levels of complexity (depending on the available data, knowledge, time, and personnel) will be needed to quantify the likelihood, level and extent of the expected impacts, as briefly indicated in the following section.

6.4. Outlook and implications for further risk analyses within ARCH

Based on the information provided in the Risk Profile Table and building on the joint meetings between Hamburg and the research partners, ARCH work for Hamburg is envisaged to be conducted at different levels of analysis (Table 9).

Study Areas/Buildings	Possible Analysis	Possible Tools
<i>Municipality Scale</i>	<u>Impact Chain Analysis</u> to assess interrelation and interdependencies between Speicherstadt and Kontorhaus districts and the surroundings (both natural and built environment)	IVAVIA impact chain creator (Adapted for ARCH) ARCH DSS (i.e. CIPCast)
<i>Speicherstadt and Kontorhaus district.</i>	<u>Scenario simulations</u> Damage identified in the buildings of Speicherstadt and Kontorhaus district may be caused by geological problems, due to: Geological and anthropic subsidence Burial of the canals (that are however continuously dredged to allow for the circulation touristic boats and jetties.	ARCH DSS Satellite Images and and/or survey supported by drones
<i>Prototypical Building Scale - identified within Speicherstadt and Kontorhaus districts</i>	Continuous data collection integration and processing from sensors and images acquired from drones or laser scanner	Sensors Survey supported by drones Photogrammetry laser scanner and/or survey supported by drones
<i>Two buildings of interest – (one for Speicherstadt and one for Kontorhaus district)</i>	3D Building model with identified damage pattern and dynamic monitoring of damage Finite element analysis of the buildings to support retrofitting interventions	Sensors installation of low-cost and traditional structural health monitoring sensors (e.g. MEMS, optic fibre and accelerometers) ; Chemical and mechanical characterisation of constructive materials; 3D models

Table 9 Possible analysis and possible tools to be implemented for ARCH work in Hamburg City

Table 9 provides initial ideas of possible examples of the work that can be undertaken in Hamburg as part of ARCH project. What proposed in Table 6 will need, of course, to be discussed and agreed with Hamburg City and ARCH research partners; it is also strictly influenced by data availability.

7. Preliminary assessment of the resilience of historic areas selected for the local activities in Hamburg

The following resilience assessment was developed using the preliminary version of the UNDRR Disaster Resilience Scorecard for Cities⁶⁸. The preliminary assessment was conducted during a webinar between the municipality of Hamburg, ICLEI, and Fraunhofer on February 11, 2020. As the original Scorecard is aimed at city-level, not all questions were immediately applicable on the level of historic areas or single heritage assets. Wherever possible, answers were provided for the historic areas under examination (e.g. with regard to hazard scenarios). For all other questions, answers were provided on city-level (e.g. with regard to city masterplans). The results give a first indication of the overall resilience of the city with some – but not exclusive – focus on the historic areas examined by ARCH. In addition, the application of the Scorecard will be used as input for the development of the ARCH Resilience Assessment Framework specifically focused on historic areas. Lastly, the preliminary resilience assessment results presented in the baseline reports should not be employed to develop resilience action plans, as not all necessary stakeholder groups were involved in the assessment process.

7.1. Essential 01: Organize for resilience

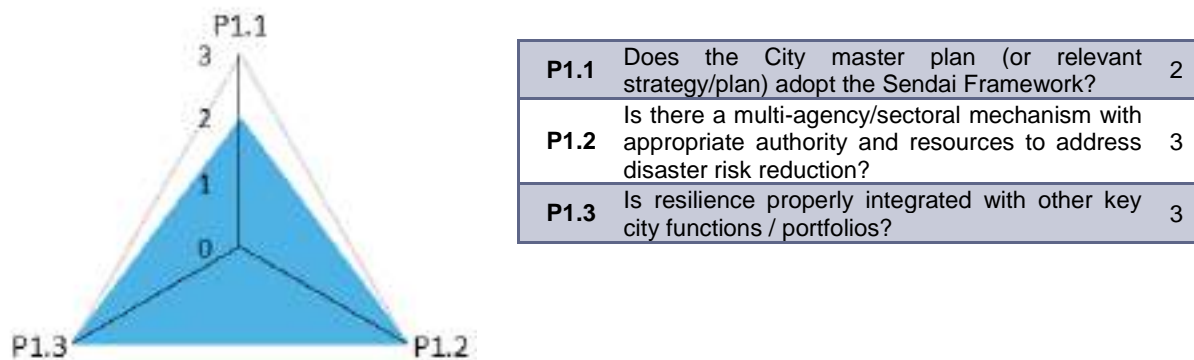


Figure 18: Results for Essential 01.

Regarding Essential 01, Hamburg achieves a resilience score of 8/9. The city has a stand-alone disaster risk reduction plan complying with national strategies and laws (score of 2 for P1.1). The city also has a well-established multi-agency mechanism to address disaster risk reduction. Specifically, the Ministry of Interior and Sports is responsible for coordinating all disaster risk reduction measures and is authorised to issue instructions to all other Hamburg

⁶⁸ UNDRR, “Disaster Resilience Scorecard for Cities.” <https://www.unisdr.org/campaign/resilientcities/toolkit/article/disaster-resilience-scorecard-for-cities> (accessed Jun. 19, 2020)

authorities in case of an emergency (score of 3 for P1.2). Lastly, although no information is publicly available, the city includes resilience (semi-) explicitly in all the decision-making processes (score of 3 for P1.3).

7.2. Essential 02: Identify, understand and use current and future risk scenarios

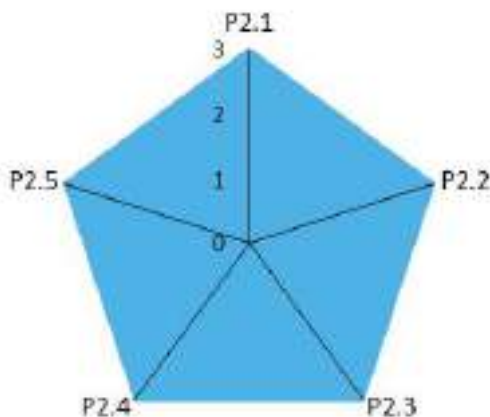


Figure 19: Results for Essential 02.

P2.1	Does the city have knowledge of the key hazards that the city faces, and their likelihood of occurrence?	3
P2.2	Is there a shared understanding of risks between the city and various utility providers and other regional and national agencies that have a role in managing infrastructure such as power, water, roads and trains, of the points of stress on the system and city scale risks?	3
P2.3	Are their agreed scenarios setting out city-wide exposure and vulnerability from each hazard, or groups of hazards (see above)?	3
P2.4	Is there a collective understanding of potentially cascading failures between different city and infrastructure systems, under different scenarios?	3
P2.5	Do clear hazard maps and data on risk exist? Are these regularly updated?	3

For Essential 02, Hamburg achieves the maximum resilience score of 15/15. The city understands its main hazards, and updates related information regularly (score of 3 for P2.1). There is also a shared understanding of risks between the city and its utility providers, although information on this process is not publicly available (score of 3 for P2.2). Related to P2.1, the city also maintains a set of agreed disaster scenarios (score of 3 for P2.3) and understands the resulting cascading effects (score of 3 for P2.4). Lastly, the city has detailed hazard maps and data for the most relevant hazards and updates them regularly (score of 3 for P2.5).

7.3. Essential 03: Strengthen financial capacity for resilience

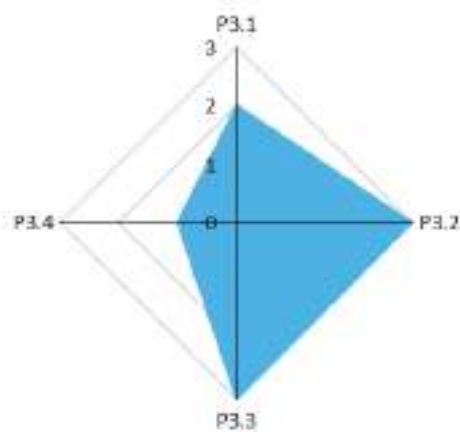


Figure 20: Results for Essential 03.

P3.1	The city / lead agencies understand all sources of funding, and the “resilience dividends”, are well connected, understand all available routes to attract external funding and are actively pursuing funds for major resilience investments.	2
P3.2	Does the city have in place a specific ‘ring fenced’ (protected) budget, the necessary resources and contingency fund arrangements for local disaster risk reduction (mitigation, prevention, response and recovery)?	3
P3.3	What level of insurance cover exists in the city, across all sectors – business and community?	3
P3.4	What incentives exist for different sectors and segments of business and society to support resilience building?	1

For Essential 03, Hamburg achieves a resilience score of 9/12. The city is aware of different funding streams for Disaster Risk Management (DRM); these are organised by the Ministry of the Interior and Sports (score of 2 for P3.1). In addition, the city's financial plan has a specific section for DRM that describes in detail, which resources are to be used for which DRM area (score of 3 for P3.2). Insurance coverage in the Speicherstadt is high across all sectors, because the Hamburger Hafen und Logistik AG, as owner of the warehouse district, requires insurance coverage as part of its rent contracts (score of 3 for P3.3). Lastly, as the information about resilience incentives is limited, it is assumed that only some incentives exist (score of 1 for P3.4).

7.4. Essential 04: Pursue resilient urban development

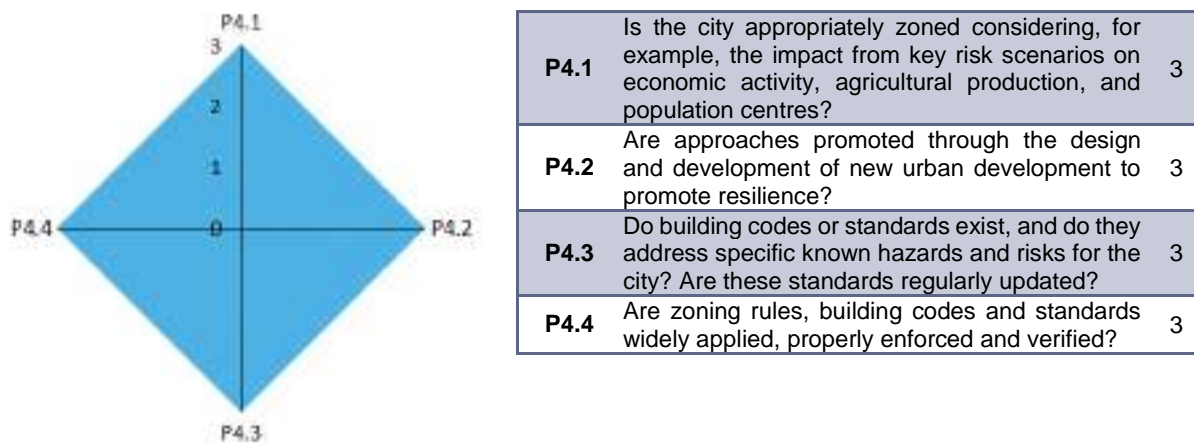


Figure 21: Results for Essential 04.

Regarding Essential 04, Hamburg achieves the maximum resilience score of 12/12. The city is zoned according to existing risk maps and this zoning plan is updated regularly (score of 3 for P4.1). In addition, there exists a clear development plan for the Speicherstadt and the Office for City Development is developing city-wide plans (score of 3 for P4.2). Lastly, there exist strict local codes and standards (score of 3 for P4.3), which are always enforced (score of 3 for P4.4).

7.5. Essential 05: Safeguard natural buffers to enhance the protective functions offered by natural ecosystems

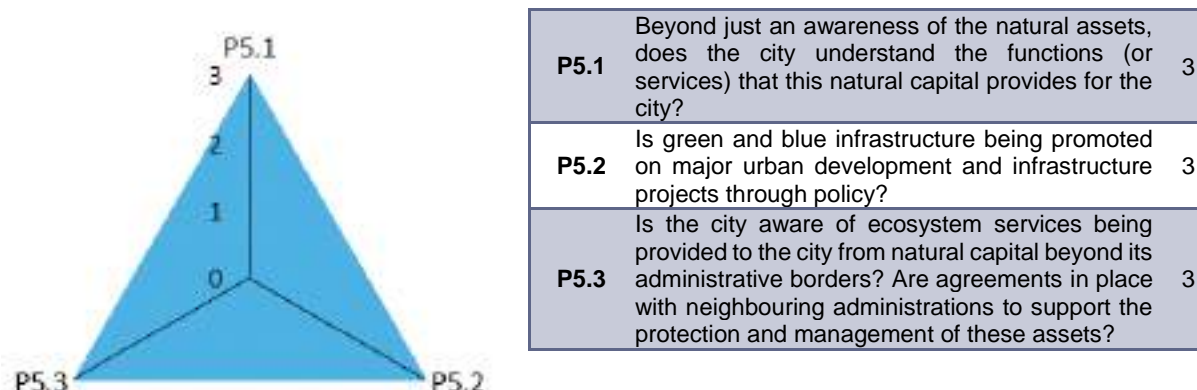


Figure 22: Results for Essential 05.

For Essential 05, Hamburg reaches the maximum score of 9/9. There exist city-wide public zoning plans and flood maps that take ecosystem services into account. In addition, there exist several habitat systems within the city limits (score of 3 for P5.1). However, with regards to the Speicherstadt, there is a clear conflict between increasing ecosystem services and heritage preservation. This is also the case for the city-wide integration of green and blue infrastructure. Hamburg implements the latter measure by conducting local workshops and providing guidance material on how to integrate blue / green infrastructure (score of 3 for P5.2). Lastly, the city is well aware of the natural capital beyond its administrative borders; multiple habitat systems of the city reach across its administrative borders (score of 3 for P5.3).

7.6. Essential 06: Strengthen institutional capacity for resilience

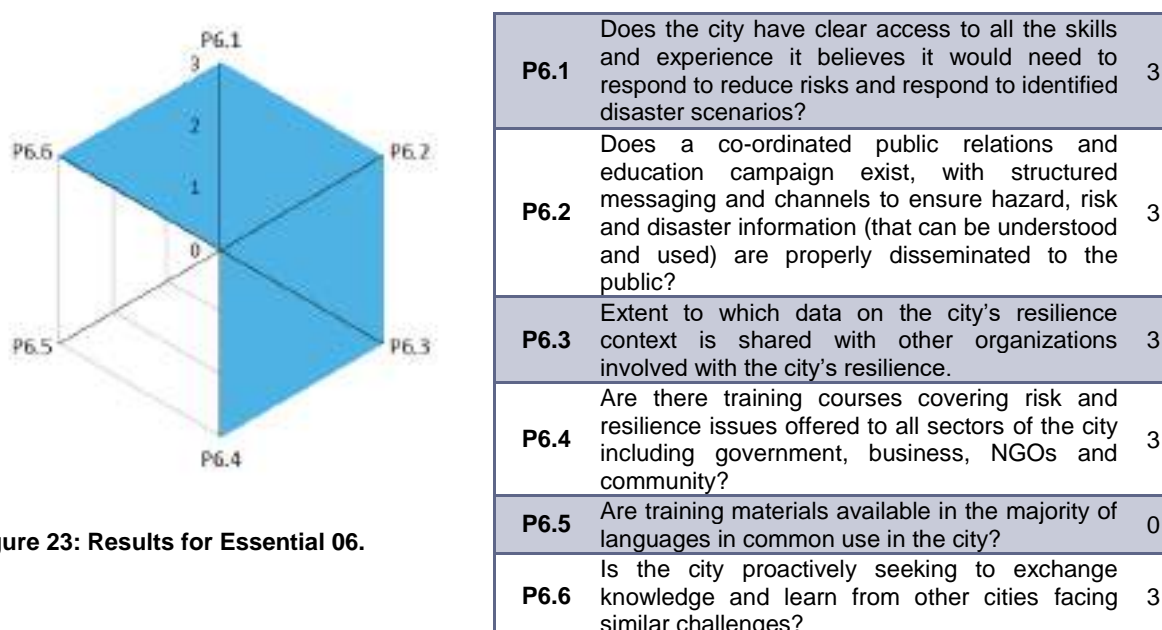
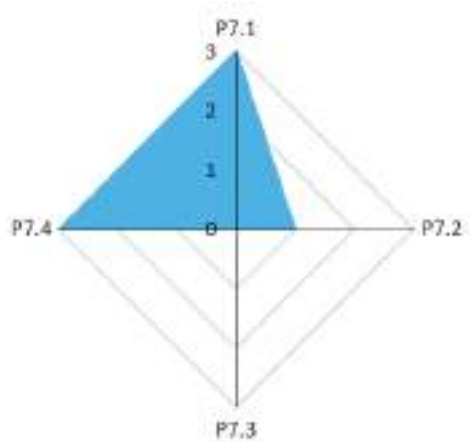


Figure 23: Results for Essential 06.

Regarding Essential 06, Hamburg achieves a score of 15/18. The city has established multiple partnerships with professional and volunteer first-responders and there exists a national mechanism for assistance between federal states in case of an emergency (score of 3 for P6.1). The city also conducts regular coordinated public relations activities, which reach most households (score of 3 for P6.2). With regards to data sharing, the city hosts a public geo portal, an open data hub, and a portal for risk reduction (score of 3 for P6.3). The different ministries within the city provide training courses covering risk and resilience. In addition, the Hafenstab – the coordinated crisis management unit for the Hamburg harbour – conducts regular trainings for all involved parties (score of 3 for P6.4). However, training material is mostly provided in German (score of 0 for P6.5) and partly in German sign language. Lastly, Hamburg is part of multiple city networks and research projects to share experiences and best practices (score of 3 for P6.6).

7.7. Essential 07: Understand and strengthen societal capacity for resilience



P7.1	Are “grassroots” or community organizations participating in risk reduction and post-event response for each neighbourhood in the city?	3
P7.2	Are there regular training programmes provided to the most vulnerable populations in the city?	1
P7.3	What proportion of businesses have a documented business continuity plan that has been reviewed within the last 18 months?	-
P7.4	How effective is the city at citizen engagement and communications in relation to DRR?	3

Figure 24: Results for Essential 07.

Hamburg achieves a score of 7/12 for Essential 07. For the Speicherstadt, community organizations are included in risk reduction and post-event response activities (score of 3 for P7.1). While the city knows its most vulnerable population groups, there is no publicly available information about specific regular training programs. In addition, information about vulnerable population groups is harder to come by for the Speicherstadt, because there are no residents living there, as it is mostly a tourism and business area (score of 1 for P7.2). With regards to business continuity plans, there was no information available during this preliminary resilience assessment (score of “-“ for P7.3). Lastly, the city uses multiple channels to engage citizens for disaster risk reduction (score of 3 for P7.4).

7.8. Essential 08: Increase infrastructure resilience

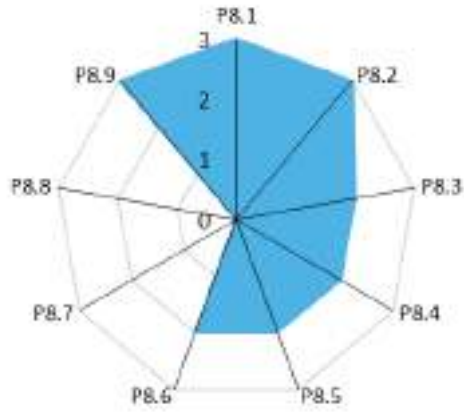


Figure 25: Results for Essential 08.

P8.1	Is critical infrastructure resilience a city priority, does the city own and implement a critical infrastructure plan or strategy?	3
P8.2	Is existing protective infrastructure well-designed and well-built based on risk information?	3
P8.3	Would a significant loss of service for these two essential services be expected for a significant proportion of the city under the agreed disaster scenarios?	2
P8.4	Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would energy infrastructure corridors remain safe (i.e. free from risk of leaks, electrocution hazards etc.)?	2
P8.5	Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would transport infrastructure corridors remain safe (i.e. free from risk of flood, shocks etc) and passable?	2
P8.6	Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event?	2
P8.7	Would there be sufficient acute healthcare capabilities to deal with expected major injuries in 'worst case' scenario?	-
P8.8	% of education structures at risk of damage from "most probable" and "most severe" scenarios	0
P8.9	Will there be sufficient first responder equipment, with military or civilian back up as required?	3

For Essential 08, Hamburg reached a score of 17/27. The city, as well as the Speicherstadt, have a critical infrastructure protection plan (score of 3 for P8.1), and there exists protective infrastructure for the most relevant risks (score of 3 for P8.2). It is assumed that water, energy, transport, and communication services will exhibit some loss of services under the "most severe" scenario, which is a storm surge event (scores of 2 for P8.3, P8.4, P8.5, and P8.6). Healthcare capabilities are not a relevant issue for the Speicherstadt (score of "-" for P8.7) and under the "most probable" scenario – a flood – most of the Speicherstadt would be shut down, including teaching facilities (score of 0 for P8.8). Lastly, all first-responders would be sufficiently equipped in case of an emergency (score of 3 for P8.9).

7.9. Essential 09: Ensure effective disaster response

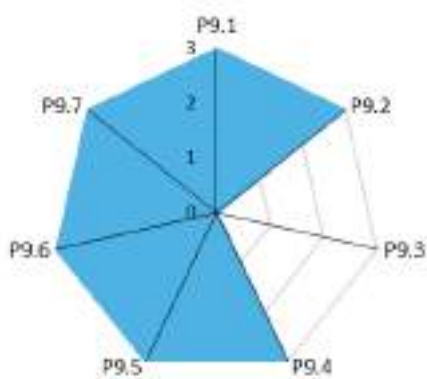


Figure 26: Results for Essential 09.

P9.1	Does the city have a plan or standard operating procedure to act on early warnings and forecasts? What proportion of the population is reachable by early warning system?	3
P9.2	Is there a disaster management / preparedness / emergency response plan outlining city mitigation, preparedness and response to local emergencies?	3
P9.3	Does the responsible disaster management authority have sufficient staffing capacity to support first responder duties in surge event scenario?	-
P9.4	Are equipment and supply needs, as well as the availability of equipment, clearly defined?	3
P9.5	Would the city be able to continue to feed and shelter its population post-event?	3
P9.6	Is there an emergency operations centre, with participation from all agencies, automating standard operating procedures specifically designed to deal with "most probable" and "most severe" scenarios?	3
P9.7	Do practices and drills involve both the public and professionals?	3

For Essential 09, Hamburg achieves a resilience score of 18/21. The city estimates that it will reach over 90% of its population with its early warning systems, which stretch across multiple channels – from smartphone apps, to TV and radio, as well as sirens and other measures (score of 3 for P9.1). As already discussed for P1.2, there is a well-established DRM plan (score of 3 for P9.2). No answer for P9.3 could be given as this issue is too specific for the Speicherstadt and is regulated at the national level (score of “-” for P9.3). As concerns equipment and supply needs, the city and the Speicherstadt are well stocked (scores of 3 for P9.4 and P9.5). There is also a sufficiently resilient operations centre, although no public information is available (score of 3 for P9.6). Lastly, the different ministries in the city conduct annual drills together with professional and volunteer first-responders (score of 3 for P9.7).

7.10. Essential 10: Expedite recovery and build back better

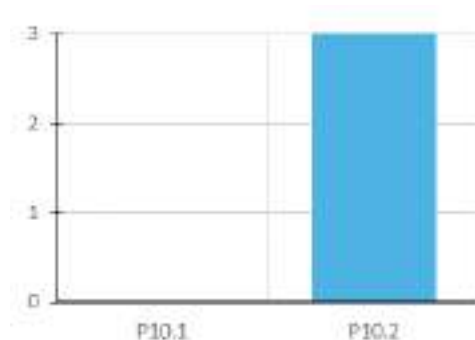


Figure 27: Results for Essential 10.

P10.1	Is there a strategy or process in place for post-event recovery and reconstruction, including economic reboot, societal aspects etc.?	0
P10.2	Do post-event assessment processes incorporate failure analyses and the ability to capture lessons learned that then feed into design and delivery of rebuilding projects?	3

For Essential 10, Hamburg achieves a score of 3/6. There is no public information available on the existence of a strategy or process for post-event recovery (score of 0 for P10.1).

However, there are clear processes in place to capture lessons learned from post-event failures (score of 3 for P10.2)

7.11. Overall resilience of Hamburg

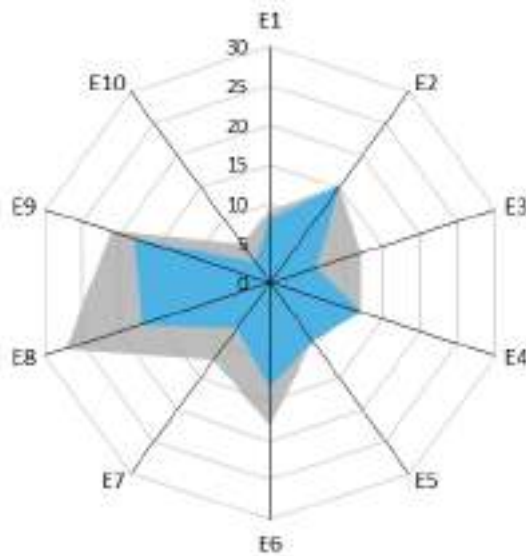


Figure 28: Combined results for Essential 01-10 for Hamburg.

Overall, Hamburg achieves a resilience score of 113/141, with full scores in Essentials 02, 04, and 05. The city understands the present and future risks it is facing very well, with significant information about disaster scenarios available and shared among different stakeholders. In addition, the city – and the Speicherstadt specifically – follows a strict zoning plan that considers risks scenarios and enforces building codes and standards. Lastly, the city is well aware of the functions that natural buffers within and outside its borders provide.

The most room for improvement can be found in Essentials 03, 07, and 08. There is a need for better information about incentives for resilience building measures and training programs for vulnerable population groups. In addition, it is assumed that at least some loss of service would be expected for most infrastructures under the “most severe” scenario. At the same time, there was not enough information available during the preliminary assessment to fully score Essentials 07, 08, and 09, i.e. the low scores for these has to be considered carefully.

8. Conclusion

The results of the initial investigation presented here correspond to the priorities and expectations that were already formulated during the preparation of the project. Discussions held in the meantime with local authorities, owners, companies and other stakeholders have confirmed and, in some cases, further substantiated the need for such investigations. As a result, some planned actions can be identified even more clearly as priorities.

With regard to any actions planned for Hamburg's target historic areas, it is advisable for the long-term success of the project to adapt to existing practices and regulations in Hamburg. This is especially true for the processing of digitally collected values and data in the city's topic-specific information and modelling systems.

The present initial investigation has shown that in Hamburg there are only very limited links between the governance frameworks described (management of cultural heritage, disaster risk management and climate adaptation). Only disaster risk management against floods after storm surges has been elaborated in great detail for the defined project area: the Speicherstadt and Kontorhausviertel.

Discussions with various responsible parties have shown that there is a further need for coordination to improve linkages and transparency between the frameworks, and that local stakeholders consulted so far view the integration of various information positively.

The following strategies and actions should therefore be priorities for the ARCH project:

- Integration of climate change and related hazards as an integral part within the future revised Management Plan and associated periodic reporting to UNESCO in the years to come. A related objective is to identify the different plans the City has in this respect, as well as to examine the Management Plan for gaps with respect to resilience-building and propose potential actions and strategies for inclusion in a future update of the Plan.
- Tools and procedures already exist to support management of data about the existing historic built fabric, and ongoing remedial or development measures, but these could be expanded and improved. For example, by constructing digital 3D models of existing structures using Building Information Modelling (BIM).
- Cooperation with archaeological department concerning research about remains of the industrial heritage of the late 19th/ early 20th century is currently limited and could be strengthened.
- Greater awareness-raising in the community of the relevance of climate change to the Speicherstadt and Kontorhausviertel is desirable, and there is an opportunity to design and implement events in the context of the ARCH project.

In Hamburg, the annual monitoring by ICOMOS Germany will be carried out for the relevant project area as a milestone, and periodic reporting to UNESCO will also begin in 2022.

The authors hope that the main changes for the project area will be the integration of analysis and proposed actions for climate adaptation and disaster prevention into the management plan

for the World Heritage Site, to support the implementation of future measures. Furthermore, it would be desirable to increase the transparency and visibility of the interdependencies between the respective governance frameworks, so that the consequences of climate change are also addressed in the Hamburg Climate Plan with regard to regional cultural heritage in the future.

Although both the Management Plan for the Speicherstadt and Kontorhausviertel, and the Hamburg Climate Plan, are not planned to be updated until ca. 2025/24 (respectively), preparation for their revision will begin well in advance. In this regard, there is potential for the ARCH project team to contribute advice on suggested additions for future integration in the plan, based on the analysis to be undertaken in coming months.

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12. Annexes

12.1. Key documents for cultural heritage management (See chapter 3)

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update	Link (if available)
UNESCO World Heritage Convention	Convention	International	binding		1972	The United Nations Educational, Scientific and Cultural Organization (UNESCO) seeks to encourage the identification, protection and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity. This is embodied in an international treaty called the Convention concerning the Protection of the World Cultural and Natural Heritage, adopted by UNESCO in 1972.	n.a:	whc.unesco.org

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update	Link (if available)
International Charter for the Conservation and Restoration of Monuments and Sites (The Venice Charter)	Charter	International	Non binding	ICOMOS	1964	Key document for Conservation and Restoration of Monuments and sites	n.a.	https://www.icomos.org/en/resources/charters-and-texts
European Charter of the Architectural Heritage	Charter	International	Non binding	Council of Europe	1975	Key document for Conservation and Restoration of Monuments and sites	n.a.	https://www.icomos.org/en/resources/charters-and-texts
Washington Charter	Charter	International	Non binding	ICOMOS	1987	Key document for Conservation and Restoration of Monuments and sites	n.a.	https://www.icomos.org/en/resources/charters-and-texts
Nara Document on Authenticity	Declaration	International	Non binding	ICOMOS	1994	Key document for Conservation and Restoration of Monuments and sites	n.a.	https://www.icomos.org/en/resources/charters-and-texts
Burra Charter	Charter	International	Non binding	ICOMOS	1981 (2013)	Key document for Conservation and Restoration of Monuments and sites	n.a.	https://www.icomos.org/en/resources/charters-and-texts

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update	Link (if available)
Florence Charter	Charter	International	Non binding	ICOMOS	1981	Key document on management of historic gardens	n.a.	https://www.icomos.org/en/resources/charters-and-texts
Recommendation on the Historic Urban Landscape	Recommendation	International	Non binding	UNESCO World Heritage Committee	2011	Key document for Conservation and Restoration of Monuments and sites	n.a.	https://www.icomos.org/en/resources/charters-and-texts
Federal construction Code	Law	National	binding	Germany	1960 (most recent update Mar 2020)	Construction Code		https://www.gesetze-im-internet.de/
Hamburg Building Code	Law	Federal State / regional	binding	Hamburg	2005 (updated Feb 2020)	Construction Code		http://www.landesrecht-hamburg.de/
Heritage Protection Act	Law	Federal State / regional	binding	Hamburg	2013	Key legal provision for Conservation and Restoration of Monuments and sites	n.a.	http://www.landesrecht-hamburg.de/
Management Plan: The Speicherstadt and Kontorhaus District with Chilehaus	Ordinance	Federal State / regional	binding	Hamburg	2013	Management of the property	2025	www.Hamburg.de/welterbe

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update	Link (if available)
Zoning and Land-Use plan	Legal provision	Federal State / regional	binding	Hamburg	1997	Legal provision on the land use	continuously	www.hamburg.de
Hamburg 2010 City Centre Concept	Guideline?	Federal State / regional	Binding		2010 (updated 2014)	The Hamburg 2010 City Centre Concept seeks primarily to integrate the new HafenCity development, which lies to the south of the city centre, in the neighbouring city centre district. The HafenCity development, coverings 157 hectares, is currently underway.		https://www.hamburg.de/contentblob/4374074/264f74889d6ecd358e255a71abb42fd6/data/download-innenstadtkonzept-2014.pdf
Speicherstadt Development Concept	Guideline?	Federal State / regional	Binding		2012	An informal planning programme that serves as a framework for managing the future development of the Speicherstadt. The Speicherstadt Development Concept is intended to serve as a basis for a local development plan for the Speicherstadt (currently under development),		https://www.hamburg.de/contentblob/4056088/42fc628d89757fee90432b0b23cb224c/data/download-konzept.pdf

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update	Link (if available)
Ordinance on the Design of the Speicherstadt	Ordinance	Federal State / regional	Binding		2008	The Ordinance stipulates that any alterations to the warehouse buildings must be compatible with heritage protection. Contains provisions on façades, roofs, building technology, advertising and vending machines, and the design of the surrounding external space.		
Design Manual for the Speicherstadt	Guideline	Federal State / regional	Non-binding		2002	Defines essential model components and explains the design principles which apply to buildings and advertising. It also contains design principles for the transitional areas between the Speicherstadt and the HafenCity, and recommendations on aspects of urban architecture, and recommendations on the design of open spaces, buildings, façades, roofs and entrance areas.		

12.2. Key documents for disaster risk reduction (See Chapter 4)

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update	Link (if available)
Sendai Framework	Policy	International	Non-binding	United Nations Office for Disaster Risk Reduction (UNDRR)	2015	Establishment of a global framework for action to prevent new and reduce existing disaster risks, based on 7 targets, 4 priorities for action with supporting rationale and 13 guiding principles.	Valid until 2030. UNDRR is in charge of follow-up and review of the Sendai Framework by preparing periodic reviews on progress, among other actions.	http://www.unisdr.org/we/inform/publications/43291

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update	Link (if available)
Decision No. 1313/2013/EU	Policy / strategy	International (EU)	Binding	The European Parliament and The Council of The European Union	2013	Decision no. 1313/2013 / EU define the various mechanism that should promote solidarity and should support, complement, and facilitate the coordination of Member States' actions in the field of civil protection with a view to improving the effectiveness of systems for preventing, preparing for and responding to natural and human-made disasters. Prevention is of key importance for protection against disasters and requires further action.		https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:347:0924:0947:EN:PDF
Decision 420/2019/EU	Policy / strategy	International (EU)	Binding	The European Parliament and The Council of The European Union	2019	Decision (EU) 2019/420 of the European Parliament and of the Council of 13 March 2019 amending Decision No 1313/2013/EU on a Union Civil Protection Mechanism		https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019D0420&from=EN

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update	Link (if available)
Directive 2007/60/ EC of the European Parliament and of the Council on the assessment and management of flood risks	Guideline	International (EU)	Binding for the federal states in Germany since 2010	The European Parliament and The Council of The European Union	2007	Directive 2007/60 / EC of the European Parliament and of the Council on the assessment and management of flood risks and Act no. 7/2010 Coll. on flood protection establish a framework for Community action in the field of water policy requires river basin management plans to be developed for each river basin district in order to achieve good ecological and chemical status, and it will contribute to mitigating the effects of floods		https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32007L0060

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update	Link (if available)
Managing Disaster Risks for World Heritage	Guideline	International	Non-binding	ICCROM, ICOMOS, IUCN, UNESCO World Heritage Centre	2010	The key objectives of this Resource Manual are to help the managers and management authorities of cultural and natural World Heritage properties to reduce the risks to these properties from natural and human-made disasters; to illustrate the main principles of Disaster Risk Management (DRM) for heritage and a methodology to identify, assess and mitigate disaster risks; to explain how to prepare a DRM plan based on this methodology; to demonstrate that heritage can play a positive role in reducing risks from disasters and so help to justify the conservation of World Heritage properties; and finally, to suggest how DRM plans for heritage properties can be integrated with national and regional disaster management strategies and plans.		https://whc.unesco.org/en/managing-disaster-risks/

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update	Link (if available)
Law on the establishment of the Federal Office of Civil Protection and Disaster Assistance	Law	National	Binding	Ministry of Justice and Consumer Protection	2004 / (amended 2009)	This law establishes the Federal Office of Civil Protection and Disaster Assistance		https://www.gesetze-im-internet.de/bbkg/BJNR063010004.html
Civil Protection and Disaster Assistance Act	Law	National	Binding	Ministry of Justice and Consumer Protection	1997 / 2009	This law establishes the foundations for the German national civil protection		https://www.gesetze-im-internet.de/zsg/ZSKG.pdf
THW Law	Law	National	Binding	Ministry of Justice and Consumer Protection	1990 / 2013	This law establishes the operating protocol for the Federal Agency for Technical Relief	Update planned in 2020	http://www.gesetze-im-internet.de/thw-helfrg/
Flood and heat prevention through urban development	Guideline	National	Non-binding	C. Becker, S. Hübner (bgmr Landschaftsarchitekten); H. Sieker, S. Gilli, M. Post (Ingenieurgesellschaft Prof. Dr. Sieker mbH)	2015	This document contains strategies and instruments for water-sensitive urban development at the local level.		https://www.bbsr.bund.de/BBSR/DE/Veroeffentlichungen/Sonderveroeffentlichungen/2015/DL_UeberflutungHitzeVorsorge.pdf?__blob=publicationFile&v=3

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update	Link (if available)
Implementation plan CRITIS of the National Plan for the Protection of Information Infrastructures	Guideline	National	Not-binding	Ministry of the Interior, Building and Community	2007	This document describes of to implement the National Plan for the Protection of Information Infrastructures		https://www.bmi.bund.de/SharedDocs/downloads/DE/publikationen/themen/it-digitalpolitik/umsetzungspln-kritis.html
Fire Service regulation FwDV 100	Regulation	National	Non-binding	Committee on Firefighting, Civil Protection and Civil Defence	1999	This regulation establishes the necessary uniformity in the fire service and to ensure this in the future. It applies to deployment and training and is implemented into binding law by each Federal State.		https://www.bbk.bund.de/SharedDocs/Downloads/BBK/DE/FIS/DownloadsRechtundVorschriften/VolltextFwDv/FwDV%20100.pdf?__blob=publicationFile
Hamburg Disaster Protection Act	Law	Regional	Binding	Hamburg Senate	1978 / 2020	This law establishes the fundamentals and responsibilities of disaster risk management in the Federal State of Hamburg		http://www.landesrecht-hamburg.de/jportal/portal/page/bshaprod.psml?showdoccase=1&st=lr&doc.id=jlr-KatSchGHArahmen&doc.part=X&doc.origin=bs

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update	Link (if available)
Hamburg Water Act	Law	Regional	Binding	Hamburg Senate	2005 / 2012	This document defines flood protection systems and their ownership, obligations and rights with regard to preventive flood protection, and general (ownership) rights and obligations with regard to water bodies in Hamburg		http://www.landesrecht-hamburg.de/jportal/portal/page/bshaprod.psm?showdoccase=1&doc.id=jlr-WasGHA2005rahmen&doc.part=X&doc.origin=bs&st=lr
Hamburg Dyke Regulation	Law	Regional	Binding	Hamburg Senate	2003	This documents defines the fundamentals for all dykes in Hamburg (e.g. required dimensions, maintenance, monitoring, etc.)		http://www.landesrecht-hamburg.de/jportal/portal/page/bshaprod.psm?showdoccase=1&doc.id=jlr-DeichOHA2003rahmen&doc.part=X&doc.origin=bs&st=lr

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update	Link (if available)
Hamburg Polder Regulation	Law	Regional	Binding	Hamburg Senate	1977	This document covers the fundamentals for privately owned flood protection systems		http://www.landesrecht-hamburg.de/jportal/portal/page/bshaprod.psm?showdoccase=1&doc.id=jlr-PolderOHArahmen&doc.part=X&doc.origin=bs&st=lr
Flood Protection Ordinance HafenCity	Law	Local	Binding	Hamburg Senate	2002	This document establishes the fundamentals for storm surge protection in the HafenCity district of Hamburg		http://www.landesrecht-hamburg.de/jportal/portal/page/bshaprod.psm?showdoccase=1&doc.id=jlr-FISchuVHArahmen&doc.part=X&doc.origin=bs&st=lr

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update	Link (if available)
Storm surge protection in the Hamburg harbour	Guideline	Local	Non-binding	Hamburg Port Authority	2018	This document indicates who / what in the Hamburg harbour is at risk in case of a storm surge, which preventive measures are available, how warnings and evacuations take place, and which emergency measures will be conducted		https://www.hamburg-port-authority.de/fileadmin/user_upload/Broschue_Sturmflutschutz_Ansicht.pdf

12.3. Key documents for climate adaptation (See Chapter 5)

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
EU Greenbook and Framework for Climate and Energy Policy to 2030.		international	Binding		2013	On 27 March 2013, the European Commission adopted a Green Paper entitled "A Framework for Climate and Energy Policy to 2030". This Green Paper launches a public consultation. The framework for climate and energy policy until 2030 includes EU-wide targets and policy objectives for the period 2021 to 2030.	The framework for climate and energy policy was adopted by the European Council in October 2014. In 2018, the targets for renewable energy sources and energy efficiency were revised upwards compared to the 2013 version.	https://ec.europa.eu/cli/ma/policies/strategies/2030_en

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
EU adaptation strategy to climate change	strategy	international	Binding		2013 (evaluated 2018)	In 2013, the European Commission adopted an EU strategy on adaptation to climate change. The strategy aims to make Europe more climate-resilient. By taking a coherent approach and providing for improved coordination, it aims to enhance the preparedness and capacity of all governance levels to respond to the impacts of climate change.	Updated strategy expected 2021	http://ec.europa.eu/clima/policies/adaptation/what/documentation_en.htm

German Strategy for Adaptation to Climate Change	strategy	national	Binding		2008 (evaluated in 2015 and 2019)	The German Adaptation Strategy (Deutsche AnpassungsStrategie, DAS) creates a framework for adaptation to the consequences of climate change in Germany. This strategy primarily represents the contribution of the Federal Government and thus provides guidance for other stakeholders. It lays the foundations for a medium-term process in which, in cooperation with the Federal Länder (federal states) and societal groups, risks will be progressively identified, action needs ascertained, appropriate objectives defined and developed and potential adaptation measures implemented.		https://www.bmu.de/fileadmin/bmu-import/files/pdfs/allgemein/application/pdf/das_gesamt_bf.pdf
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Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
Climate Adaptation Action Plan (I + II)	National Adaption Plan	national	Binding		2011	<p>On 31st August 2011 the Federal Cabinet adopted an action plan for the German Strategy for Adaptation to Climate Change (DAS) of December 2008.</p> <p>The progress report on the German Strategy for Adaptation to Climate Change of the end of 2015 takes stock of the nationwide activities and informs about the work programme for the coming years (Action Plan II).</p>		https://www.bmu.de/fileadmin/bmu-import/files/pdfs/allgemein/application/pdf/aktionsplan_anpassung_klimawandel_bf.pdf https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Klimaschutz/klimawandel_das_fortschrittsbericht_bf.pdf

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
Monitoring Report: Climate Adaptation Action Plan	report	national	n.a.		2015	This is the most comprehensive report by the German government on adaptation to climate change to date and shows that rising temperatures, wetter winters and more frequent weather extremes are having an increasing impact on German society. The areas affected include energy supply, agriculture and health care. Using data from 15 different sectors of society, the report shows which changes can already be identified as a result of climate change and which counter-measures are already taking effect.		https://www.umweltbundesamt.de/publikationen/monitoringbericht-2015

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
Monitoring Mechanism Regulation	Regulation	national	binding		2019	Information on Member States' national adaptation planning and strategies, outlining their implemented or planned actions to facilitate adaptation to climate change. That information shall include the main objectives and the climate-change impact category addressed, such as flooding, sea level rise, extreme temperatures, droughts, and other extreme weather events.	Reporting period every 48 months.	http://cdr.eionet.europa.eu/de/eu/mmr/art15_a_daptation/envxl78ma/

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
Impacts, vulnerability and adaptation assessments	Assessment	national	n.a.		2015	For the progress report on the German Adaptation Strategy and the further development of German adaptation policy, such a cross-sectoral and consistent vulnerability analysis for Germany has therefore been prepared from 2011 to 2015. Vulnerability analyses are an important step in adaptation planning to identify adaptation needs, develop a strategy for adaptation to climate change or an action plan with concrete measures. They answer the question of where a country or region is particularly vulnerable to climate change - both spatially and thematically.		https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/climate_change_24_2015_kurz_vulnerabilitaet_deutschlands_gegenueber_dem_klimawandel_6.pdf

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
Handbook on good practice for adaptation to climate change	Guideline	national	Non-binding		2014	The "Handbook on Good Practice in Adaptation to Climate Change" presents a set of criteria developed within the research project "Good Practice in Adaptation to Climate Change" to evaluate adaptation activities. In addition to the criteria for good adaptation, several practical examples for different fields of action are presented. The handbook is intended to inspire actors to develop their own adaptation measures and to support them in overcoming obstacles on their way.		https://www.umweltbundesamt.de/sites/default/files/medien/364/publikationen/uba_handbuch_gute_praxis_web-bf_0.pdf

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
Action plan: Adaptation to Climate Change (German only)	Plan	Regional - Local	binding		2013	After the first Hamburg Action Plan for Adaptation to Climate Change was adopted in 2013, the Hamburg Climate Plan now includes both adaptation to climate change and climate protection. Measures to adapt to climate change have been taken in areas such as port management, coastal protection, water management, health and urban planning. Climate impact monitoring helps to observe climate change and its effects and to manage adaptation. The adaptation strategy primarily contains measures with which the state fulfils its task of ensuring services of general interest.		https://www.hamburg.de/contentblob/4052864/e1b7549bfc46806b9caf-a9d89963bd62/data/aktionsplan-anpassung-an-den-klimawandel.pdf;jsessionid=22A53BA42099686A637FDAD24415F6E5.liveWorker2

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
Hamburg Climate Plan	Plan	Regional - Local	binding		2015 (revised 2019)	As planned, with the first revision of the Hamburg Climate Plan, the Senate is further developing the content and methods of the Hamburg Climate Plan from December 2015 and is setting new climate targets for Hamburg in the light of current developments. With this revision of the Hamburg Climate Plan, the Senate also informs the Hamburg Parliament on the development of the framework conditions for Hamburg and the targets in the Hamburg Climate Plan that have already been achieved.		https://www.hamburg.de/contentblob/4658414/b246fbfbbf1149184431706972709508/data/d-21-2521-hamburger-klimaplan.pdf 2019 revision: https://www.hamburg.de/contentblob/13899086/749a6e50662c96eee81d370f1b0cb631/data/d-first-revision-hamburg-climate-plan.pdf

Official Monitoring tool	Monitoring System	Regional - Local	Not applicable			<p>The City of Hamburg is setting up a climate impact monitoring system to monitor the long-term effects of climate change on the city of Hamburg and to assess whether the adaptation measures implemented are effective.</p> <p>This should help in the long-term management of adaptation measures and make it possible to determine whether Hamburg has taken sufficient precautions against the consequences of climate change.</p> <p>The first indicators (IMPACT indicators) have now been developed for the following central fields of action of the Hamburg Climate Change Adaptation Strategy, which illustrate the</p>		https://www.hamburg.de/klimafolgen-monitoring/
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Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
						consequences of climate change for Hamburg: <ul style="list-style-type: none"> - Inland flood - Health - Coastal flood protection - Agriculture - Urban and landscape planning 		

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
RISA Strukturplan Regenwasser	report	Regional - Local				The Regen Infrastruktur Anpassung (RISA) project is a joint project of the Ministry of Urban Development and Environment of the Free and Hanseatic City of Hamburg and HAMBURGWASSER. The project was launched in 2009 in response to the increasing conflict of objectives between further sealing tendencies, potential consequences of climate change, demands on quality of life and infrastructural requirements.		https://www.risa-hamburg.de/fileadmin/ri sa/Downloads/BUE_H SE_2015_RISA_Strukturplan_Regenwasser_2030.pdf

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
Hamburger Gründachstrategie	strategy	Regional - Local	Non-binding		Information not available	Until 2024, the Federal Office for the Environment and Energy is making three million euros available for a support programme for green roofs. The Hamburg Green Roof Fund supports voluntary measures of intensive or extensive green roofs for residential and non-residential buildings in Hamburg.	From June 2020, the Hamburg green roof funding will be supplemented by the funding opportunities for green walls.	http://www.hamburg.de/gruendach

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
Digital evaporation potential map	Map	Regional - Local				Geographic Information Systems (GIS) were used for the development of the evaporation potential map. These make it possible to combine soil information that is available nationwide at the Department of the Environment and Energy in such a way that a classification of Hamburg's soils with regard to their expected cooling capacity in the summer months (evaporation potential) becomes possible. The boundary condition for this was unsealed soil.		https://www.hamburg.de/kuehlleistung-von-boeden/8753652/verdunstungspotentialkarte/

Construction programme for flood protection	programme	Regional - Local	binding			<p>Hamburg is 100 km away from the North Sea. The metropolis is endangered by storm surges due to its location on the tidal Elbe.</p> <p>The tasks include the determination of basic principles for the design of flood protection systems as well as the planning of construction and maintenance measures.</p> <p>A total of 108 km of public main dike lines (including the new dike) and numerous crossing structures - sluices, barrages, pumping stations, dike banks and barrage gates - must be continuously adapted to the increasing loads and changing urban boundary conditions, modernised and brought up to the state</p>		https://lsbg.hamburg.de/planung-und-entwurf-hochwasser/
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Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
						of the art. The new dimensioning water levels for Hamburg were published on 09.08.2013 in the Official Gazette (p. 1282).		

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
Climate Change impact information for Companies situated in Hamburg	brochure	Regional - Local	Non-binding		2018	This brochure aims to encourage entrepreneurs to deal with the consequences of climate change. It shows which climate changes are to be expected in Hamburg, how companies can be affected and what the Free and Hanseatic City of Hamburg is already doing to protect its citizens and companies from climate change-related risks. Possible risks, opportunities and measures to adapt to climate change consequences are named for individual, central Hamburg industries.		https://www.hamburg.de/contentblob/4846394/4bf69fd7edf5cb9fdac5935874f25a71/data/d-info-broschuere-klimawandel-wirtschaft.pdf

Name of document	Type of document	Level	Binding / non-binding	Author(s)	Year of publication	Summary of content	Timeline for future revision/update)	Link (if available)
KLIQ – Climate impact adaptation of inner-city high-density quarters (in German)	report		Non-binding	REAP; Behörde für Umwelt und Energie Hamburg	02.06.2017	Climate-relevant adaptation measures should be developed and discussed together with local actors. As there is a rather low potential for flood protection measures on private land, these measures will be combined with concepts for public space. At the building level, the possibilities for passive air conditioning of rooms in existing buildings will be examined and - if possible and reasonable - coupled with active cooling by rainwater.		https://www.hcu-hamburg.de/index.php?id=8361 Checklist risk analysis: https://www.hcu-hamburg.de/fileadmin/documents/REAP/files/Wissensdokument_KLIQ_Ueberflutungs-_und_Hitzevorsorge_Checkliste.pdf Full documentation: https://edoc.sub.uni-hamburg.de/hcu/volltexte/2017/365/

12.4. Speicherstadt Development Concept (2012)



SPEICHERSTADT HAMBURG **Development Concept**

SPEICHERSTADT HAMBURG DEVELOPMENT CONCEPT

Ministry of Urban Development and Environment

April 2012

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1. Introduction

Hamburg's Speicherstadt (warehouse district) is a symbol of economic power and architectural tradition, the significance of which extends well beyond the region's borders. It is the largest cohesive and integral warehouse complex in the world, comprising numerous historic warehouses built in the late 19th and early 20th century, and incorporating specific functional, architectural and urban planning structures in a system of streets, waterways and interposed buildings. But this picturesque district also has great tourist potential. The entire Speicherstadt was listed in 1991 under the Hamburg Heritage Protection Act.



Given their extraordinary significance, the Free and Hanseatic City of Hamburg is submitting the Speicherstadt and Chilehaus with Kontorhaus district (Hamburg's historic office district) to be inscribed on UNESCO's World Heritage List. The Speicherstadt and Kontorhaus district were included on the German Tentative List in 1999 and 2005 respectively. Nomination is scheduled for 2015.

As a result of the HafenCity development project, the unique Speicherstadt complex is becoming part of the heart of Hamburg, situated as it is between the historic city centre and the new HafenCity. Until recently, the Speicherstadt had a predominantly east-west structure and orientation, but in the future north-south connections will play an increasingly important role. While its historic foundation, its overall appearance and characteristic structures need to be carefully preserved, the aspiration is to develop the Speicherstadt into an attractive district, which connects the historic city centre with the HafenCity.

As a result of changes in the logistics industry, the Speicherstadt has largely lost its original function as an area for the transshipment and handling of goods. Instead, it is playing host to increasing numbers of service providers and cultural institutions, while there is also increasing interest in residential use. As it adapts to these changes, the historic warehouse district will have to meet new demands, such as

- complying with rules and requirements on design, construction and safety in the context of new types of use that are unrelated to the port,
- addressing the organisational challenges presented by increasing visitor numbers,
- adjusting to traffic challenges resulting from a new mix of pedestrians, cyclists, motorists and delivery vehicles frequenting the Speicherstadt.

Figure 1: Aerial view of the Speicherstadt

These demands and challenges will have to be reconciled with

- the architectural character of the Speicherstadt,
- the unique urban planning structure of the complex as a whole,
- the continuation of port-related activities (e.g. storage, processing and transshipment),
- the requirements of heritage protection and compliance with the UNESCO World Heritage Convention,
- the preservation of the commercial character of the district, and
- legal requirements concerning construction.

To address the issues arising from incorporating the Speicherstadt in the heart of the city of Hamburg, the Hamburg Ministry of Urban Development and Environment commissioned a study from the city planners and architects ASW and the traffic planners SBI. Entitled, "Development and Design Potential of the Speicherstadt and Ways of Reshaping it" ("Entwicklungs- und Gestaltungspotentiale der Speicherstadt"), the study seeks to identify the potential for new uses of the Speicherstadt while respecting its historic heritage and preserving its existing characteristics. The study sets out relevant criteria and describes the existing technical and legal constraints. A concept has been drafted for the traffic infrastructure and the design of public spaces within the Speicherstadt. It is on the basis of the quoted study that the Hamburg Ministry of Urban Development and Environment has drawn up this Development Concept for the Speicherstadt.

The nomination of Speicherstadt and Chilehaus with Kontorhaus district as a World Heritage Site will be based on a series of documents. One of them is the so-called Management Plan, which will secure the preservation of the site in co-operation with all stakeholders. This Development Concept will serve as one of the main inputs to the Management Plan.

The present Development Concept focuses in particular on flood protection: The Speicherstadt is situated on a tidal section of the river Elbe which is prone to flooding. Currently, there is no public protection system against flooding anywhere in the Speicherstadt, making it almost impossible to obtain permits for residential use. The Development Concept identifies ways in which the Speicherstadt could be integrated into the public flood protection system.

The Speicherstadt is subject to special legislation, namely the Port Area Development Act (Hafenentwicklungsgesetz, HafenEG), which only permits port-related uses. In order to make the Speicherstadt part of the city centre it will be necessary to take it out of the remit of the Port Area Development Act and to draw up new development plans (Bebauungspläne). The Development Concept will serve as a basis for such future development plans for the Speicherstadt.

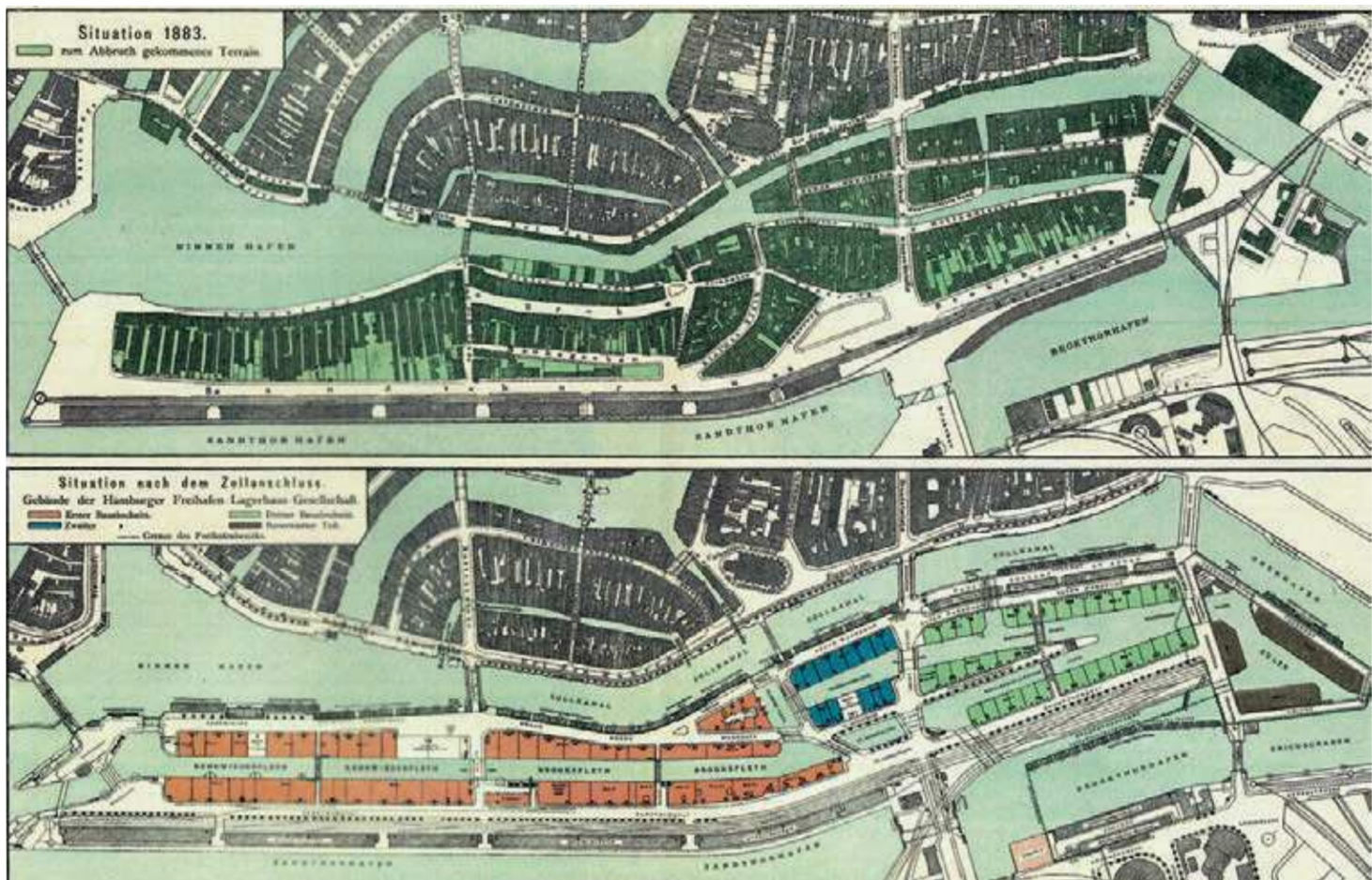
2. History of the Speicherstadt

The Speicherstadt is separated from the city centre by the Customs Canal ("Zollkanal"). In urban planning and architectural terms, it constitutes the largest self-contained ensemble of listed buildings in Hamburg.

The Speicherstadt was built in the context of Hamburg's integration into the German Empire's Customs Union. Bismarck had introduced a protectionist strategy of customs tariffs in 1879 and was putting pressure on Hamburg to join the Customs Union. There was considerable opposition to this in Hamburg, but in 1881 an agreement was signed between the city and the German Empire. It entered into force in 1888 and had a major impact on the port, the regional economy and, indeed, on the lives of all those living in Hamburg. For centuries, transit trade in Hamburg had been almost exempt from customs duties, thus benefiting the city's port

and economy. Even after the establishment of the German Empire in 1871, most of Hamburg had preserved its status as a sovereign customs territory, but all that changed in 1888, when all goods traded within the city limits became subject to customs duties. However, by way of compromise, Hamburg continued to be granted the privilege of operating a free port.

Many new warehousing facilities needed to be built for the storage of duty-free transit goods. The city authorities considered several alternative locations, but finally selected an area immediately to the south of the city centre for this development project. In 1883, work began to clear the districts of Kehrwieder and Wandrahm and demolish the approximately 1,000 residential buildings, housing some 20,000 people, to make way for the warehouses.



The first section of the Speicherstadt, which was completed in 1889, was the area between Kehr-wiederspitz and Kannengießerort, where blocks A to O were built and new roads and waterways ("fleets") constructed.

The second section (blocks P, Q and R) was built between St. Annenufer and Neuer Wandrahm in the years 1891 to 1897. Further complexes were erected during the third project phase between 1899 and 1927 and comprise blocks S to X, the construction of which was temporarily halted by WW I and the inflation and economic depression that followed. The fourth construction phase to be executed on Ericusspitz (blocks Y and Z), plans for which had been made as early as 1905, was never even started. The Hamburg Free Port Warehouse Association (Hamburger Freihafen-Lagerhaus-Gesellschaft, now known as the Hamburger Hafen und Logistik Aktiengesellschaft, HHLA) built and administered the individual blocks.



By 1927 there was a total of 24 warehouse blocks. Impressive bridge gates were built to delimitate the Free Port, which created the impression of a city of warehouses within the city. The purpose of the warehouses was to store and process duty free goods, which were transported both by road and on the waterways. Typically, the merchandise was unloaded from seagoing vessels and put on barges which would then transport it on to the warehouses. Here the goods would be winched up to the respective floors of the warehouse where they were stored. The other side of the warehouses faced the street so that goods could be lowered di-

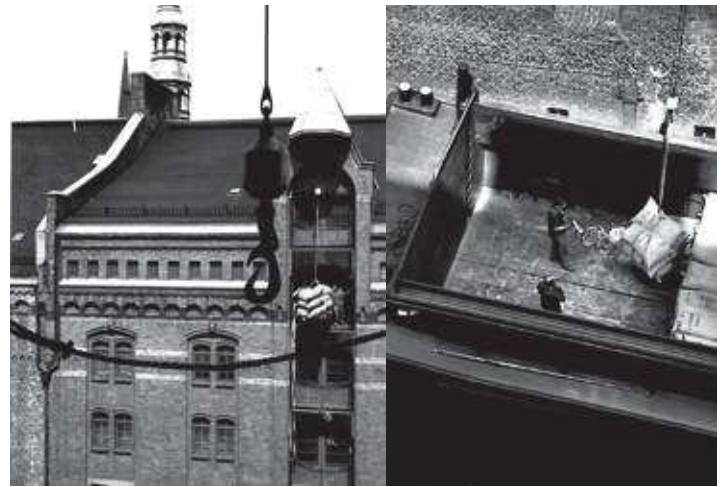


Figure 3: Transfer of goods from the barges to the warehouse blocks

rectly on to horse-drawn drays, railway wagons and later lorries. Next to the storage areas there were offices, the so-called Kontore of the warehousing and trading companies. Most of them occupied the lower floors, end-of-row buildings, or were located in blocks H and O. The size of the various sections of the Speicherstadt was determined by transport considerations and the size of the barges and drays that delivered the goods, and their design ultimately echoed the traditional warehouses that had previously existed along Hamburg's waterways. Their loading doors, transverse roof sections (Zwerchhäuser) and pedimented winch bays regularly punctuate the long warehouse blocks. An added feature in the more recent blocks on Wandrahminsel are the fire escape stairs (so-called Westphalian Towers). They were built on the water side of warehouses and each served two neighbouring blocks.

The inner structure of the warehouses consists of a simple skeleton structure supporting large floor areas, which are structurally unconnected to the outer walls. Transverse fire walls divide the blocks into sections. The earlier blocks were built as wrought-iron skeleton constructions, but these proved not to be sufficiently resistant to fire. From

1892, therefore, wooden frames were used. From 1903, concrete ceilings and encased cast iron pillars became available, later sheathed steel skeletons. After WWII, when some buildings were reconstructed, steel and concrete frames were used.

When the Speicherstadt was first built, it benefited from a centralised energy supply in the shape of an hydraulic power transmission system based on pressurised water. This system, like an earlier example in Bremerhaven, was modelled on English ports. A centralised system powered the handling winches and cranes. However, it was susceptible to frequent failures and was therefore soon replaced by electric motors. The hydraulic station at 30, Sandtorkai was consequently converted into an electrici-

ty power station. The former boiler house – it is still called the Kesselhaus – now houses the HafenCity-InfoCenter.

The number one driving force and mastermind behind the building activities in the Free Port was chief engineer Franz Andreas Meyer. He was responsible for the waterways, bridges and roads, but also for the design of the warehouses. He is quoted as defining them as purpose-built examples of “straightforward, solid brickwork architecture”. Meyer held that the “shapes and formative elements of the German brick building style” were ideal for meeting the specific constructional requirements of this type of warehouse building. Now, 100 years on, what Meyer regarded merely as welcome additions

FRANZ ANDREAS MEYER (*1837, †1901)

Franz Andreas Meyer left school in 1854 and enrolled at the Polytechnic in Hanover. At university, he was heavily influenced by Professor Conrad Wilhelm Hase, a prominent representative of the New Gothic Hanover Style (Hannoversche Neugotik). After his studies he returned to Hamburg in 1862 where he had spent much of his childhood and his youth. Over the next five years, Meyer was employed by the Parliamentary Consultative Committee for Shipping and Port Affairs (Schifffahrts- und Hafendeputation) where he was mainly involved in the construction of the new Sandtorhafen. In 1865, Meyer was appointed Engineer and Technical Executive (Ingenieur und technischer Bürochef). When the post of the Inner City District Engineer (Bezirksingenieur der Innenstadt) became available, Meyer took on that role within the Parliamentary Consultative Committee for City Development (Baudeputation). In 1872, he was appointed Chief Engineer and he was responsible for the technical aspects of all public building and city development projects in Hamburg.

Between 1881 and 1889, Meyer oversaw the construction of the Speicherstadt in the newly established Free Port, which had been separated from the City of Hamburg in the context of the establishment of the German Customs Union. It was and continues to be the largest, historically most important, and easily the most impressive example of the brick work architecture developed by the Hanover School (Hannoversche Schule). The construction of the Speicherstadt marked the emancipation of Hamburg’s warehouses and the architectural tradition that had produced them. They were the unadorned and sober counterparts of Hamburg’s prestigious bourgeois villas and shaped the underside of the city, which was mostly hidden from view because the warehouses overlooked the waterways. The shapes and formative elements of the Hanover School make the warehouse ensemble in the Free Port look matter-of-fact and dispassionate, but at the same time lend them an impressive aesthetic air.

to his design, immediately catch the eye and give the warehouse blocks their picturesque structure: winch bays and the addition of ceramic ornaments, glazed bricks and other neo-Gothic elements. These combined to make the Speicherstadt a source of great pride: It was the jewel in the crown and capacious treasure chest of Hamburg commerce.

Gothic design remained predominant until 1904 when brick façades started to become simpler and more rigidly structured. With its pillared façade the most recent eastern section of the third building phase (1926/27) is not dissimilar to the Kontorhaus (office building) architecture.

In 1902/03, a new administrative building was added to the Speicherstadt at 1, Bei St. Annen. Three of the architects of Hamburg Town Hall, namely Johannes Grotjan and Hanssen & Meerwein, were involved in the construction of this new office building. With its sophisticated and expensive design this end-of-row building between Holländischer Brook and Wandrahmfleet rises ostentatiously above the warehouse blocks. In terms of style, it emulates other buildings from the Early German Renaissance period. Its motifs such as turrets, bays and arcades are typical of the town halls built during the Wilhelminian/Promoterism period in Germany (second half of the 19th century), the clear message to contemporaries being: Take note, this is the town hall of the Speicherstadt!

During World War II more than 50% of the Speicherstadt was destroyed. Warehouse blocks A, B, C, J,



Figure 4: The Speicherstadt's "town hall", today the headquarters of the HHLA

K, M and the eastern part of block O were almost completely burnt down and destroyed. No attempt was made to rebuild blocks A, B, C and J. In their place we now find the Hanseatic Trade Center. As for block M, only the façade was saved. The damage to blocks D, E and L was less extensive, being limited to the top floors which were reconstructed. It is thanks to the sturdy construction of the warehouses and their many built-in firewalls that some of them were salvaged from the flames.

The architect Werner Kallmorgen (1902-1979) masterminded the reconstruction. It is thanks to

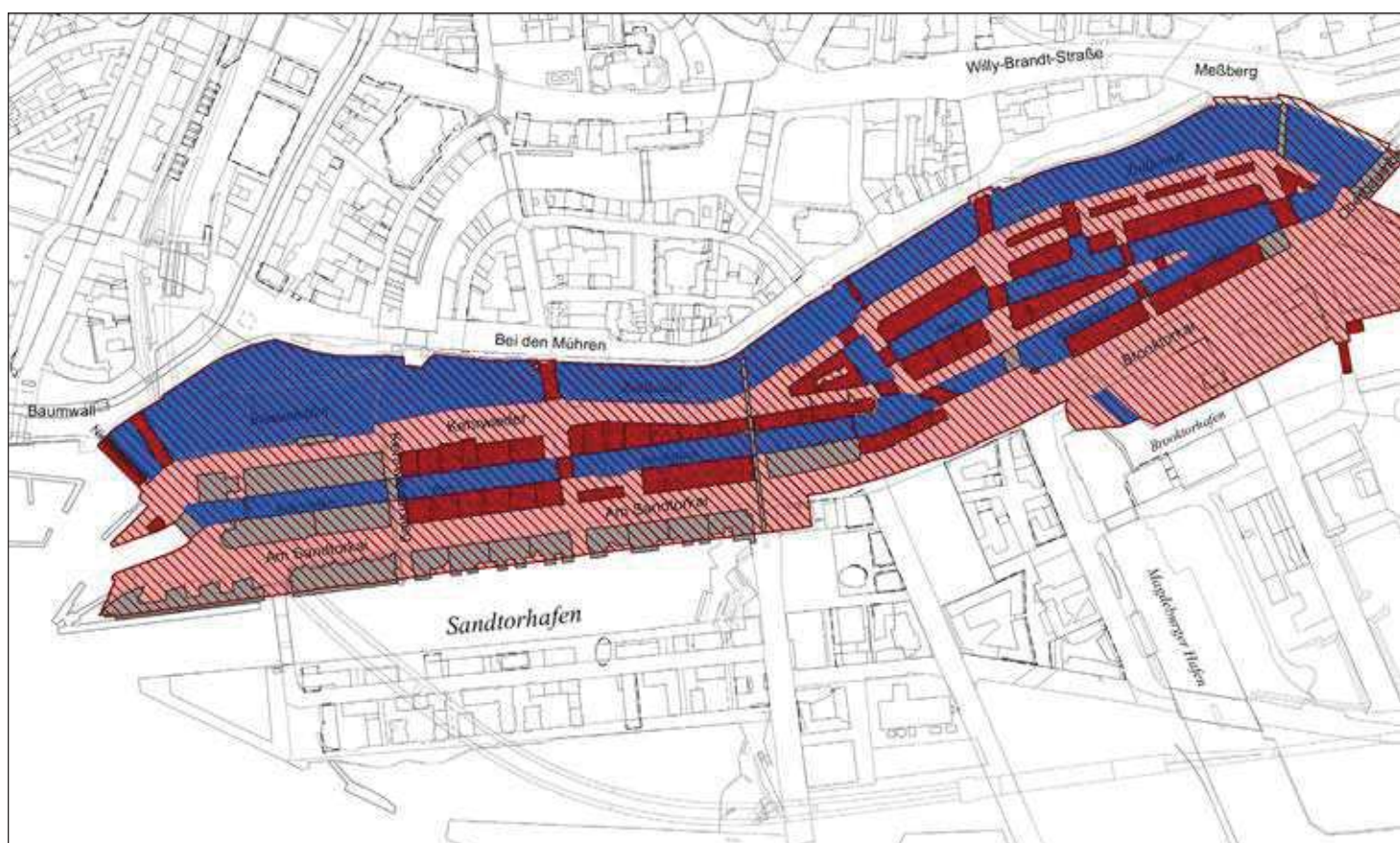


him that most of the ruins were rebuilt. Depending on the degree of destruction he opted for either a careful and detailed reconstruction or for liberal additions to the partly preserved blocks. In many cases, the only evidence that the top sections of the blocks have been rebuilt is the very minor variation in the colour of the brickwork. In other cases, like the eastern corner of block L, the year 1957 is written into a section of the wall.

While all this reconstruction work was going on, new blocks were built that adhered rigidly to Kallmorgen's idea of post-war modernism: They consisted of sparse, cube-shaped structures, which effortlessly blended into their environs because they used the same brick material. Cases in point are blocks K and O, which were built in 1958. The coffee exchange was housed in a new office building (block O) with a skeleton construction and infill

panels of brickwork. In 1967, the last warehouse was built: block T at 12, Alter Wandrahm.

Since the late 1960s, the transshipment of goods in the Port of Hamburg has been dominated by the use of containers, which has also led to changes in the warehousing and logistics infrastructure. In turn, this has had a major impact on the Speicherstadt. The use of barges within the port declined steadily from the 1960s onwards and stopped completely in the 1980s. The use of containerised transport also became more widespread for goods which had traditionally been stored in warehouses, such as coffee and cocoa. A parallel development saw the Speicherstadt become the world's largest storage and trading location for oriental carpets. Even today, carpet traders operate their warehouse facilities in much the traditional way, using winches, for example, but their merchandise is now exclu-



sively transported by road. On 15 May 1991, the entire Speicherstadt, in its historical boundaries, was listed under the Hamburg Heritage Protection Act. The listed ensemble includes both the historic warehouses and the reconstructed buildings from the post-war period. All the streets, public spaces, waterways and quays in the district are also protected under the Act.

In 2005, the Speicherstadt was placed on the German Tentative List for nomination for the UNESCO World Heritage List, together with the Chilehaus and the Kontorhaus district. By ratifying the World Heritage Convention, signatories including the Federal Republic of Germany have undertaken:

- to adopt a general policy which aims to give the cultural and natural heritage a function in the life of the community and to integrate the protection

of that heritage into comprehensive planning programmes

- to develop scientific and technical studies and research and to work out such operating methods as will make the State capable of counteracting the dangers that threaten its cultural or natural heritage
- to take the appropriate legal, scientific, technical, administrative and financial measures necessary for the identification, protection, conservation, presentation and rehabilitation of this heritage

These provisions of the World Heritage Convention not only apply to recognised or nominated heritage sites, but to the entire natural and cultural heritage of signatory states.

The Free and Hanseatic City of Hamburg intends to submit the "Chilehaus and Kontorhaus district with the adjoining Speicherstadt" to be inscribed on UNESCO's World Heritage List.

To facilitate compliance with the requirements of heritage preservation and protection, particularly as regards the external appearance of the Speicherstadt, the Hamburg Senate adopted a design regulation which sets out specific and tailor-made provisions for the Speicherstadt: The Ordinance on the Design of the Speicherstadt (Verordnung zur Gestaltung der Speicherstadt) of 5 August 2008, contains provisions on façade design, roofs, building and facility technology, advertising spaces, the use of vending machines and the design of outdoor spaces without prejudice to the stipulations of the Heritage Protection Act. Thus, planning permission is subject to compliance with the latter.

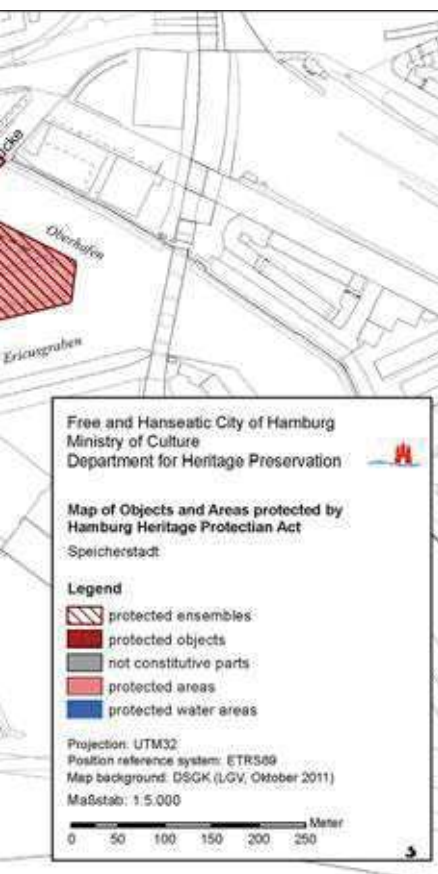


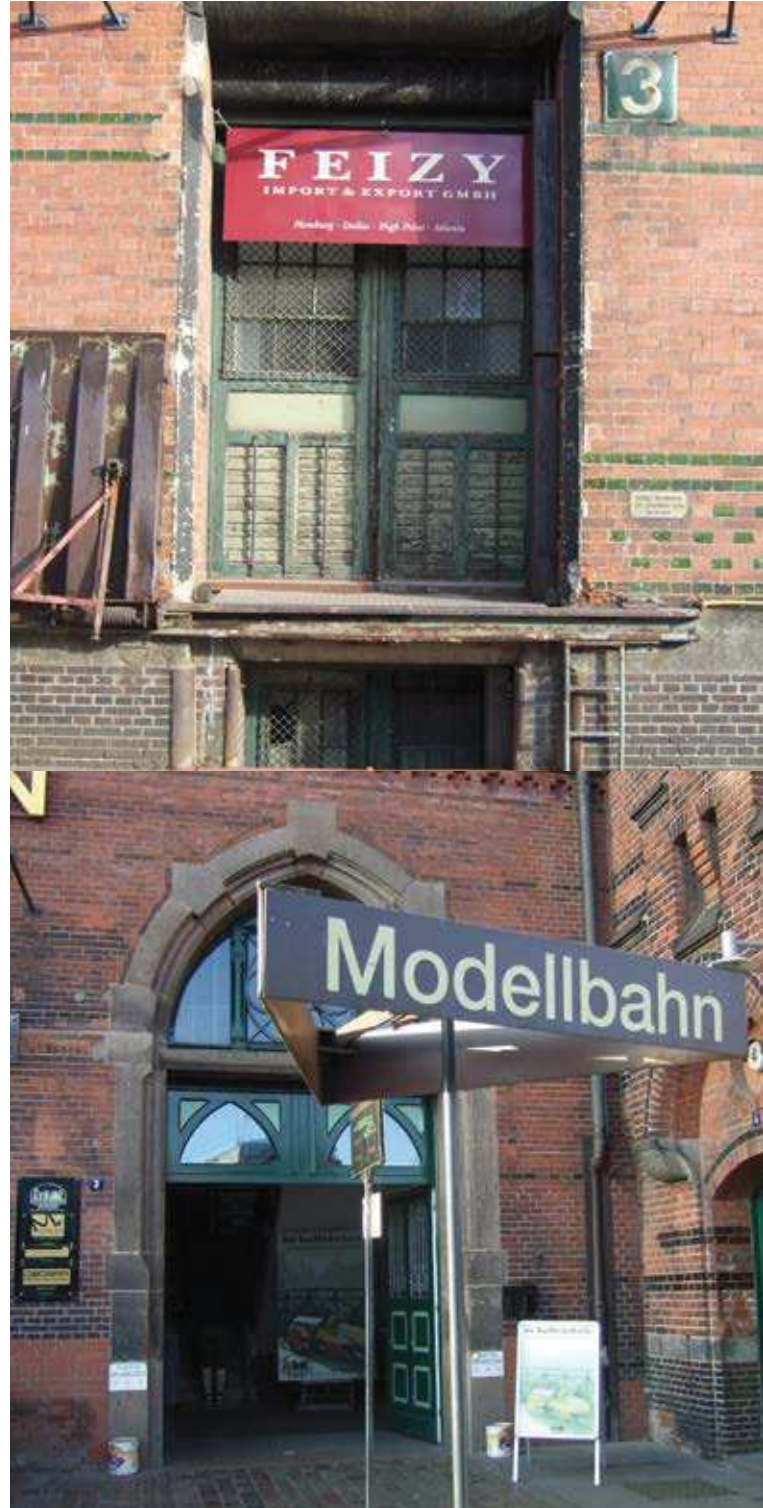
Figure 5: Heritage Protection Map:
Annex to the Regulation on the Protection
of the Speicherstadt

3. How the Speicherstadt Buildings are Used

Large parts of the Speicherstadt are still characterised by trade and types of commerce with some connection to the port. However, those warehouses which are no longer required for the storage of goods have long since begun to find alternative uses. As the owner of the warehouses, HHLA produced a study in November 2000 describing the development of the Speicherstadt and offering several alternative scenarios. Scenario II, which was finally selected, is based on the idea of “Actively Shaping Future Development” and underpins HHLA’s activities in the Speicherstadt. A third of the warehouse space has already been converted to new uses.

In the course of the part-privatisation of HHLA, its Speicherstadt assets were separated from its other business activities. The Speicherstadt buildings were assigned non-listed tracking stocks, which are wholly owned by the Hamburg Capital and Holdings Management Company (Gesellschaft für Vermögens- und Beteiligungsmanagement (HGV) mbH), which in turn is wholly owned by the City of Hamburg.

In 2007, the Hamburg Parliament adopted a decision entitled the Memorandum on the Part-Privatisation of HHLA (Bürgerschaftsdrucksache zum Teilbörseingang), which confirmed a gentle development approach towards new uses for the Speicherstadt. The present Development Concept for the Speicherstadt seeks to present individual development modules and identify the opportunities and challenges presented by each. This is in order to define a system of mixed uses for the Speicherstadt, which is in keeping with its function as a link between the historic city centre and the new HafenCity.



3.1 Storage, Transshipment and Processing

Traditionally, coffee and tea, cocoa, dried fruit, nuts, spices and other such precious delicacies were the most important goods stored in the Speicherstadt. For more than a hundred years, the storage, transshipment and processing of these products were the main occupations of specialised merchants and independent storage managers and quality surveyors (Quartiersleute).

Many renowned trading companies had and still do have their headquarters in the Speicherstadt. From there they have built up their network of worldwide trading connections, thus turning the Free and Hanseatic City of Hamburg into a trading centre of global importance. Indeed, names such as Hälssen & Lyon, Ockelmann & Consorten and Eichholz & Consorten can still be seen on some of the warehouses.



For decades now, the Speicherstadt has been in transition. Some operators have found better storage facilities outside the Speicherstadt for many of their traditional goods, while other products have found their way into the Speicherstadt and are now being stored and handled there. High-value, oriental carpets are a case in point. They have been shipped to the Speicherstadt and stored there for several decades now and from Hamburg are distributed to many European markets and to America. Today, the

Speicherstadt is the world's largest storage location for oriental carpets.

The warehouses in the Speicherstadt have also attracted new users from the fashion industry. There are now some 40 companies from the fashion and textile industries operating storage facilities and showrooms in the old warehouses.

As a result of these changes, storage and processing will in the future only constitute two of many different activities in the Speicherstadt. Currently, some 96,000 out of a total of 300,000 square metres are used for storage or as showrooms. The Speicherstadt was, of course, originally designed to store goods. It would therefore not be desirable if these traditional warehousing and distribution activities disappeared completely, since it is they that give the Speicherstadt its typical character. This means that, in the long term, it will continue to be necessary to provide sufficient space for lorry access and parking.



3.2 Service Industries and Offices

From the outset, office space was required in the Speicherstadt to organise the transshipment and storage of goods. As a rule, there was at least one small office on each floor and definitely one per merchant company. The offices were used to organise import and export activities. This is where the books were kept and other administrative jobs carried out. Often these offices measured less than a dozen square metres.

The Speicherstadt barely contains any of the typical office buildings that we are familiar with from the Kontorhaus district. Exceptions are the former administrative building of HHLA at 1, Am Sandtorkai,



Figure 6: Courtyard of the office building at Sandtorquaihof

and the current one in block U. The Sandtorquaihof in block H, too, was designed as an office building right from the start. These office blocks are characterised by large windows, narrow profiles and interior courtyards and have the proportions typical of the period.

After WW II several new office blocks were built, which can be regarded as models for modern office architecture inserted in the historical context of the Speicherstadt. These buildings, namely block T, parts of block O, the end-of-row buildings in block R (all

designed by the architect Werner Kallmorgen) and the contemporary end-of-row building in block X (designed by the architects gmp) fit neatly into the Speicherstadt ensemble.

The diversification of the Speicherstadt warehouses has meant that office operators have settled into classical storage spaces. Amongst those setting up business there are PR and advertising agencies, IT companies, other modern service providers, event agencies and fashion companies. Currently, some 81,000 square metres in the Speicherstadt are occupied by offices.

However, warehouse conversions must comply with the requirements of heritage protection and the provisions of the Ordinance on the Design of the Speicherstadt. Some of the warehouse buildings are less suitable for conversion because their



Figure 7: Inside block U (HHLA)

floor plans are inappropriate. The HHLA administrative building, block H and several other post-war buildings were conceived of and designed as office buildings right from the start and have been used as such, while other warehouses will have to undergo careful examination as to their suitability for new uses.

For each block, important issues need to be considered, for example:

- Depth of the building and window size as this determines the amount of natural light indoors
- Ceiling height and constructive grid
- Building materials employed as this affects fire safety and emergency escape routes
- Shape and design of roofs to determine whether an interior courtyard could be integrated
- Flood protection requirements: What modifications have to be carried out if basements and ground floors are to be rented out to new users?

Block P is a good example of how historic warehouses can be put to new uses: This block, which was built in 1893, now houses the Hamburg Port Authority (HPA). It has a total length of 127 m and now features large atria which provide a great deal of natural light. Despite the modifications required, the overall appearance of the building has been preserved.



Figure 8: View of warehouse block P, home of the Hamburg Port Authority, from the north

3.3 Living in the Speicherstadt

Enabling more people to live in the city centre is a top priority in Hamburg's town planning strategy. As the Speicherstadt is currently undergoing major modifications, it seems only natural that part of it should also be considered for residential purposes. It is desirable for the Speicherstadt to develop into a lively inner city district, which necessarily includes its being used for residential purposes. However, converting former warehouses into apartments is a major undertaking, given the requirements in terms of lighting, access infrastructure such as stairways, building installations and facility technology. Indeed, converting former warehouses so they can be used for residential purposes begs the question of whether the proposed changes might interfere with the nomination of the Speicherstadt as a World Heritage Site. In other words, living in the Speicherstadt will only be permissible if considerable efforts are made to reconcile residential use with the need to preserve the essential character of the buildings.

Another important aspect of living in the Speicherstadt concerns protection against flooding. At present, there is a general ban on buildings in the Speicherstadt being used for residential purposes and, between 1 October and 15 April of each year, on overnight stays within the area prone to flooding (cf. Art. 63b of the Hamburg Act on Water Management (Hamburgisches Wassergesetz). Exemptions from this are only granted where the safety of persons is ensured through constructional and other local measures, i.e. apartments must be connected to emergency escape routes at flood-safe levels. This can only be guaranteed in the immediate vicinity of Kibbelstegbrücke, which is safe for both pedestrians and cyclists even in high storm-tides and can be used by emergency rescue vehicles. The Kehrwieder-/Binnenhafenbrücke, by contrast, is a footbridge, which cannot be used by the fire brigade and other rescue vehicles. Thus it cannot be accepted as an escape route for nearby apartments.

Access to and from warehouse blocks E, G, N and

O can be provided via the Kibbelstegbrücke so that it seems realistic to consider them for residential use. However, the western section of block O is now a multi-storey car park, which was built only



Figure 9: Kibbelstegbrücke and warehouse block N

recently, and block N has been converted into a covered market, a restaurant and offices. The top levels of the latter have been designed in such a way that they could also be used as loft apartments.

If the Kehrwieder-/Binnenhafenbrücke were to be upgraded so that it could be used by emergency vehicles, warehouses L and D could also be considered for residential use. The cost of such an upgrade, however, would be almost the same as a newly built bridge, which seems disproportionate in relation to the relatively minor benefit accrued. In theory, additional bridges and elevated walkways could be built to connect other warehouses to flood-safe escape routes. However, they would involve major construction work at significant cost, since they would have to provide sufficient clearance for lorries driving underneath them. The overall appearance of the Speicherstadt would suffer as a result, which

means that such measures are out of the question for a large part of the Speicherstadt. A possible exception is block X which is situated at Brooktorkai. Here a walkway could be built to connect the warehouse to the south side of the existing street, which is at a higher level anyway. If the Wandrahmsteg were relocated and rebuilt at an elevated flood-safe level, the Customs Head Office on Teerhof could be connected to the flood defences north of the Zollhafen (Customs Port). In total, some 100 apartments could be created if all of these measures were implemented.

For the time being, then, due to the absence of adequate flood protection, residential use can only be a lesser priority for the Speicherstadt. If the entire Speicherstadt were integrated into the existing city-centre flood protection zone, more warehouses would become eligible so that a total of 320 flats and apartments could be created. This would presuppose, however, that solutions were found to issues concerning construction, construction monitoring and other legal matters.

This Development Concept only looks at those warehouse buildings which have not yet been comprehensively rehabilitated or converted. For those which have been recently converted, the cost of modifying them yet again within a relatively short time span would not seem justifiable in economic terms. Consequently, converting or adapting warehouses for residential purposes seems to be a realistic option for blocks L, M, E, G, V and X as well as for office block H and the Customs Head Office on Teerhof.

Blocks L, M, V and X are situated on Am Sandtorkai / Brooktorkai, a main thoroughfare, which means that they are exposed to significant traffic noise. In addition, that main road is situated to the south of the warehouses so that only their upper storeys would be suitable for apartments. Blocks L, M, V and X have a depth of between 25 and 28 m, while

block E is wedge-shaped so that its depth is 32 m at the western end and only 18 m at the eastern end. Block G has a depth of 17 to 18 m. Buildings which are more than 15 m deep are only suitable for residential purposes if additional sources of natural light such as interior courtyards are inserted into the existing structures. The possible impact of this on the buildings, bearing in mind that they are listed, would have to be assessed on a case-by-case basis. Ground floors are not suitable for living in as they are right next to the street. As regards the lower storeys, an assessment would have to be made as to whether the addition of interior courtyards would provide sufficient natural light. Some of the storeys have very low ceilings. Given the depth of the warehouse floors, solutions might include removing part or all of some floors to ensure high-quality living conditions. This would lead to fascinating spatial restructuring, which would lend a special quality to these newly created apartments. The warehouses that have not yet been renovated offer excellent opportunities for new forms of combining living and working under the same roof, in particular for people employed in the creative industries.



Hotels

Some of the warehouses may also be converted into hotels. More specifically, the sections of block O that are situated at 4 and 5, Sandtorkai and the Coffee Exchange, which is currently being used as office space, have been earmarked for hotel use. Since hotel accommodation is classified as residential use, the conversion of warehouses into hotels requires a specific flood protection concept to be produced and agreed.

3.4 Cultural and Leisure Facilities

For decades the Speicherstadt was reserved for the storage and processing of goods, and the accompanying administrative services, particularly because the customs border constituted a physical and mental barrier.

However, even while it still had the status of a free port, this did not prevent operators in the Speicherstadt from trying to attract tourists by, for example, staging events such as the open-air play *Hamburger Jedermann*. A number of museums were also established such as the Spice Museum and the Museum of the Speicherstadt. The range and number of cultural activities has increased since the removal of the district's free port status so that there are now various venues for leisure pursuits and cultural activities in the Speicherstadt :

- The Museum of the Speicherstadt
- The Spice Museum
- The Architectural Archive of Hamburg
- The German Customs Museum
- The Hamburg Dungeon
- The Afghan Museum
- Dialogue in the Dark
- The Miniature Toy Train Wonderland (Miniaturwunderland)

In addition, concerts, operas and open-air plays such as the *Hamburger Jedermann* are regularly staged in the Speicherstadt. Altogether, cafés, restaurants and venues for cultural and leisure activities occupy some 25,000 square metres in the Speicherstadt. The large number of museums and cultural venues make the inner-city Speicherstadt a waterside world of cultural 'islands'. Such cultural activities contribute significantly to the liveliness and attractiveness of the Speicherstadt and will continue to be promoted and extended. However, in the Speicherstadt there should be a carefully balanced mix of both cultural and leisure activities on the one hand, and other uses on the other. Similarly, cultural and leisure activities in the Speicherstadt should complement rather than compete with those on offer in the HafenCity.

Figure 10: Cultural events and activities in the Speicherstadt (from left to right): *Hamburger Jedermann*, Hamburg Dungeon and Dialogue in the Dark



3.5 Creative Milieus

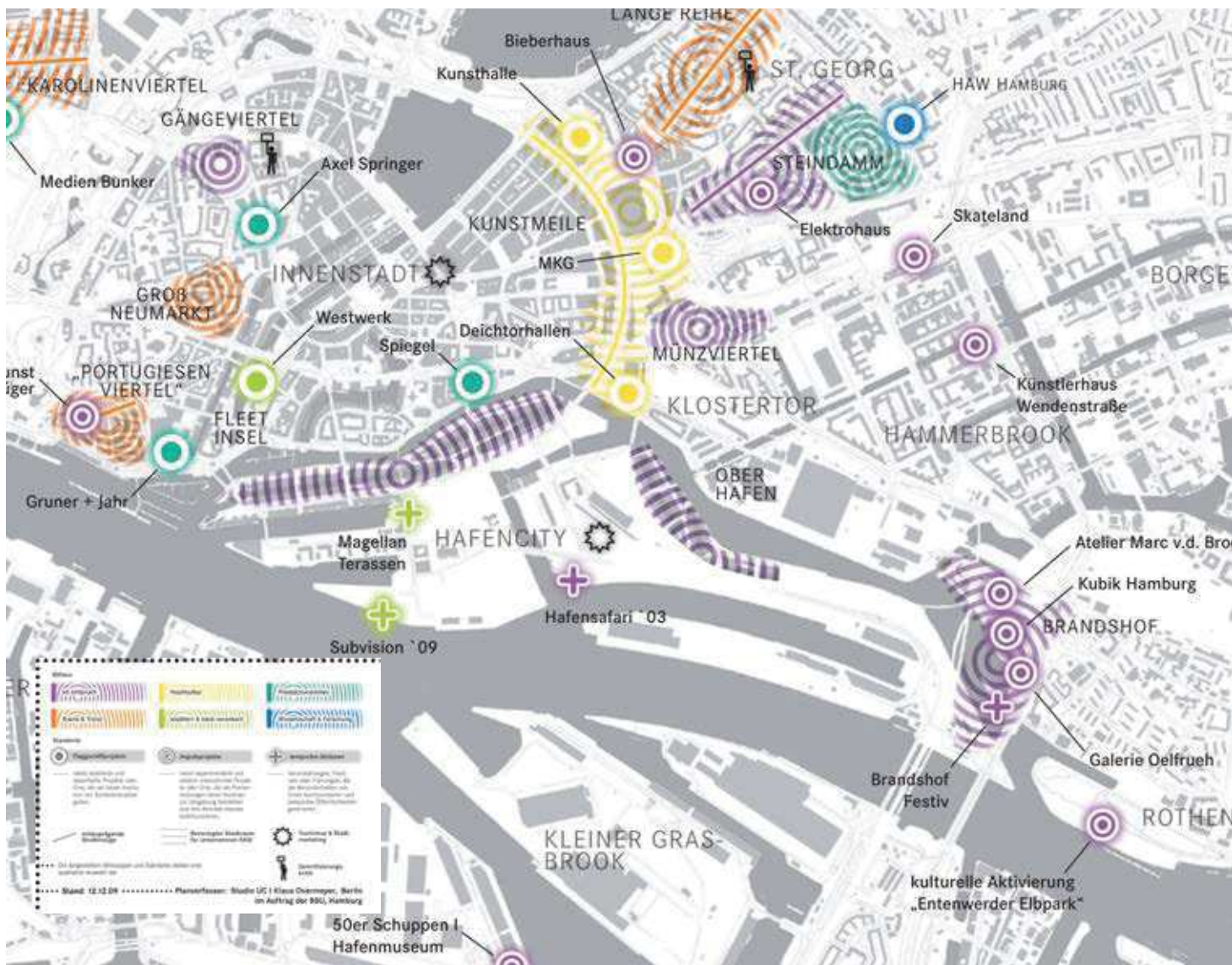


Figure 11: Report on "Creative Milieus and Open Spaces in Hamburg", revised version

In 2010, the Hamburg Ministry of Urban Development and Environment (Behörde für Stadtentwicklung und Umwelt) presented a report which looked at creative milieus and open spaces in Hamburg. That report highlights possible city development projects, which would enable creative potential to be unlocked and allow more space to be opened up for that purpose.

One of the areas with a high creativity potential identified in the report is the Speicherstadt. As it is no longer going to be classified as part of the port area, but as a so-called transformation zone, it is expected that the

city authorities, on the basis of their sole ownership and special management competencies, will be able to shape developments in a way that promotes that creative potential.

If creative and cultural activities in the Speicherstadt are better publicised through exhibitions, open studios and temporary event formats this will contribute to making the Speicherstadt a more lively place, including outside office hours. The Speicherstadt has a prominent position between the historic city centre and the new HafenCity. Its atmospheric historic buildings and

generous open spaces attract artists and people with creative ideas who will find new uses for the existing buildings. Alongside international companies like Warner Brothers Group, many SMEs from the creative sector have set up business in the Speicherstadt. Two storeys of warehouse block V have been converted into nine studios for artists.

There is a strong demand for space in the centre of Hamburg that can be used for artistic and creative purposes. In fact, the studios in the Speicherstadt are the most popular among the ones administered by the Studios for Art Association (Verein "Ateliers für die Kunst"). The city will benefit from opening up the Speicherstadt to artists and their activities at several levels: from a development, cultural, political and economic point of view. Quite apart from the positive effect that this is likely to have on the Speicherstadt itself and on the city centre, Hamburg as a whole will be able to boost its image as an art-friendly city by sending out a positive message to artists and the creative industries.

The Speicherstadt is particularly suitable for the developments described, not only because of the availability of space, but also because potential partners and clients are close by. There are advertising agencies and media centres as well as the so-called 'Arts and Culture Mile' (Kunst- und Kulturmeile). Together, these offer numerous social and professional meeting points and thereby increase the attractiveness and quality of the Speicherstadt as a workplace. The concentration of so many activities in the Speicherstadt means that their visibility will be increased and the Speicherstadt will gain an international profile which is commensurate with its significance as an ensemble of listed buildings. In addition, efforts will be made in the future to attract less well-established artists and creative companies to the Speicherstadt. They will be offered studio and office space on very favourable terms, i.e. at current, frozen rent levels for studios in the district. Some 5,000 square metres have been earmarked for young artists, who might not always seek a high degree of sophistication when it comes to revamping

the former warehouse space.

An additional 5,000 square metres will be made available, among other things, for studios, exhibitions, events and performances. This space will be offered at approximately cost-covering rents to artists and people in the creative industries in a wider sense, such as designers and architects. While small creative clusters are being encouraged in some parts of the Speicherstadt, it is hoped that artistic and cultural activities will be a feature of the entire district.

Catering and Retail

With its attractiveness to tourists and its strategic position between the historic city centre and the new HafenCity, the Speicherstadt is ideally suited for the catering industry. Cafés and restaurants with outdoor seating enhance street life in any city district and efforts will be made to encourage more of them to set up business in the Speicherstadt in the years to come. Because of the legal situation that used to

Figure 12: An Oriental carpet made of stone by F. Raendchen



3.6 Other Uses

obtain in the Speicherstadt (cf. Port Area Development Act) there are currently very few retail outlets. But that will change once the ensemble is no longer officially classified as part of the port area. Ground floors will then in some cases become available for retailers with a connection to the goods traditionally stored in the Speicherstadt such as tea, coffee and carpets (theme-oriented retail). Great care will have to be taken, though, to preserve existing ground floor façades so only a few, modest modifications will be permitted: No large shop windows or external advertising will be allowed.



Parking Space

At the moment, parking space in the Speicherstadt is very limited. The newly built car park in block O has a capacity of 830 parking spaces, 250 of which are available for the general public.

3.7 Pre-requisites for New Uses of Buildings in the Speicherstadt

Protected Building Status

For historic buildings within the Speicherstadt to be eligible for new uses, the most important single pre-requisite is that the conversion measures be compatible with the status of a World Heritage Site. This also applies to new buildings, which will have to comply with the rules for the whole ensemble.

Planning Legislation

In planning terms, the Speicherstadt is currently governed by the Port Area Development Act, which stipulates that the only permissible uses are those which serve the port. Permission for alternative uses can only be granted by way of derogation, and such alternative uses must not alter the overall character of the district. If there is to be an orderly changeover to non-port-related uses in relevant parts of the Speicherstadt, it is necessary to take it out of the Port Area Development Act and enact new planning legislation. This will have to be done in compliance with the Construction Code (Baugesetzbuch). Also, land-use plans (Bauleitpläne) containing both preparatory measures and binding provisions will have to be drawn up.

Ordinance on the Design of the Speicherstadt

The following provisions of the Ordinance on the Design of the Speicherstadt of 5 August 2008 have to be respected by all conversion measures and new buildings (cf. Annex 1 for the full version of the ordinance). In each case, permission will have to be obtained from the Heritage Protection Agency.

Façades

- Façades must be designed in such a way that the surface area of their openings is smaller than that of the wall area. Structural elements must be used to divide the ground floor, upper storeys, attic and roof areas into clearly distinguishable sections. The colour of these structural elements must resemble that of the surrounding brickwork.
- Façades visible from the street must be made of

brick, the colour and size of which must echo those of the existing brickwork.

Projecting façade sections must blend in with the rest of the building in question and must not protrude by more than 0.75 m. There must be no balconies, galleries, loggias, conservatories or sun blinds on façades overlooking streets or waterways.

- Any openings in the outer walls such as windows, doors and gates must be clearly set back from the front line of the façade. The design of each storey must reflect that of the other storeys. Windows must be in portrait format. Sun blinds and roller shutters on the outside of windows are not allowed. Windows must be divided by stay bars. All the windows and doors within one building or block must be painted in the same colour. Curved, tinted and reflective glass must not be used. The sizes and shapes of shop windows must be in line with other windows in the same building. To close off the loading bays it is permissible to put in additional glazing if the latter is set back by at least 1.5 m from the front line of the façade. Window and door frames in these loading bays must be the same colour as the original loading doors.
- No plants may be grown on façades.

Roofs

- Roofs may be finished in unpainted slates or copper without artificial patina. Each block must have a uniform roof covering.
- Balconies, cut-away sections and skylight windows at roof level are only allowed in areas where these cannot be seen from publicly accessible places. Skylight windows must not constitute more than ten per cent of the overall roof area. However, rows of sky lights are permissible near roof ridges if they do not exceed 25 per cent of the roof area.
- Roof-top superstructures such as transverse roof sections and dormers are permissible in the case of buildings where the roof has a pitch of more

than 27 degrees. These roof-top superstructures must correspond to existing superstructures on the respective block in terms of shape, size and design, and must be positioned along the axes of façades.

Building Technology

- Any externally visible technical equipment such as aerials, and outlets of heating and ventilation systems must be limited to the minimum technically required and must be placed on the side of the buildings that does not face the street.
- Refuse containers and recycling bins must be located inside buildings.

Advertising and Vending Machines

- Advertising is only allowed if it refers directly to the services performed in that particular location. It has to take the form of black plaques placed next to entrances and attached directly on to the façade of the building housing the company in question. The signs must have gold lettering or semi-relief golden letters and their size and design must be in keeping with existing plaques and name plates. There must not be more than one company name plate on each section of the façade and such name plates must not be too close to the corners of buildings. Nor must they cover or in any way interfere with the structural or ornamental elements of existing façades.



- Vending machines and display cases are not permitted close to façades.

Construction Monitoring and Legal Requirements

Parking spaces for cars and bicycles

Currently, there are only a few private parking spaces for motorists. Planning rules normally require car parks to be provided on any estate where a change of use is envisaged. The required parking facilities for bicycles should be placed either inside buildings (ground floors) or in the loading and unloading zone outside. Additional parking spaces for cars and bicycles, which are required by law, must either be created on nearby land (servitudes) or compensated for in cash. For reasons of heritage protection, in most cases it will not be possible to create the required number of parking spaces in the Speicherstadt. The technical instruction "Required parking facilities for cars and bicycles" (Fachanweisung "Notwendige Stellplätze und notwendige Fahrradplätze") determines that such compensation payments are not due in those cases where it is impossible to create parking spaces because of heritage protection constraints.

Natural Light in Buildings

As the vast majority of the buildings in the Speicherstadt are narrow and deep with few windows, and are characterised by low ceilings and structural pillars to support heavy loads, the amount of natural light

reaching the inside of warehouses is a critical issue. For residential buildings, the legislation requires the size of windows and other elements providing natural light to be greater than or equal to one eighth of the ground floor area. Rooms that are not lived in do not have to comply with this provision, i.e. they can be built without windows if adequate illumination can be provided by other means (Paragraph 44 of the Hamburg Building Code, HBauO). In the majority of cases, the existing window provision in the warehouse buildings does not meet these requirements. In consultation with the Heritage Protection Agency, the following measures could be considered:

- Creation of interior courtyards,
- Creation of (additional) openings and zones (Blindfelder) in façades which would imitate the design of existing doors and windows,
- Opening up the cornices (Gesimskränze) in eaves with deeply receding reveals into which windows could be inserted,
- Creation of sky lights and rows of windows near the roof ridges.



Height of Storeys and Ceilings

According to the Hamburg Building Code (Paragraph 44 (1) of HBauO), ceilings in rooms intended for human habitation must be at least 2.40 m high. Paragraph 23 of the Ordinance on Work Places (Arbeitsstättenverordnung, ArbStättV) stipulates that working rooms and offices must have a clearance height of 2.5 m. If these minimum ceiling heights are not available, two storeys must be merged.

Staircases

The rise/run ratio of the existing staircases in some warehouse blocks is too steep to meet current legislative requirements. Also, in some cases, the staircases are too narrow to comply with the requirements on safe escape routes (cf. German Industry Standard (DIN) 18065 and Paragraph 17 of the German Ordinance on the Safety and Design of Work Places, cf. European Directive ASR 17/1,2).

Protection against the Risk of Falling

Windows and loading bays which do not feature railings or safety fences of the required height, must be furnished with appropriate safety equipment to safeguard against the risk of falling.

Barrier-free Access

The Hamburg Building Code includes special requirements for apartments and civil engineering works which are publicly accessible and for buildings that are used primarily by people with restricted mobility (Paragraph 52 of Hamburg Building Code). The provisions on residential buildings set out therein do not apply where the effort and cost required to achieve barrier-free access would be disproportionate. Buildings that are used by the public must be equipped with lifts. Efforts will be made to achieve barrier-free access to all parts of the Speicherstadt. Assessments will have to be made on a case-by-case basis to establish whether this is possible everywhere.

Heat and Noise Insulation

The heat and noise insulation of the Speicherstadt

buildings needs to be upgraded in such a way that preserves the external design of the buildings. Both the Hamburg Act on Climate Protection (Hamburgisches Klimaschutzgesetz, HmbKliSchG) and the German Regulation on Energy Saving (Energieeinsparverordnung, EnEV) provide for waivers for listed buildings.

Fire Safety

The conversion of the warehouses to residential and office use requires existing fire safety schemes to be completely revised. New schemes need to be developed for each individual building, as the structural engineering of most of them does not comply with the fire safety requirements of the Hamburg Building Code. To compensate for this, fire alarm and technical fire-fighting systems (anlagentechnischer Brandschutz), fire doors etc. will have to be installed. Because it would be difficult to reach the warehouse buildings in the event of flooding and because of the way they are built and the materials used, sprinkler systems must be installed and approved by the competent authorities.

Requirements for Residential Buildings

For every new building containing three or more apartments, legislation stipulates that playgrounds must be built. However, there is limited space for such facilities in the Speicherstadt. Exemptions can be granted if the new buildings – although otherwise eligible for planning permission – could not be built as a result of non-compliance with this requirement or if the cost of compliance would be disproportionate. In such cases, there is an obligation (servitude) to secure playground areas on neighbouring land (Paragraph 10 of Hamburg Building Code).

Requirements for Event Venues

The Hamburg Regulation on Gathering Places (Hamburgische Versammlungsstättenverordnung) stipulates special fire safety requirements for event venues: There must be at least two physical escape routes. The width of the escape routes depends on the number of people present in any one location, but must be at least 1.20 m.

3.8 Concept for New Uses of the Speicherstadt

Hamburg aspires to develop the Speicherstadt into a lively inner-city district that connects the historic city centre with the new HafenCity. This will only be achieved if the mix of different uses in buildings and public spaces attracts enough people at all times of the day. In the long term, it is hoped that this mix will include appropriate proportions of residential use, offices, cultural and creative activities, leisure pursuits and goods storage.

The intention is for the Speicherstadt to allow economically established activities to coexist with others that are not economically established. Because of its central, prestigious location, the Speicherstadt is ideally suited as a home for arts-related, cultural and entrepreneurial activities. Networking between these different spheres will create synergies and promote the regional economy.

There is no comprehensive system of flood defences in the Speicherstadt, which is why, unfortunately, there are currently severe constraints on residential use, which could otherwise enliven the district. While this situation prevails, i.e. as long as no definitive decision has been taken about a comprehensive future flood protection system, the City of Hamburg will strive to act in a way that does not preclude any future developments in the Speicherstadt. Warehouse buildings that have been earmarked for rehabilitation or new uses will have to be examined to determine whether, in principle, they are suitable for residential use. If so – even if

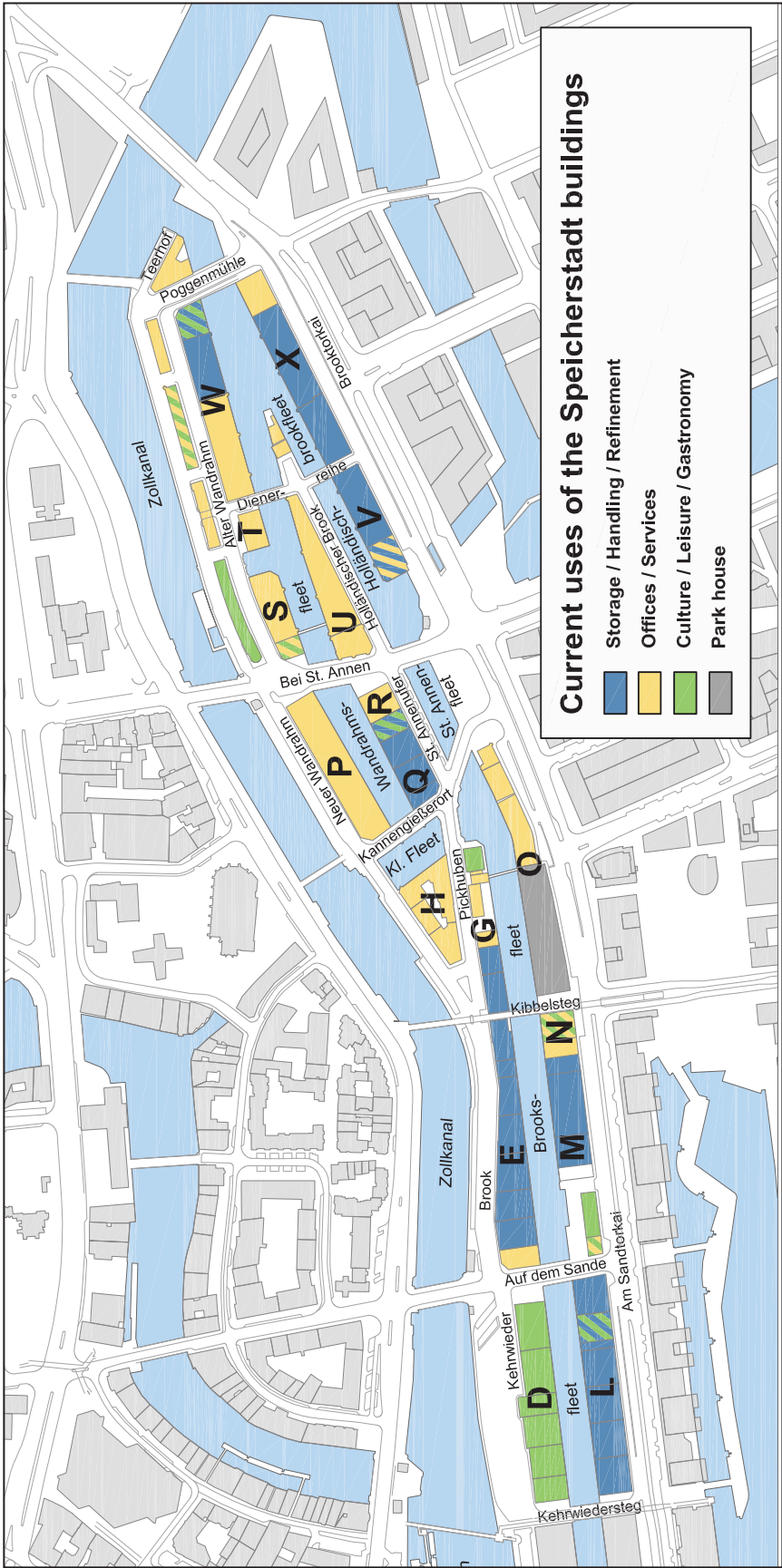
that only applies to parts of the buildings in question – any conversion work and intermediate uses must not preclude future residential use. This also applies to upgrading and adding value to warehouse buildings by converting them. Unless this is kept in mind, any subsequent residential use could be ruled out by the increased value of the property. As soon as there is a comprehensive system of flood defences in place that encompasses the entire Speicherstadt, buildings eligible for residential purposes should immediately be converted into apartments, provided that this can be reconciled with the requirements of heritage protection.

Creative and cultural activities can enliven the Speicherstadt by providing public exhibitions, open studios and temporary event formats. They constitute an alternative to pure office use until a comprehensive system of flood defences makes residential use possible.

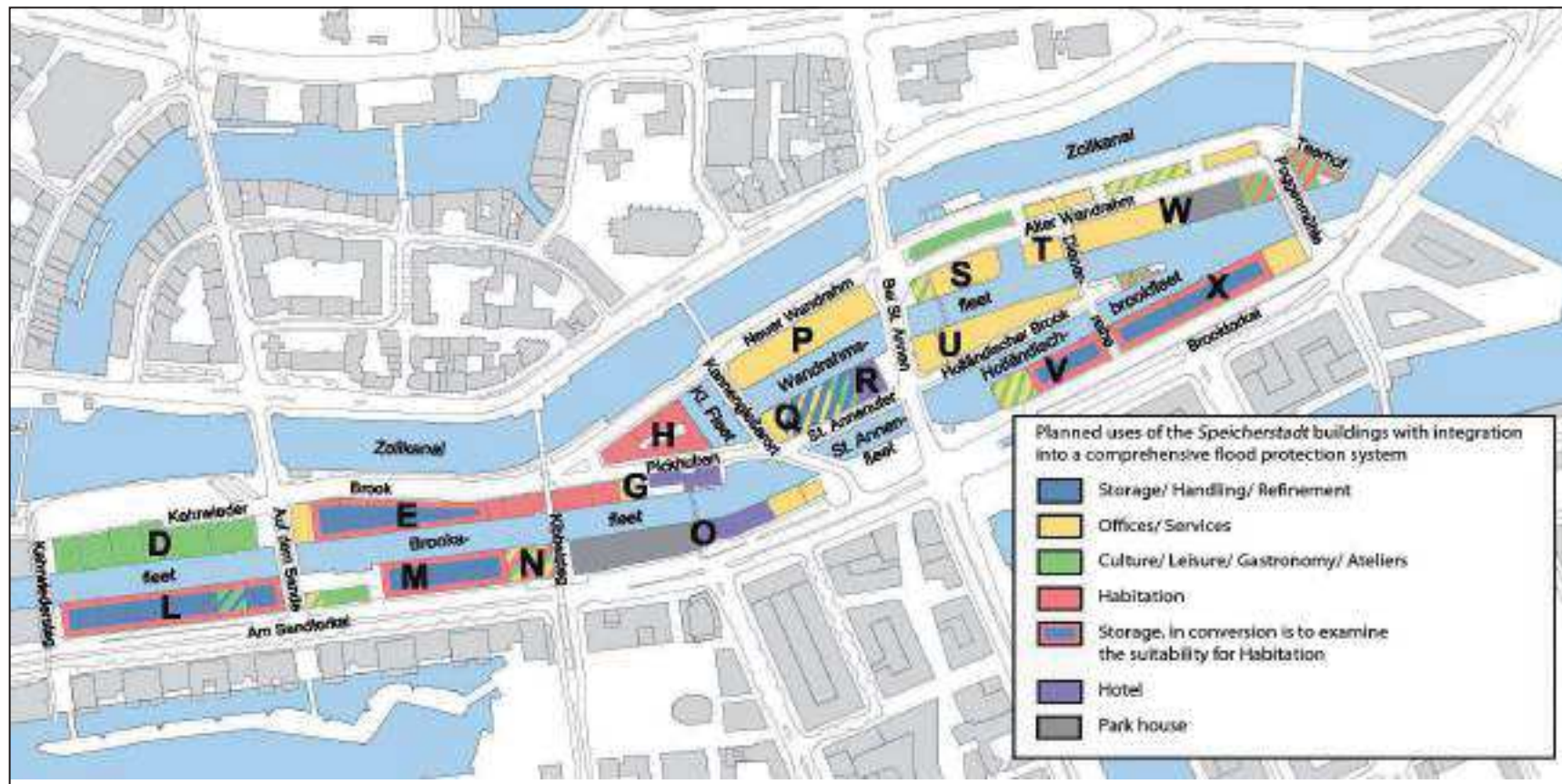
What follows is the Concept for Future Uses no. 1, which assumes that, in the long term at least, there will be a comprehensive system of flood defences for the Speicherstadt. If the City of Hamburg should decide against such a system Concept no. 2 will be implemented.



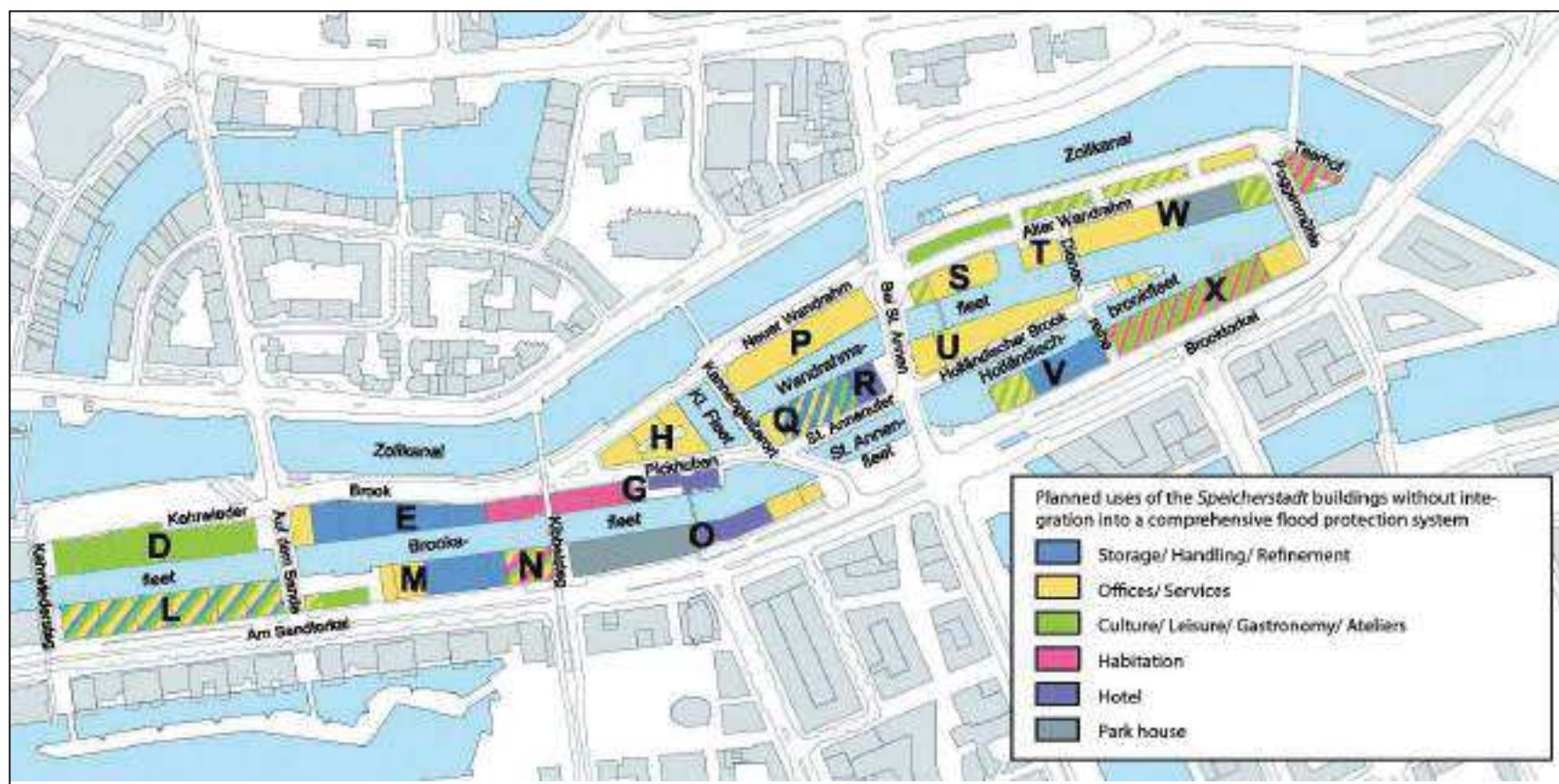
3.9 Current Uses and Alternative Uses in the Future



Current Uses



Concept no. 1
Uses of the Speicherstadt after integration into the flood protection systems of the city centre and HafenCity



Concept no. 2
Uses of the Speicherstadt without integration into the flood protection systems of the city centre and HafenCity

4. Flood protection

4.1 Current Situation

The Speicherstadt lies outside the public main dyke system. It is situated between the city centre, which is protected by a system of flood defences, and the HafenCity, which is built on plinths that raise it above the reference water level.

For the Speicherstadt as a whole there is currently no comprehensive system of flood defences, e.g. in the form of a closed network of dykes. Some warehouses are protected by individual flood defences (Objektschutz). The Speicherstadt lies between 4.50 m and 5.50 m above sea level (NN = tidal reference level), i.e. considerably lower than the reference mean water level of 7.30 m above sea level, to which an additional margin has to be added for waves.

The buildings in the Speicherstadt have in fact been flooded repeatedly over the years. However, this eventuality was anticipated when the concept of mixed office, storage and other industrial uses was drawn up.

4.2 Engineering and Technical Flood Defences

Several arguments can be put forward in support of integrating the Speicherstadt into the systems of flood protection that exist in the city centre and the HafenCity:

- It will only be possible to convert large parts of the Speicherstadt for residential or hotel use if the entire ensemble is protected against flooding. Already, there are restrictions on non-residential activities because of insufficient flood protection. Occupants and users have to live with a situation where they cannot access buildings during flooding and where the inundation of basements and ground floors is a regular occurrence. This means that it is difficult to successfully market parts of the Speicherstadt.
- Repeated flooding is causing damage to the fabric of the buildings, which could be avoided through comprehensive flood defences.
- There are plans to preserve parts of the existing halls in the Oberhafenquartier (upper port area) of the HafenCity and to convert them to new uses. These halls are built at a level which makes them vulnerable to potential flooding. A comprehensive line of flood defences encompassing the Speicherstadt and the HafenCity would protect that area, and make it possible to keep the halls and use them without any restrictions.



Figure 13: Main dyke line and area at risk of flooding

- The north-south transport axes providing access to the HafenCity would still be passable during floods and unrestricted mobility could be guaranteed. Rescue vehicles could reach the Speicherstadt and the HafenCity more easily during floods.
- Open spaces in the Speicherstadt would be protected against flooding. This would remove the need for evacuation plans and clean-up operations.

In engineering terms, then, the first task is to establish an uninterrupted flood defence line that meets the various requirements with regard to water loads and safety precautions. One way of achieving this would be to link up the plinths (Warften) in the HafenCity using flood protection walls and gates to form a new flood defence line, which would in turn connect up to the existing public main dyke system where appropriate, thereby forming a closed system of flood defences for the entire Speicherstadt. Flood protection measures will have to be implemented in such a way that they do not detract from the historic design of the Speicherstadt. In particular, the marked contrast between older and more recent buildings in the Speicherstadt must not be exacerbated by an extended and more sophisticated system of flood defences.

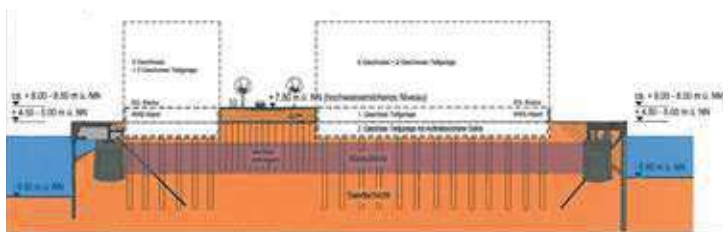


Figure 14: The plinths in the HafenCity

The fundamental flood protection solution employed in the HafenCity is the construction of plinths i.e. the raising of the ground to above sea level (tidal reference level for floods). The current system of flood protection in Hamburg means that the Speicherstadt is flooded in storm surges. Using the system of plinths in the HafenCity and by connecting the Speicherstadt to the main dykes in the Niederhafen (lower port area), it would be possible to establish an uninterrupted flood defence line encompassing the Kehrwiederfleet waterway, Sandtorkai, the Grosser Grasbrook, Strandkai, Magedburger Hafen, Versmannstrasse, Oberhafen / Billhafen and the entire embankment of the B4/75 national road. Since 1998, several studies have looked at possible locations for a flood defence line for the Speicherstadt. They are all based on the idea of closing the gap between the existing flood protection system of the city centre and the plinths of the HafenCity.

In the meantime, recent construction and development in the HafenCity and in the western part of the Speicherstadt up to Kehrwiedersteg have produced a slightly different situation.

Barrages and locks exist to cross over canals. Path and street intersections are being equipped with flood gates and other infrastructure cable and line crossings are being secured by sliding gates. Some parts of the flood defence line have already been completed, e.g. the pedestal buildings on Am Sandtorkai and the connection of Grosser Grasbrook with the planned Überseequartier behind Strandkai, the level of which will also be raised. Shanghai-allee, complete with its connection to the raised Versmannstrasse – Baakenbrücke has also been finished. The full length of Versmannstrasse will be raised to a flood-safe level. The Deutsche Bahn railway line has been constructed as a cofferdam inserted between sheet piling retaining walls.

4.3 Position of the Flood Defence Line

The present study assumes that the Speicherstadt will be connected to the main dyke at the Kajen-to-Nicolai barrage. The planned flood defence line will run along Kehrwiedersteg thereby leaving Kehrwiederspitze, the area of the Alsterfleet waterway with the pumping station, and the locks at Schaartor outside the flood-protection zone.

In the Binnenhafen there will be a barrage or lock, with a clearance width of 40 m. There are two possible locations for this structure, namely either to the east of the Nikolai barrage or along the Deichstrasse axis. In both cases, a connection with the public dyke line would be established and both alternatives provide for a walkway over the construction. On the Kehrwiederfleet waterway, there will be a barrage or lock with a clearance width of 18 m. The embankment along the streets of Kehrwieder to Brook will be reinforced and upgraded in accordance with the provisions on public flood protection systems, the levels of protection being 7.50 m above sea level (NN = tidal reference level) plus an additional freeboard for storm floods with high



Figure 16: Barrage at Billwerder Bucht

waves. This freeboard will be provided in defined windward areas.

On land, the planned flood protection wall will run along the western side of Kehrwiedersteg, crossing the two streets Kehrwieder and Am Sandtorkai. These cable and line crossings will be equipped with sliding gates or they will need to be protected by flexible sliding valve constructions. A major engineering and construction project will be required

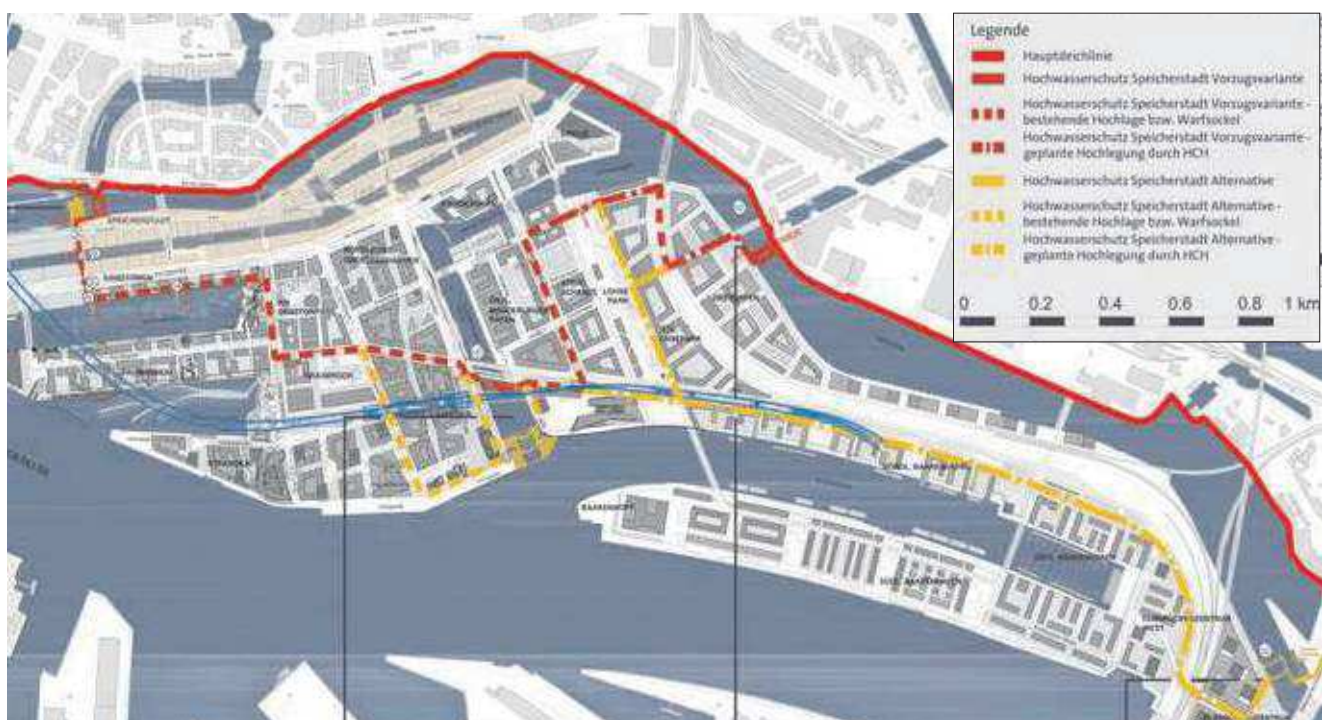


Figure 15: Comprehensive line of flood defences, extract from the report by the engineering firm Körting (2008)

at the crossing on Am Sandtorkai where the main sewer (Kuhmühlenstammsiel) was recently rehabilitated. Because of the misalignment of the flood protection wall between the two lanes of traffic, there will have to be separate sliding gates in the central reservation. The protection wall will connect up with the pedestal buildings on Am Sandtorkai, which are equipped for future flood defence systems. For the cross-over points to the Sandtorkai promenade, flood gates will have to be built on Kehrwiedersteg and its continuation, Brooksbrücke, up to Auf dem Sande. Around the Kibbelstegbrücke the pedestal buildings will connect up with the new street of Grosser Grasbrook by way of a wall that extends into the plinths at the back of the Sandtorhafen and Grasbrookhafen port basins. Grosser Grasbrook extends all the way to the raised area of the cruise terminal on Am Strandkai and thus provides a connection with the Überseequartier district along the Magdeburger Hafen basin.

An obvious solution for the crossing of the 80 m wide basin of Magdeburger Hafen would be to build a dam plus barrage or a lock south of the Baakenbrücken with a clearance width of 30 m. This would be built either adjoining the Baakenbrücken or further away, as a separate bridge with its own walkway. From there, the flood defence line will link up with Versmannstrasse, the level of which will be raised along its entire length.

The most ambitious solution would be to have the flood defence line extend all the way to Zweibrückenstrasse. Further down, this street crosses underneath the Hamburg-Hanover railway line and the overground S 3 line towards Hammerbrook (S 3 from Pinneberg to Stade). The level of the area north of Zweibrückenstrasse will be raised where the Elbbrückenzenrum is to be built. Since the railway line will be at a higher level, ensuring that the railway crossing is flood-safe, the flood defence line can be brought right down to the Oberhafenkanal without the need for barrier gates (Gatlösungen).

However, were a low-lying riverbank promenade to be included in the plans, this would have to be equipped with a flood gate. The final link would be provided by a barrage across the Oberhafenkanal in front of Billhorner Brückenstrasse and on its western bank, which would link the flood protection wall up with Brandshofer Deich (dyke).

A smaller-scale solution would be to have the flood defence line run from Baakenbrücken via Shanghaiallee to Koreastrasse and its continuation, Stockmeierstrasse, and then via Lohsepark to the railway embankment that links up with the Oberhafen. From there, the flood defence line could continue via a barrage to the west of Hammerbrookschleuse lock, where the wall coming from the Speicherstadt would again link up with the main regional dyke (Landeshauptdeich). The 'big solution' described above would result in a flood defence line with a total length of 3.5 km; the smaller one would measure approx. 2.6 km. The big solution offers the advantage of also protecting the Oberhafenquartier district of the HafenCity, which would make it possible to preserve the existing halls and put them to new uses without any restrictions due to flood protection considerations.

The HafenCity measures are presented here as a choice between two main alternatives. Before a final decision is made, further detailed studies will be required, in the course of which minor modifications might become necessary.

4.5 Legal Framework

The Hamburg Water Management Act (Hamburgisches Wassergesetz, HWaG) regulates all interventions and measures regarding flood defence systems and their maintenance.

In accordance with Paragraphs 48 and 55 of the Hamburg Water Management Act, the establishment of a flood defence line including the barrages and flood gates described above requires approval by the competent authority.

When implementing a flood defence line to protect the Speicherstadt, the general technical rules on public flood protection systems will obviously apply, and issues of heritage protection will have to be taken into account. In addition, to ensure the feasibility of a public flood protection system for the Speicherstadt, a general legal framework needs to be defined. If all these preconditions are met, it seems conceivable to build a public flood defence line around the Speicherstadt.

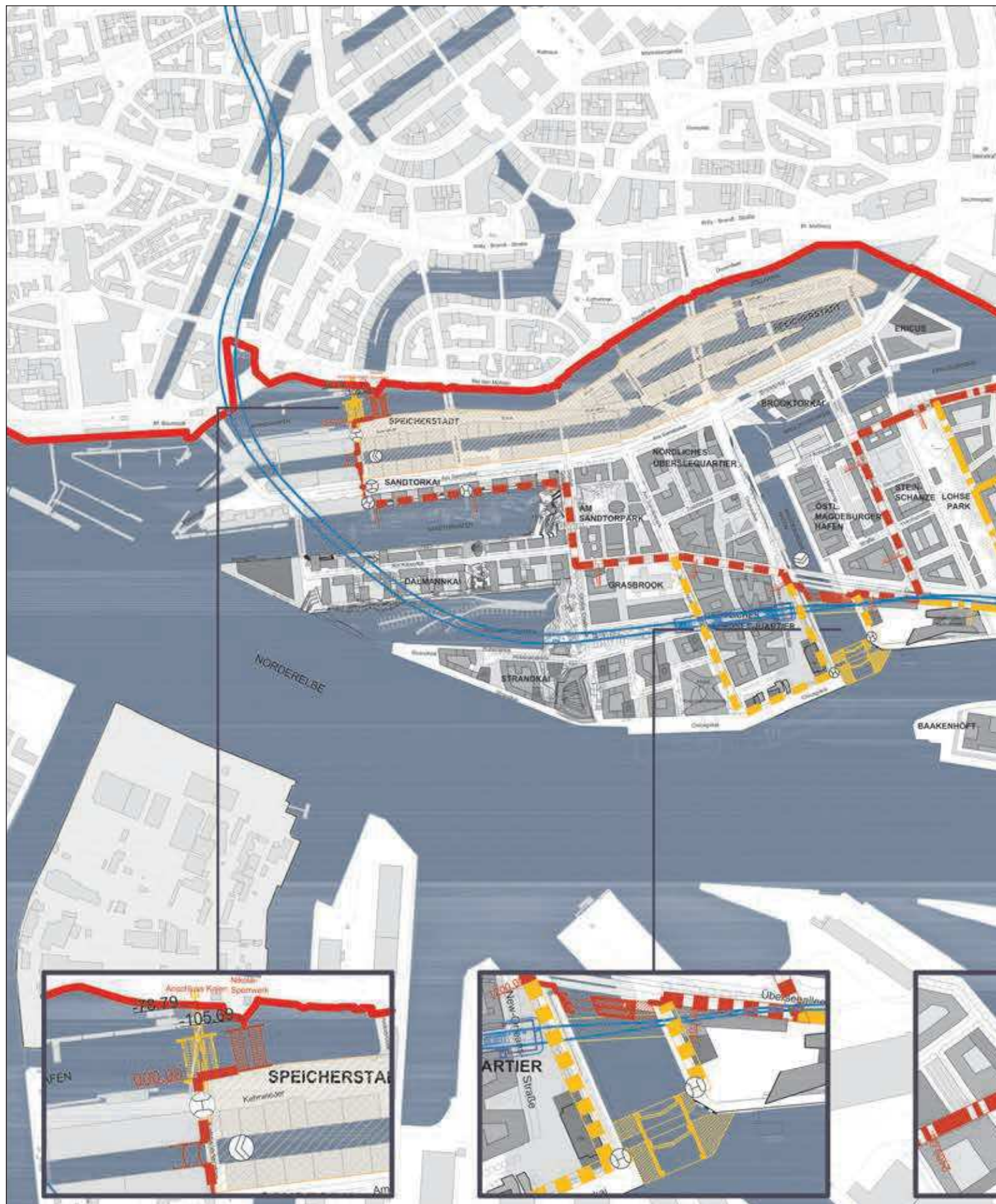
4.6 Conclusions

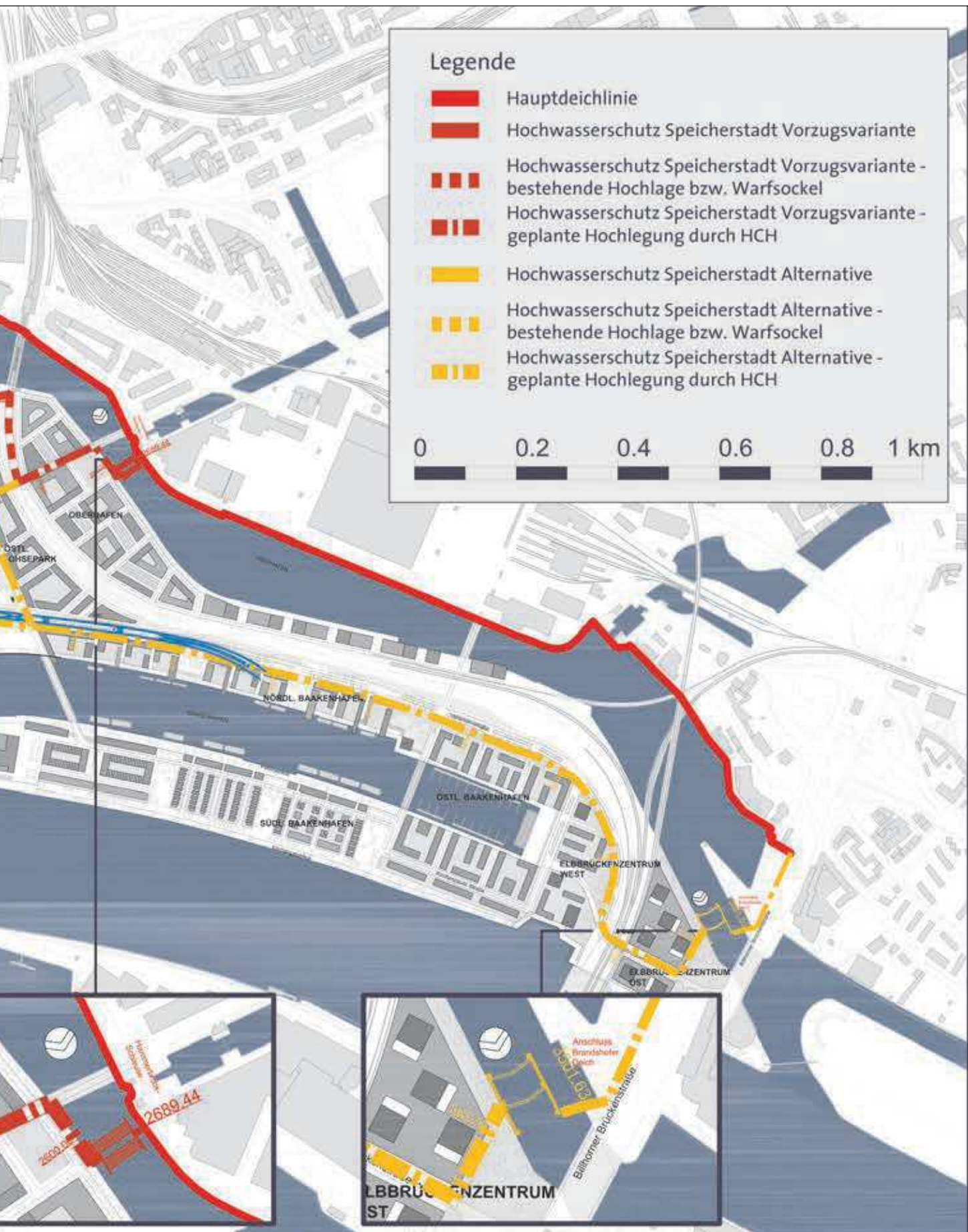
It is technically possible to establish a flood protection system for the Speicherstadt if the plinths of the HafenCity are combined with supplementary flood protection constructions linking existing defences with the main regional dyke. The approximate investment required to create such a system has been estimated at approx. EUR 126 million. To this must be added annual maintenance and operational costs, which at this stage cannot be quantified.

The study drafted by the company Körting and presented in this text sought initially to demonstrate the technical and financial feasibility of creating a comprehensive flood protection system for the Speicherstadt. However, before a decision on the implementation of the concept described here can be taken, further detailed studies will be necessary.



Figure 17: Overview of the proposed flood protection system – report by the engineering firm Körting (2008)





5. Quay Walls and Low Tide Protection

5.1 The Quay Walls under the Warehouses

Some 120 years after they were constructed, the quay walls of the Speicherstadt are now showing a degree of wear and tear. This is evident both at the water's edge and in the warehouse buildings themselves, particularly in their basements. In 2008, the HHLA commissioned the engineering company Kramer & Albrecht to assess the structural safety of the quay walls underneath the warehouses. A sample of five sections of quay wall were singled out for the study.

The structural safety assessment found cracks at regular intervals in the fire walls and outer walls in the warehouse basements. The experts conclude that because of increased water pressure the damaged quay walls will in the future not be capable of fulfilling their function. Structural assessments and calculations have shown that the quay walls of four of the blocks studied can no longer be regarded as

structurally safe. The quay wall of the fifth block is considered only just adequate. In the view of the experts there can be no doubt that all the quay walls will need to be rehabilitated. They also insist that more detailed follow-up studies be carried out to analyse the foundation pile heads. They believe that the heads have probably become exposed (cf. also chapter 5.3) and that the piles have started to rot, weakening the pile heads.

In recent years there has been an increase in the damage reported to the basement walls of several warehouse blocks on the waterway side. This consists of cracks at regular intervals in the fire walls and outer walls of the warehouse basements. Also, the ground underneath the foundation slabs has subsided as a result of sand being washed out from between the wooden piling walls, which have become vulnerable to leaks. This means that the foundation slabs, some of which are not reinforced, are no longer able to support their loads.

The report proposes the following alternative measures:

- Re-anchoring the quay walls,
- Erecting sheet piling walls,
- Ensuring constant water levels at low tide

The second alternative would raise serious issues about the historic design of the Speicherstadt and cannot be reconciled with the requirements of heritage protection. It must therefore be ruled out. The total cost of the measures is put at EUR 24.6 million plus VAT. This includes the rehabilitation of foundation slabs, walls and barge mooring facilities as well as measures to prevent more sand washing out from behind the quay walls.

In 2008, on behalf of the Free and Hanseatic City of Hamburg, the Regional Ministry for Finance (Finanzbehörde), which is the sole owner of the Speicherstadt properties, commissioned the engineering

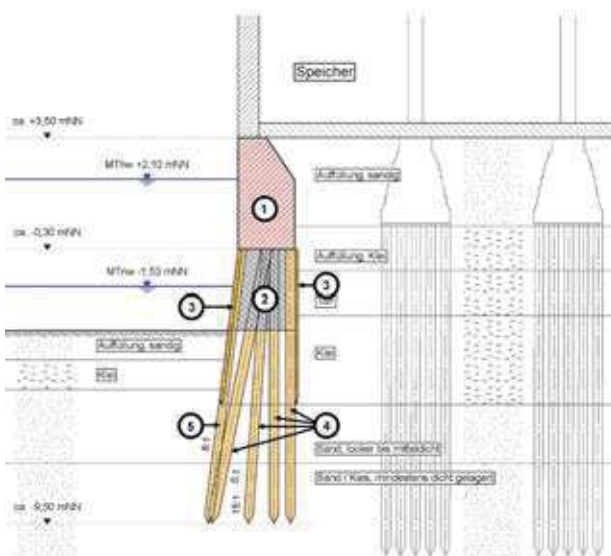


Figure 18: The structure of the quay walls
 1 Brick wall section
 2 Buffer layer (consisting of medium-sized stones and sand)
 3 Wood piling skirt on both land and water side
 4 Rows of round wood piles on land side
 5 Row of wood piles on water side

firm WK Consult to carry out a more detailed and exhaustive study on the structural safety of the quay walls. WK Consult inspected the quay walls from both the land and the water. Individual warehouses were selected and sample measurements taken of water levels and cracks. Evidence in the form of calculations was not included in the study.



Figure 19: Quay walls underneath warehouse blocks D and L

Using the guidelines entitled “A Classification Matrix of Damage in Water Transport Infrastructure” (Schadensklassifizierung an Verkehrswasserbauwerken) WK Consult analysed the damage and saw no immediate need for action. On the waterway side, they found damage mostly in the form of weathered and chipped walls, missing sections of brickwork and cracks in the outside of walls. Because of the limited extent of the damage, WK Consult consider that at present only certain sections of the quay walls are at risk.

On land, the inspection uncovered above-average and severe damage in warehouse blocks G, L, P, S and W. The damage found indicates that quay walls are being deformed by changing tidal water levels and are therefore developing separation cracks.

As regards the wooden foundation piles of the quay walls, the report found some instances of material being washed out from between and under the piles, as well as from the dams. The experts consider that such wash-outs will not have any impact on the structural safety of the quay walls themselves, but that they might affect the structural safety of the warehouse blocks resting on them, as well as the latter’s fitness for use. They believe it is possible that in the long term earth could be washed out from underneath the warehouse basements, which could lead to subsidence. The experts propose to backfill the problem areas in order to prevent the loss of earth. In the context of such rehabilitation work, the wooden pile heads, whose condition was not part of the present study, could also be analysed. The additional data gathered could provide the basis for additional measures which might be necessary in this area.

After mapping the damage on the waterway side and the land side, two different categories of severity and quantity of damage were defined by the experts. For the areas of medium-severe damage the experts recommend rehabilitation in the medium term (3 to 5 years), while for those with low damage levels they consider that rehabilitation can be done over 10 to 15 years.

Careful examination of the crack measurements revealed a clear correlation between tidal range and the width of cracks. A comparison of the crack widths with the variation in water levels measured shows that cracks tend to widen and narrow depending on the tide. This is probably due to changes in the tidal range of the Elbe river in the course of the last century. The increase in tidal range has led to excessive hydrostatic pressure on the quay walls. The experts recommend that the quay walls in both of the areas defined above be retrofitted with new transverse micro-piles. This would both minimise tide-dependent deformation and reduce the horizontal load (resulting from increased hydrostatic pres-

sure) and would at the same time remove some of the load from the wooden foundation piles. Such retrofitting of additional anchors would neither affect the permeability of the construction nor detract from the overall appearance of the Speicherstadt.

The engineering firm WK Consult puts the cost at approximately EUR 2.3 million net for the medium-term rehabilitation measures and a total of EUR 4.7 million net for the long-term measures.

As the two reports which have been commissioned have in part produced different results, a definitive rehabilitation concept has yet to be agreed.

5.2 Other Quay Walls along Streets

Because of their age, the quays of the Speicherstadt generally require a great deal of maintenance work, mainly repairs to the brickwork.

It is the Hamburg Port Authority (HPA) which is responsible for repair and maintenance work on the embankments of the Speicherstadt. The authority inspects the walls at regular intervals.

The need for large-scale maintenance or comprehensive rehabilitation measures is usually evidenced by walls becoming significantly deformed or larger cracks appearing. In these cases, whole sections of wall are inspected, measurements taken and the damage documented. The results are then translated into measures such as the ones currently being implemented along the Customs Canal where a 140 m-stretch of the wall is undergoing comprehensive rehabilitation. Similarly, in the spring of 2008, 40 m of quay wall along the Customs Canal were fitted with additional anchors. For the time being, there seems to be no further need for urgent maintenance work in the Speicherstadt.

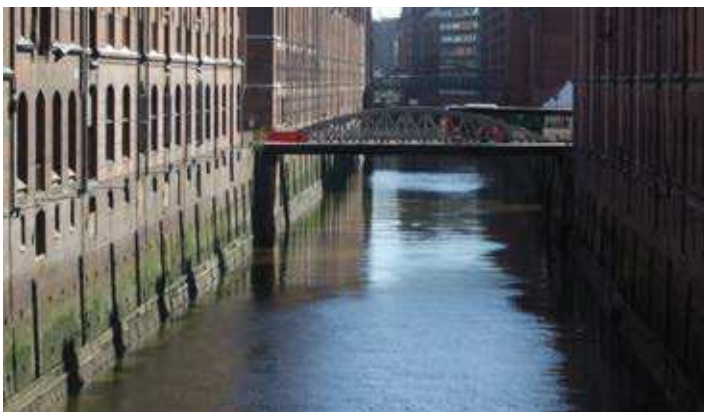


Figure 20: Kaimauern unter den Speicherblöcken D und L



Figure 21: Quays along the Customs Canal

5.3 Protection at Low Tide

Over recent decades, the tidal range in the port of Hamburg has constantly increased. As a result, the mean low-water level (mittleres Tidenniedrigwasser, MTnW) has fallen to the level of the wooden foundation piles. At the time these piles were driven, their heads were designed to be 0.50 m below sea level (tidal reference level), which was the mean low water level at the end of the nineteenth century. This ensured that the piles were permanently immersed and thereby protected from rot. The mean low-water level has in the meantime fallen to approximately 1.60 m below sea level which means that the pile heads are dry twice daily for several hours at a time. This can cause the pile heads to become damaged. Already, in the case of warehouse block Q a significant reduction in the structurally effective diameter of the wooden piles has been detected.

In 2009, HHLA commissioned a study in which the engineering firm Körting was asked to look at protection measures against wear and tear from low water levels. In their report, the engineers conclude that raising the low-tide level to at least the tidal reference level (sea level) would be effective in reducing the wear and tear on the load-bearing foundations.

The feasibility study describes five alternative scenarios. Common to all of them is the idea of

building so-called permanent weirs (feste Wehrschwellen), which would keep the water level in the Brooksfleet, Kleines Fleet, Wandrahmsfleet, St. Annenfleet and Holländisch Brooksfleet waterways at the desired minimum level. The alternatives look at possible locations for these permanent weirs and the possibility of some of the weirs being moveable, which would allow ships to sail through the Speicherstadt during the same tidal slots as today. One alternative provides for bottom outlets in the form of stop logs (Damm balkenverschlüsse), which would make it possible to clean port basins. The investment for the solutions described would be between EUR 1.15 and 3.2 million (plus VAT).

Another way of ensuring minimum low-tide water levels for the Speicherstadt would be to combine this objective with the planned flood protection system. Barrages could be replaced by locks (in the same locations). In the case of the Oberhafen area, it would even be conceivable to build a barrage that stays closed most of the time while the other three barrages would be replaced by locks which could be opened for the passage of port ferries and tourist boats. Locks and barrages require similar amounts of investment. However, the former take up a lot more space, making it more difficult to integrate them into city development plans. Furthermore, locks occasion considerable operational costs, because of processing vessels passing through them.

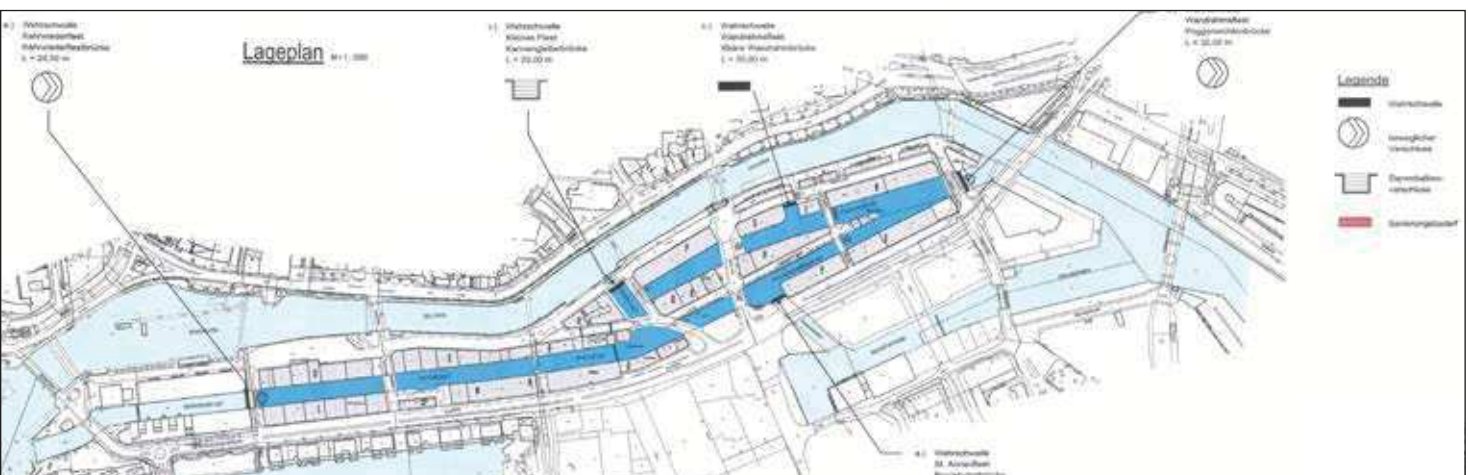


Figure 22: Low-tide protection including moveable weirs and stop logs; source: report by the engineering firm Körting, November 2009

6. Traffic

6.1 Access to and Transport Development within the Speicherstadt

For more than a hundred years the movements of vehicles, vessels and pedestrians in the district were exclusively geared towards the port-related uses of the Speicherstadt, with traffic typically either originating or terminating there (Ziel- und Quellverkehr). The only exceptions were the two traffic axes Sandtorkai/Brooktorkai and Bei St. Annen, where there was through-traffic connecting the Speicherstadt via the Freihafenbrücke to the southern parts of the port and to Harburg.

The relaxation of the special rules applying to the free port and their recent abolition have meant that the traffic situation in the Speicherstadt has changed. While most routes still originate or terminate in the Speicherstadt, the following factors have led to a change in traffic flows, primarily along the axes mentioned:

- Traffic heading towards the southern part of the Hamburg metropolis has increased, avoiding the bridges across the River Elbe,
- The building of the Köhlbrandbrücke has shifted traffic towards the southern parts of the port and the A7 motorway, away from both the modern and the old Elbe tunnel,
- New traffic flows have been generated by the building of the HafenCity.

In addition to this, the number of pedestrians and cyclists in the Speicherstadt has risen considerably, as a result of more tourists being attracted to it, because of the new activities in the Speicherstadt and in connection with the building of the HafenCity.

The developments described mean that new demands are being placed on the roads and streets in the Speicherstadt, which has not seen any major changes to its transport infrastructure for over a hundred years. In the context of the HafenCity development, a traffic study was carried out which also encompasses the Speicherstadt. This so-called "Scenario 2025" forms the basis for all road infrastructure planning in the Speicherstadt and the HafenCity. Most of the east-west traffic is channelled along the four-lane main roads Am Sandtorkai and Brooktorkai south of the Speicherstadt so that the latter is spared all through-traffic.

The current traffic concept provides for a total of four connection points with the districts to the north of the Customs Canal:

- Niederbaumbrücken / Am Sandtorkai
- Brooksbrücke / Auf dem Sande
- Kornhausbrücke / Bei St. Annen
- Oberbaumbrücke / Brooktorkai



Figure 23: Traffic in and through the Speicherstadt

The no. 10 cycle route, which connects the city centre with the HafenCity, Wilhelmsburg, Harburg and Neugraben, runs through the Speicherstadt along the following streets: Bergstrasse, Domplatz, Brandstwierte, Bei St. Annen and Osakaallee. In the future, the River Elbe Long Distance Cycle Path will also run through the Speicherstadt (cf. chapter 6.2).

It emerged early on in the process of drawing up the master plan for the HafenCity that the Jungfernstieg – Domplatz – Brandstwierte – Bei St. Annen route is important for pedestrians visiting the Speicherstadt or the HafenCity. Wherever possible, north-south traffic flows will be organised in such a way as to respect the existing fabric of the streets and the internal structures of the Speicherstadt ensemble as a whole. Since the existing bridges cannot be widened, it was decided to limit the number of cars and vehicles crossing St. Annen / Kornhausbrücke. If all the vehicles currently using this

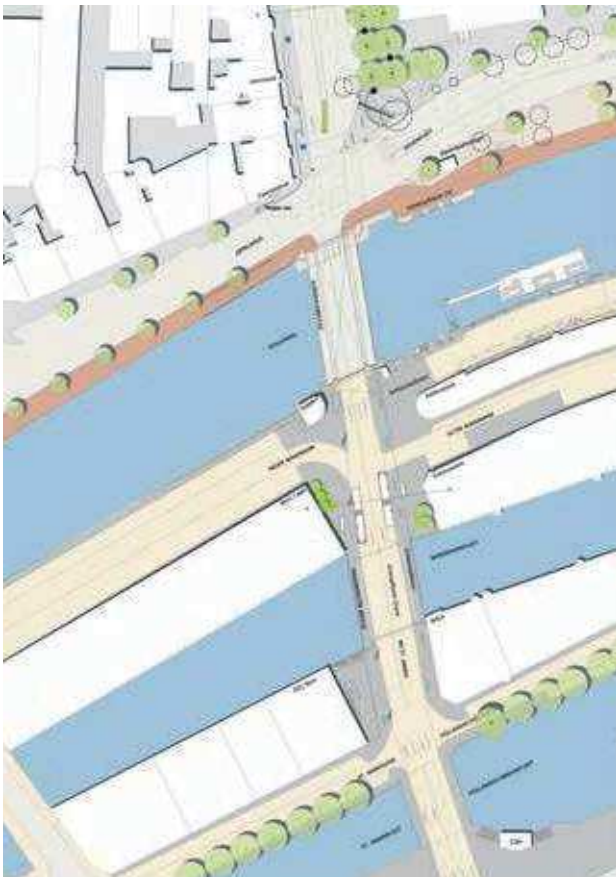


Figure 24: Open space planning at Bei St. Annen; architects: LRW

bridge were diverted to the bridges to the east and west of St. Annen / Kornhausbrücke, this would reduce the daily traffic over the latter to some 19,000 to 20,000 journeys. An integrated traffic and open space plan (Integrierte Verkehrs- und Freiraumplanung) has been drawn up which covers this entire area. The plan is currently being implemented.

To improve the connection for pedestrians from Baumwall underground station to the HafenCity, the Senate approved a plan in 2009 with the following main components:



Figure 25: Pedestrian access to the Elbphilharmonie (Philharmonic Hall on the Elbe), architects: Herzog & deMeuron

Addition of another exit stairway from the mezzanine level of the eastern access to Baumwall underground station,

- Introduction of a consistent guidance system channelling pedestrian flows to the western footpath between Baumwall and Am Sandtorkai,
- Implementation of a new lighting design,
- Widening of the footpath to 5 m as far as the Sandtorhafenklappbrücke (moveable bridge at Sandtorhafen) and a consistent and recognizable design on this route.
- Adjustment of the level of the Sandtorhafenklappbrücke .

Figure 26: Draft Public Transport Concept for the Speicherstadt and the HafenCity;
source: HafenCity Hamburg GmbH, 2012



Measures

A traffic plan has been proposed for the Speicherstadt, which will be implemented in several phases. The traffic forecasts used for this plan are based on the reference year 2025 and will only materialise as the HafenCity development progresses. In the meantime, it is safe to assume that there will be less traffic, so that measures to reduce traffic and its impact can be implemented gradually until then. The following factors may contribute to reaching this goal if and when they are accompanied by reliable traffic studies:

- Improving access to the eastern part of the HafenCity and the Kleiner Grasbrook in the medium term by building an overground or underground line.
- Am Sandtorkai, Brooktorkai and Bei S. Annen should remain main roads with a 50 km/h speed limit. For all other streets and roads in the Speicherstadt analyses are being carried out to

establish whether it is possible to designate all of them as 20 km/h zones.

- The number of heavy goods vehicles in both the Speicherstadt and the HafenCity should be reviewed to see whether it can be reduced.
- Due to their need for large-radius curves, heavy goods vehicles will continue to be handled by Pickhuben street.
- The following street intersections will be modified: Willy-Brandt-Strasse-Brandstwierte, Ludwig-Erhard-Strasse-Mattentwiete, Baumwall-Niederbaumbrücke and Kajen-Hohe Brücke-Kehrwiederbrücke.
- A new bridge will be built from Versmannstrasse via Grossmarktgelände (wholesale market) linking up with Amsinckstrasse, thus diverting part of the through-traffic generated by the building of the eastern section of the HafenCity away from the HafenCity and the Speicherstadt.

6.2 Developing the Road Infrastructure Inside the Speicherstadt: Parking, Loading and Unloading, Pedestrians and Cyclists

Throughout the Speicherstadt the transport infrastructure recalls the type of traffic that was typical of the decades when it was built, i.e. at the turn of the last century. To this day, the harmony of the architecture and the open spaces bear witness to the traffic of the time, which was characterised by horse-drawn drays, porters, the harbour railway and the barges on the waterways.

Since it is being turned into a city centre district, the Speicherstadt will have to adjust: Already, the changes which have taken place in the district are putting pressure on the existing city infrastructure. In some areas, the roads are no longer able to cope with the traffic and road safety cannot be guaranteed. In other places, there are no footpaths and there is no clear distinction between public and private spaces (öffentliche Erschließungsflächen und privat genutzte Flächen). Some public spaces give the impression of having remained largely unchanged since the days when the Speicherstadt was used solely as a warehouse district. This may not always correspond entirely to people's expectations of an area close to the city centre, but it is part of what makes the Speicherstadt special, which is why its authenticity needs to be preserved. In creating new areas for public recreation (Aufenthaltsräume) and adapting street infrastructure to bring it into line with current legislation, therefore, the original fabric of the streets and the historic building materials must be preserved. The parking bays and loading and unloading zones next to warehouse buildings are evidence of their historical function. Heritage protection requires these spaces to be preserved.

In front of the warehouse buildings there are strips of cobble setts, which are raised above the surrounding area by the thickness of one layer of cobble setts. They were not meant to serve as a footpath, although people now use them as such. These strips, which have a consistent width of some 1.5 m, had several functions: They served as



Figure 27: Strip of cobble setts in front of the warehouse buildings

areas where goods could be temporarily parked while awaiting further transport; they protected the façades of the warehouses from damage due to collisions with drays; they marked and continue to mark the areas under the winches from where the goods would be hoisted to the respective storeys of the warehouse, and they house the staircases to the basements (and additional goods lifts) and emergency exits. These cobbled strips have always been characteristic of the Speicherstadt and will be preserved.

In the Speicherstadt the individual buildings on each side of the streets are not directly opposite each other (unlike those facing the waterway). As described in the preceding paragraph, in front of each façade there is a slightly elevated functional strip or, on the opposite side of the street, a footpath. This is the case e.g. in front of the Handelshaus (House of Commerce and Trade) and the Sandtorquaihof (the Sandtorquai Office Block) on Pickhuben and also in front of the former customs administration buildings on Alter Wandrahm. Where possible, these pavements will be widened. In particular, it is planned to create pavements of an appropriate width along the promenades on the quay walls (from Binnenhafen to Zollkanal and from St. Annenufer to Holländischer Brook).

The loading and unloading zones are also testimony to the historical logistic activities in the Speicherstadt and will be preserved as they are. Depending on how the adjoining buildings are used, they could serve as loading and unloading zones or as parking.

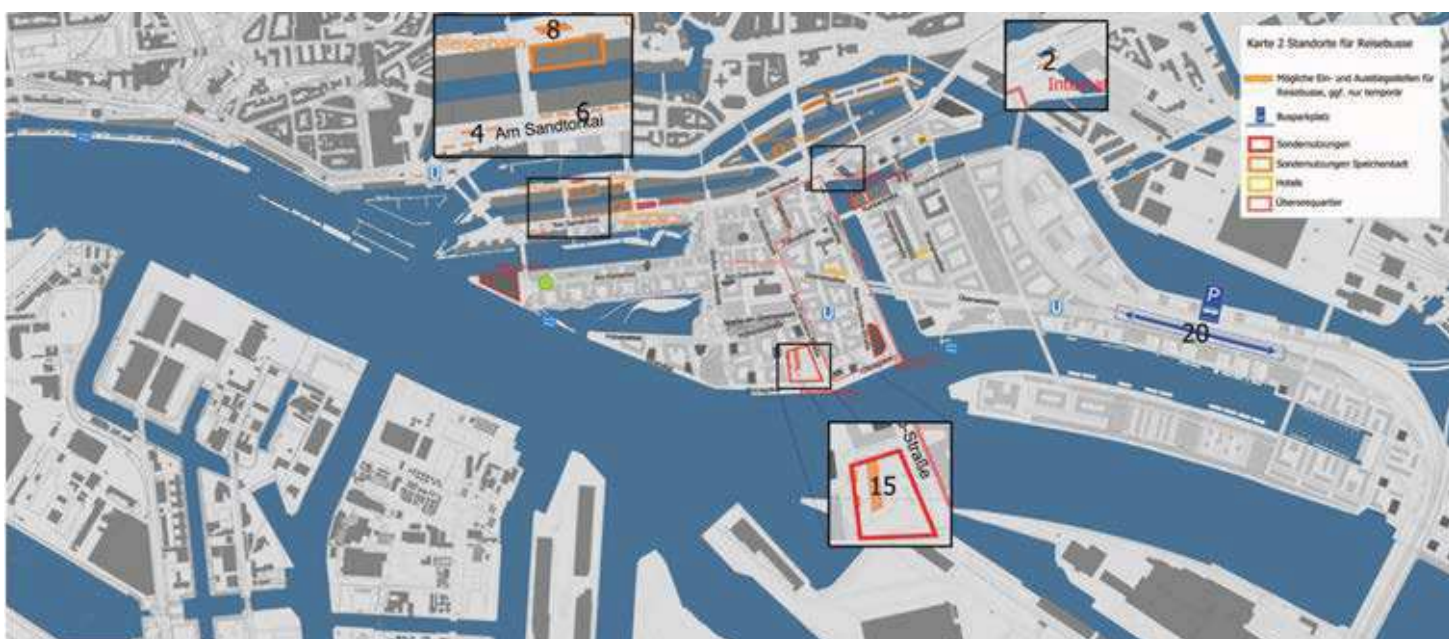
The authorities will look at the feasibility of converting the Speicherstadt into a traffic-calmed district with a general speed limit of 20 km/h, with the exception of the main roads. This would further enhance the attractiveness and quality of the Speicherstadt and its many open spaces for pedestrians and cyclists and preserve its multi-functional character. Parking will only be permitted in designated areas. It will be permitted to pull up on loading and unloading strips to get into and out of cars and, of course, for loading and unloading. In order to avoid cluttering the Speicherstadt with traffic signs, it is planned to position the notices prohibiting parking and indicating maximum speed at the points of entry to the Speicherstadt.

Cyclists will use the roads alongside other vehicles. The introduction of a general speed limit of 20 km/h should make this a feasible proposition. The only

cycle lanes will be Am Sandtorkai – Brooktorkai and the River Elbe Long Distance Cycle Path. The latter will eventually run along Binnenhafen and the Customs Canal, i.e. through the Speicherstadt. In the immediate vicinity of the Customs Museum, the space in front of buildings will be reserved for the purposes of the museum. A decision will have to be taken about whether to allow the cycle path to pass through that area or whether to divert it via Alter Wandrahm. On the remaining streets, any repairs to the road surface should ensure that the edges are constructed from large, smooth cobble sets, for the increased comfort of cyclists.

The amount of parking space available in the Speicherstadt will always be very limited. In other words, it will not be possible to meet increased demand for parking within this inner-city district as a result of the increased activities there. The new multi-storey car park in block O provides public parking space for 250 cars.

Coaches will be allowed to enter the Speicherstadt, but because of the lack of space there will not be any parking facilities for them.



Car drop-off bays will have to be considered separately – one possibility would be to use the parking strips on Am Sandtorkai and the areas on Kehrwieder opposite warehouse block D for this purpose. Currently, the parking facilities at Kehrwieder, more particularly between Auf dem Sande and Kehrwiedersteg, look a little disorderly. This area has

become cluttered with various pieces of temporary traffic guidance equipment and clearly needs redesigning.

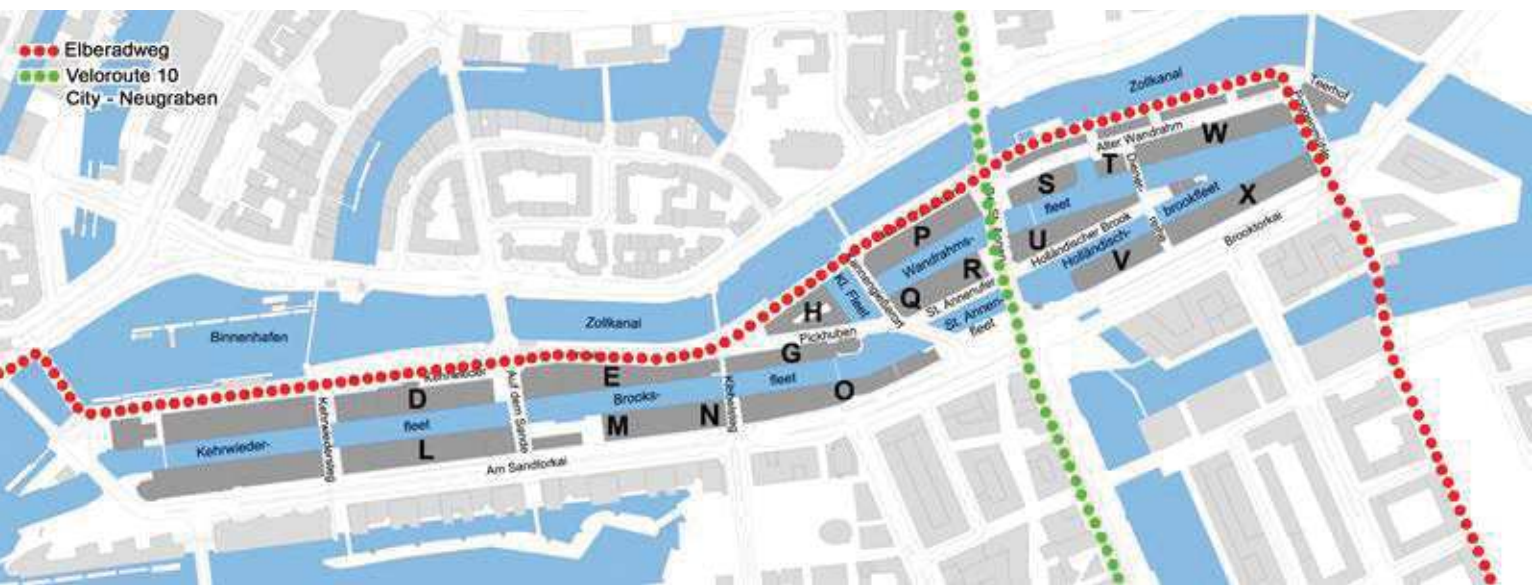


Figure 28: Future route of the River Elbe Long Distance Cycle Path and the existing no. 10 cycle route in the Speicherstadt

Figure 29: Parking spaces for coaches in the Speicherstadt and the HafenCity; draft by HCH GmbH, November 2007

6.3 Design of Roads, Footpaths and Parking Spaces

Viewed from afar, the Speicherstadt's most distinctive feature is the long stretches of warehouse and office buildings. They characterise the design of the overall ensemble. It is the clarity of the architectural language employed by its builders that makes the Speicherstadt so very special and valuable in cultural and historical terms. The integrity, fabric and homogeneity of this ensemble must also be preserved in the future. This means that the entire streetscape must be treated as a single entity. As for the materials used, cobble setts predominate between the warehouse façades and the waterways, and between opposite façades.

The character of the district must not be impaired by the erection of permanent structures, the addition of exaggerated street furniture, signposting, advertising hoardings or vegetation. Any design elements used in the open spaces of the Speicherstadt must therefore be plain and functional. They must not compete with the typical design patterns of the buildings or with other parts of the historic fabric of the Speicherstadt which are worthy of preservation, such as the bridges, bridge railings and the like.

The roads, parking areas and footpaths must be demarcated by the design itself, so as to render the use of traffic signs and bollards almost superfluous.

- The dividing line between the road and the parking strip/delivery zone, i.e. between public and private areas, will be marked by a double row of lower-lying cobble setts that serve as a pavement drainage channel.
- Kerbstones will rise 7 to 8 cm above the road and parking strip, thus marking the edge of the footpath. Next to the pavement there will be a double row of cobble setts, forming a pavement drainage channel.
- Road markings must consist of steel road studs. There will be no white or coloured lines on road surfaces.

- Footpaths and cycle lanes on the Binnenhafen/ Customs Canal will be identified by differently coloured copper slag stones.
- Other design alternatives may be considered if they improve the usability of streets, roads and paths for all modes of transport including pedestrians and at the same time minimise modification of existing surfaces.

Basement Hatches

Basement hatches are positioned within the 1.5-m wide cobble setts strip in front of the warehouses. The edges of hatch openings must be made of stone. Even if hatches are no longer used for their original purpose, they must still be recognizable. It will be prohibited to cover former hatches with concrete.



Figure 30: Sealing of a basement hatch with concrete

Figure 31: Operational basement hatch

6.4 Road Materials

Predominance of Stone

Stone dominates the streetscape in the Speicherstadt and must continue to do so. In areas where previous rehabilitation measures have employed other materials, those areas must be restored.

Materials and Shapes

The original road and pavement surfaces made of granite and copper slag stones must be preserved as historical testimony. This is stipulated by the Ordinance on the Design of the Speicherstadt. Any repairs and new paving must use the same materials. The direction in which cobble setts are laid indicates their function: They are positioned perpendicular to the direction of movement of pedestrians and vehicles. Should insufficient copper slag stones be available on the market, concrete blocks (Betonsteine) with a copper slag coating (or Hamburg port cobble setts) may be used instead.

Kerbstones

Broad, smooth granite kerbstones (also known as "Hamburg edgestone", Hamburger Kante) with an adjoining drainage channel made up of a double row of cobble setts, are a common sight in the Speicherstadt. With their 7 to 8 cm-high edge, they will also continue to be a feature of the street environment in the Speicherstadt in the future.

Exemptions

The following exemptions will apply to materials and the positioning of cobble setts:

- At St. Annenufer and Holländischer Brook, where permeable surfaces will also be permitted.
- At the southern border of the heritage protection site, where the road surfaces of Am Sandtorkai and Brooktorkai are tarmacked.
- St. Annen square will incorporate some elements of open space planning and materials taken from the Boulevard of the Überseequartier district will be transferred to the other side of the street.



6.5 Traffic Planning

The Current Traffic Situation

The following plan was drawn up by the engineering firm Schmeck und Junker in Hamburg who were commissioned by the HHLA (Hamburg Port and Logistics plc, Hamburger Hafen und Logistik Aktiengesellschaft) to produce a basic transport plan. The next step in the process will be to design the individual spaces and surfaces in the Speicherstadt.

The engineers started by taking stock of the overall traffic situation in the Speicherstadt: Recent years have seen a fall in the number of lorries and an increase in the number of cars, due to the rise in the number of people working in the Speicherstadt and as a result of the tourist attractions that this part of Hamburg has to offer. Pedestrians and cyclists are another significant component in the transport mix.

Access to the Speicherstadt by motor vehicle is primarily via Sandtorkai/Brooktorkai, roads which have two or three lanes in each direction. This is also where the multi-storey car park in block O provides

public parking for 250 cars.

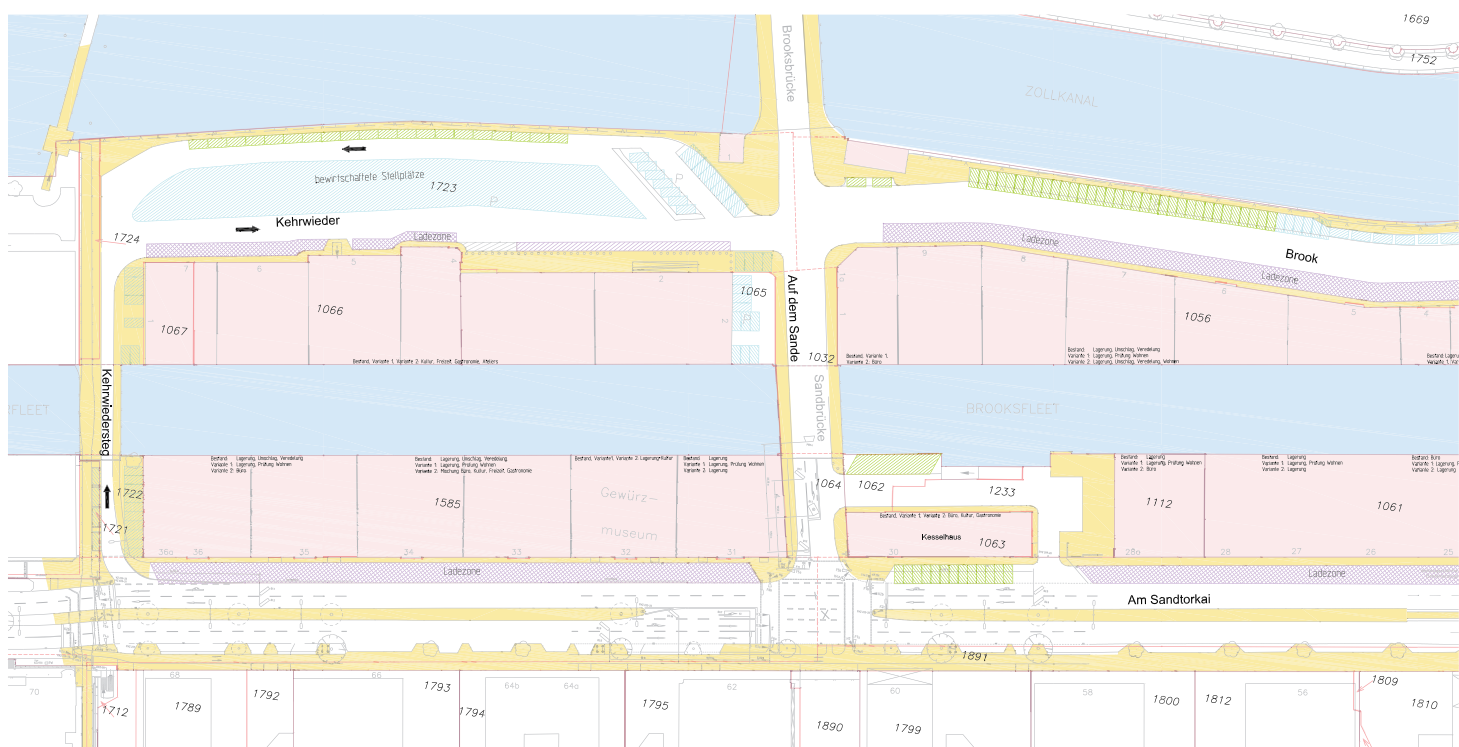
Between Sandtorkai and the city centre the streets Auf dem Sande and Bei St. Annen cross the Speicherstadt. Bei St. Annen is a main road that serves a wider area.

Most of the east-west traffic axes are one-way streets. The only exceptions are Brook, Neuer Wandrahm and Pickhuben.

Cobble sett road surfaces ensure that vehicles already travel at reduced speeds in the Speicherstadt.

The use of public thoroughfares and the volumes of traffic in the Speicherstadt are to a large extent determined by how the buildings are used.

Since the warehouses were originally used for storage, there are 5 m-wide loading and unloading zones along the fronts of buildings. These are leased almost exclusively by HHLA. Some of these areas



are still being used for the transshipment of goods and can be closed off temporarily during loading and unloading using removeable barriers, which are attached to warehouse walls. Other parts of the areas leased by HHLA can be used for short-stay parking or are being subleased to locals for parking.

The cultural and leisure activities, as well as restaurants and pubs in the Speicherstadt, require appropriate parking facilities, which are provided primarily by the multi-storey car park and in some of the loading and unloading zones. Parking spaces have also been allocated to office staff and service providers in former loading and unloading areas.

The waterway or canal side of roads and streets features a narrow strip with a kerbstone, which acts as a safety strip to prevent vehicles from hitting crash barriers and overshooting the edge of quays.

A stock-taking exercise has produced exhaustive data on all of the areas available for parking. These

have been recorded on a map (cf. figures at the bottom of the page and on the following pages).

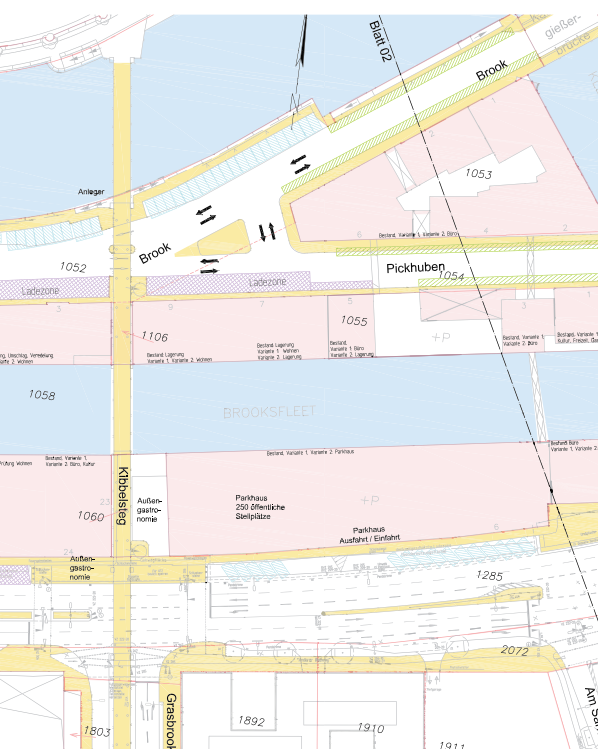
In the western section of the Speicherstadt (cf. figure below) most of the buildings are used for goods storage, transshipment and processing, which is why large parts of the loading and unloading zones described above have been preserved.

There is a paying car park on Kehrwieder.

The parking facilities along the canal embankments are situated on public land. They are erratically positioned both parallel and perpendicular to the road and there are as yet no plans for how they could be uniformly arranged.

There are so far no parking facilities reserved for bicycles or motorcycles.

In the eastern section of the Speicherstadt (cf. figure below) the only areas where the original loading



Legende:




-  Parkstände im öffentlichen Grund
-  Parkstände in Ladezonen
-  Stellplätze Privat auf gemieteten Flächen

Figure 32: Map of existing parking spaces in the western part of the Speicherstadt

and unloading zones have been preserved are those around Brooktorkai and on St. Annenufer. St. Annen street has been kept free of any parking spaces. As for the remaining streets, there is no uniform orientation of parking spaces in parallel or perpendicular to the road.

There are no parking spaces along the canal edge of Alter Wandrahm.

Water pipes and Sewers

The engineering firm commissioned considers that most of the Speicherstadt's pipes complies with current requirements.

The capacity of Hamburg Water's network will have to be reviewed if significant increases in water consumption are envisaged.

The Hamburg City Drainage Network was built between 1890 and the present day. Experience has shown that sewers have a lifespan of 80 years. There are 850 m of pipes which date from before 1930.

Public street lighting will be adapted to the changes in the public spaces and street environment in the Speicherstadt.

Legende:




	Parkstände im öffentlichen Grund
	Parkstände in Ladezonen
	Stellplätze Privat auf gemieteten Flächen

Figure 33: Map of existing parking spaces in the eastern part of the Speicherstadt

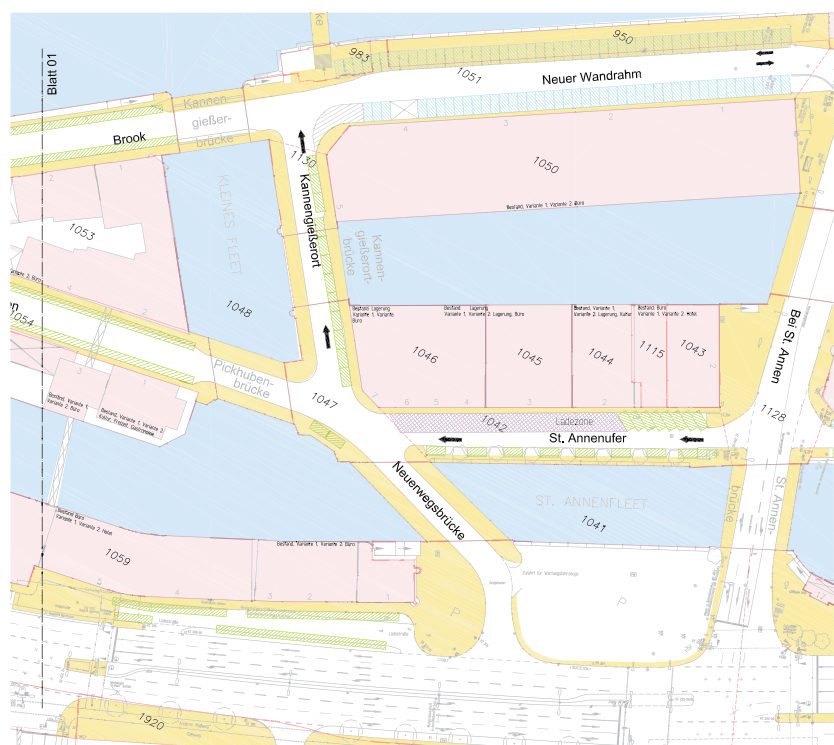
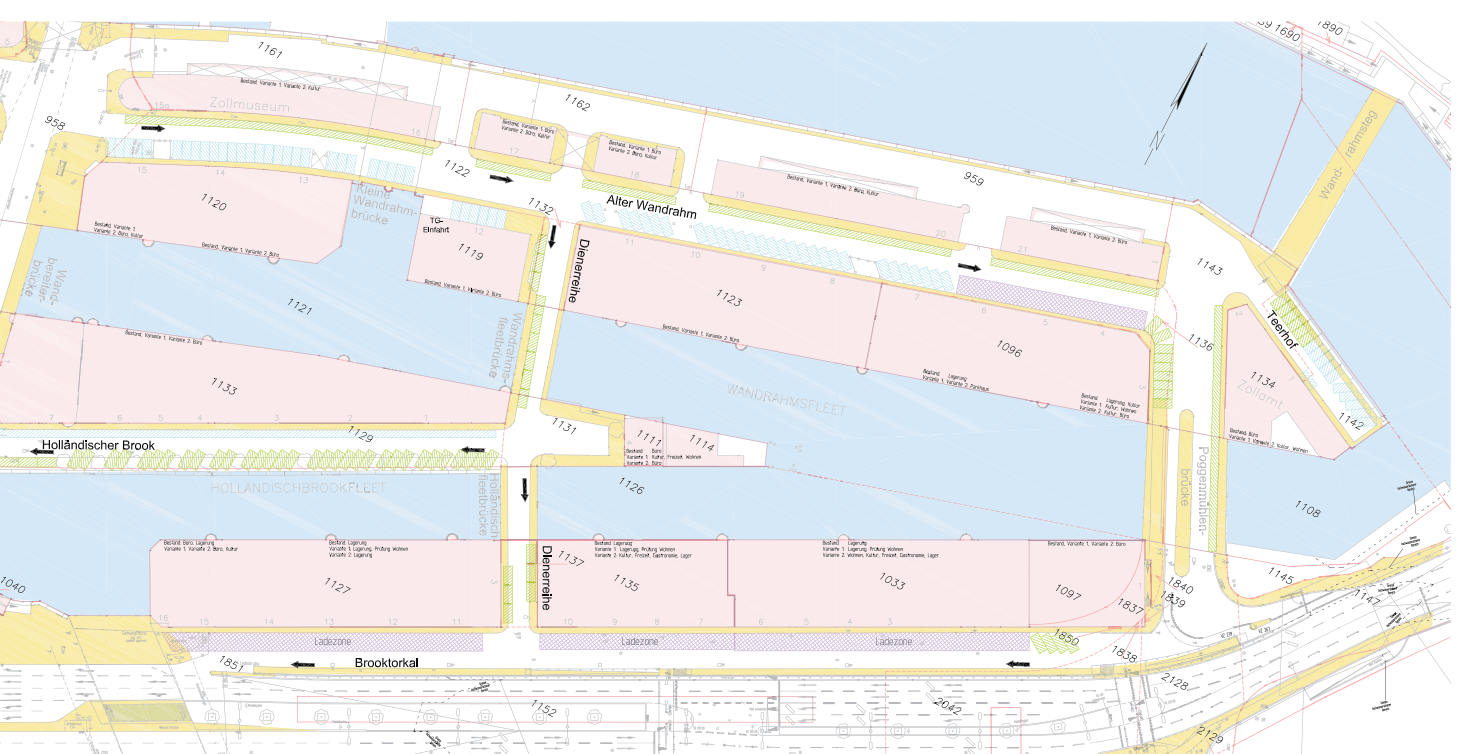




Figure 34: Signposting of loading and unloading zone

Figure 35: The street space at Holländischer Brook



Traffic Concept

As described in chapter 6.4, for reasons of heritage protection, existing roads will as far as possible not be widened. They will also continue to be constructed using the same materials.

It should be possible to achieve significant reductions in the amount of space dedicated to moving traffic.

After carefully balancing the need for parking with other needs in the Speicherstadt, it has been decided that parking spaces should be maintained where possible, and that in future a charge should apply.

The following guidelines have been defined for the new concept:

- The narrow cobble sett strips along warehouse façades will serve exclusively to provide access to the respective buildings. On the opposite side of each street, i.e. along the waterways and canals, pavements will be created that

comply with requirements on barrier-free access to public spaces.

- The existing loading and unloading zones (with a width of 5.0 m) will not be changed. Depending on the use of nearby buildings, these areas can also be made available for parking.
- Along the Customs Canal a 7 m-wide promenade will be created by combining a 4 m-wide pavement and a 2.5 m-wide two-way cycle lane. A row of large granite cobble setts will mark the boundary between the two. In those areas where there are adjacent parking spaces, the kerbstones will be shifted 60 cm outwards in order to prevent cars from straying into the cycle lane.
- As a rule, cycle lanes will be located on the road itself. They will be paved with smooth granite for improved riding comfort. The only exception to this will be the River Elbe Long-Distance Cycle Path.

Figure 36: Transport concept (preliminary draft) for the western part of the Speicherstadt



- Existing granite cobble setts will be left in place. To provide an even surface, pavements will be reinforced with slag stones where available. As an alternative, concrete blocks with an appropriate coating, like the ones on St. Annen, may be used (so-called Hamburg port cobble setts, cf. above).
- As a rule, in each street parking spaces will be given the same orientation, i.e. parallel, perpendicular or diagonal to the road..
- In front of warehouse block D on Kehrwieder, part of the former loading and unloading zone will become a line of bus stops.
- The chargeable parking spaces on Kehrwieder have been moved so that they abut the pavement and cycle lane. This has created space for some 100 chargeable parking spaces.
- A city bike collection and drop-off facility will be situated in Auf dem Sande. Motorbike parking spaces will be under the cycle path in Brook street. Cycle racks will also be provided
- Pickhuben street will continue to be open to lorry traffic in both directions.
- On Am Sandtorkai, in front of the western section of the row of warehouses (block O), there will be a hotel driveway with short-stay parking spaces.
- To complete the overall visual impression and give the street environment a uniform and orderly appearance, wider kerbstones will be trimmed where necessary to enable the drainage channels next to the kerb to be restored. Also, as a rule, roads will continue to slope downwards from the crown to the edges to assist drainage.

The following chapter 6.6 lists the future street profiles.

Legende:

	Stellplätze		Kopfsteinpflaster
	Ladezone		
	Verkehrsfläche		
	Gehweg/Radweg/Anprallschutz		Schlackenstein
	geplante Stadtradsfläche		
	Einbahnstraße		
	Pfosten		
	Fahrradbügel		

Figure 37: Transport concept (preliminary draft) for the eastern part of the Speicherstadt



6.6 Street Profiles

Kehrwieder

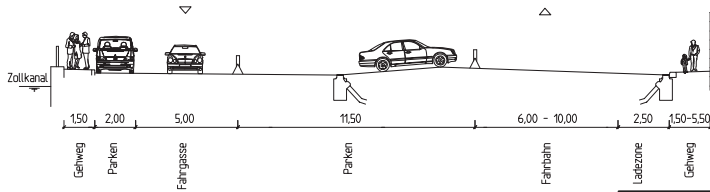


Figure 38: Current situation

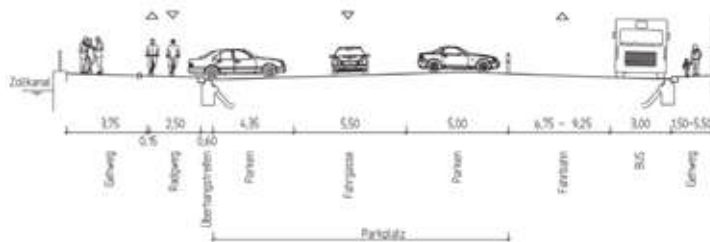
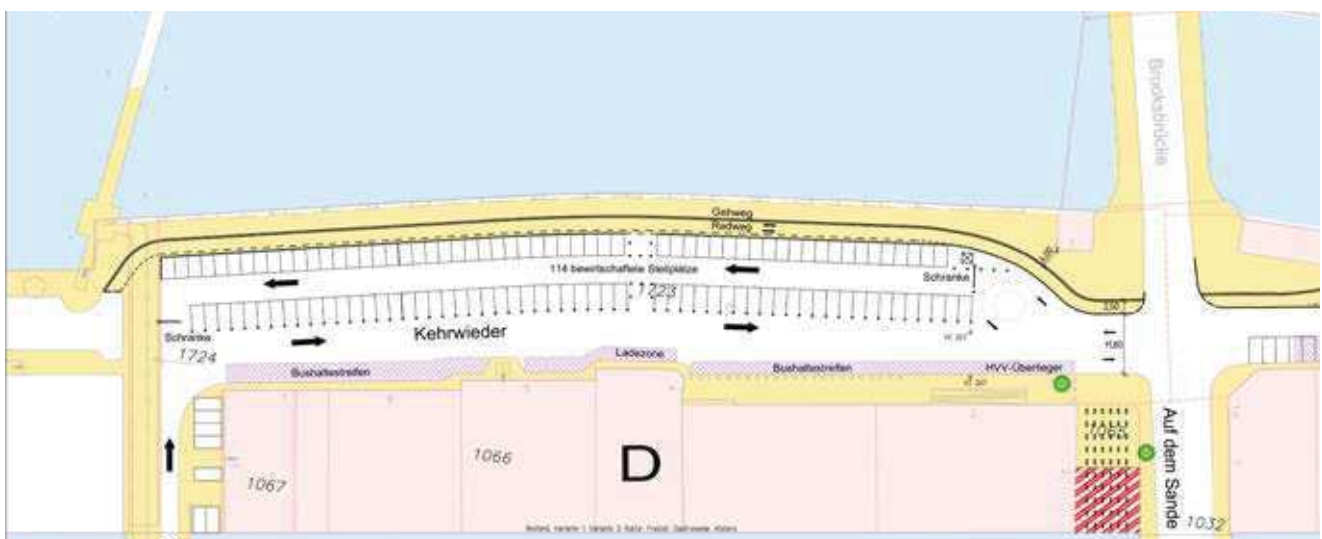


Figure 39: Plan

With the exception of the demarcation between foot-paths and cycle paths, space in the Speicherstadt will not be structurally demarcated. This should encourage its use for leisure pursuits and provide performance venues for cultural events (open-air operas, flea markets, etc.).

The chargeable parking spaces will be delimited to the south by removable bollards. There will be two rows of parking spaces perpendicular to the road with an access lane in between. There will be a pedestrian crossing point in the middle of the car park. To limit the amount of traffic entering the Speicherstadt via Kehrwiedersteg, access will only be permitted for coaches and delivery vehicles. There will be separate paths for pedestrians and cyclists along the water's edge. In front of buildings the existing pavement widths will be maintained.

It will be possible for coaches to park and passengers to alight at the bus stops. However, no long-term parking will be allowed there. As regards the bus stop for city bus services on Auf dem Sande street, it will be possible to create a parking space for waiting buses in front of the western part of block D. There will be a city bike collection and drop-off point to the east of block D. The remaining space will be used for cycle racks.



Am Sandtorkai West

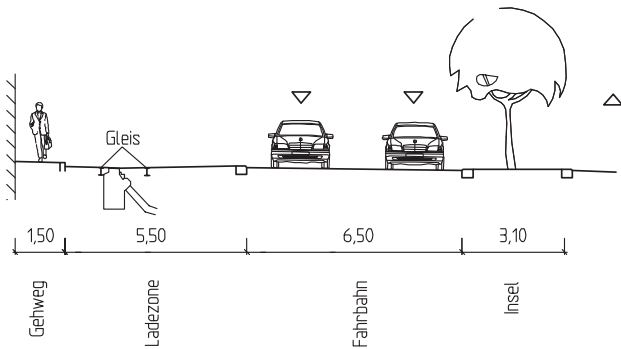


Figure 40: Current situation

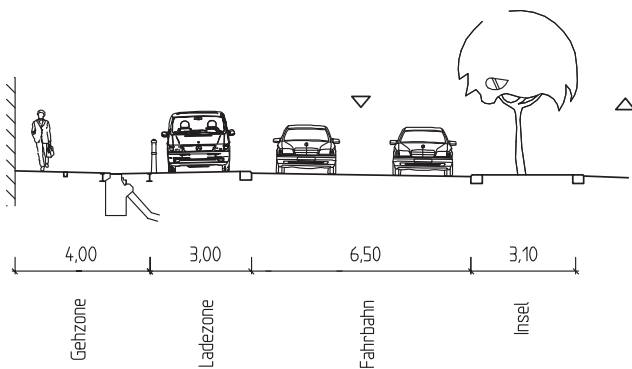


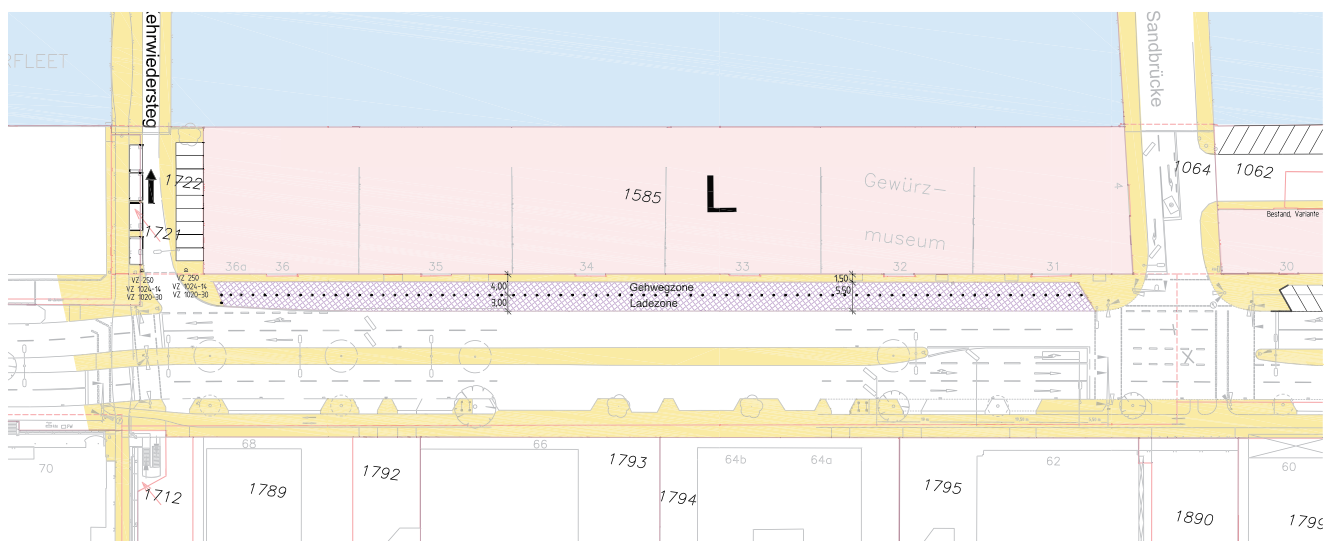
Figure 41: Plan

In the context of efforts to improve access to the HafenCity, the profile of Am Sandtorkai has already been restructured all the way up to the southern edge of the loading and unloading zone. In the medium-term, block L will be converted into a venue for cultural activities along the same lines as Kaispeicher D, which lies opposite.

As a result of the gradual decline in storage activities, it will be possible to split the existing loading and unloading zone into a 3 m-wide parallel parking strip, which will be adequate for delivery vehicles, and a 4 m-wide pedestrian zone.

The existing kerb edge will be lowered to improve walking comfort in the northern part of the area, where there still is a railway track.

Drainage channels will be located in the pedestrian zone. They will be separated from the loading and unloading zone by removable bollards



Brook

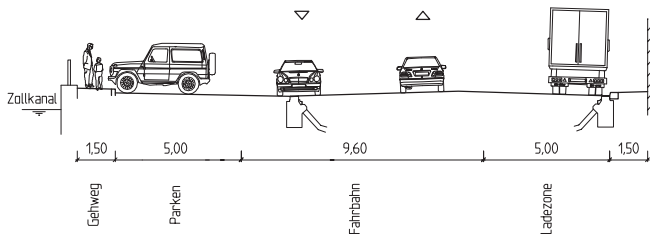


Figure 42: Current situation

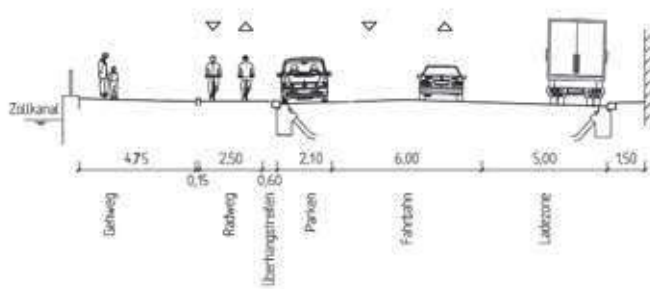


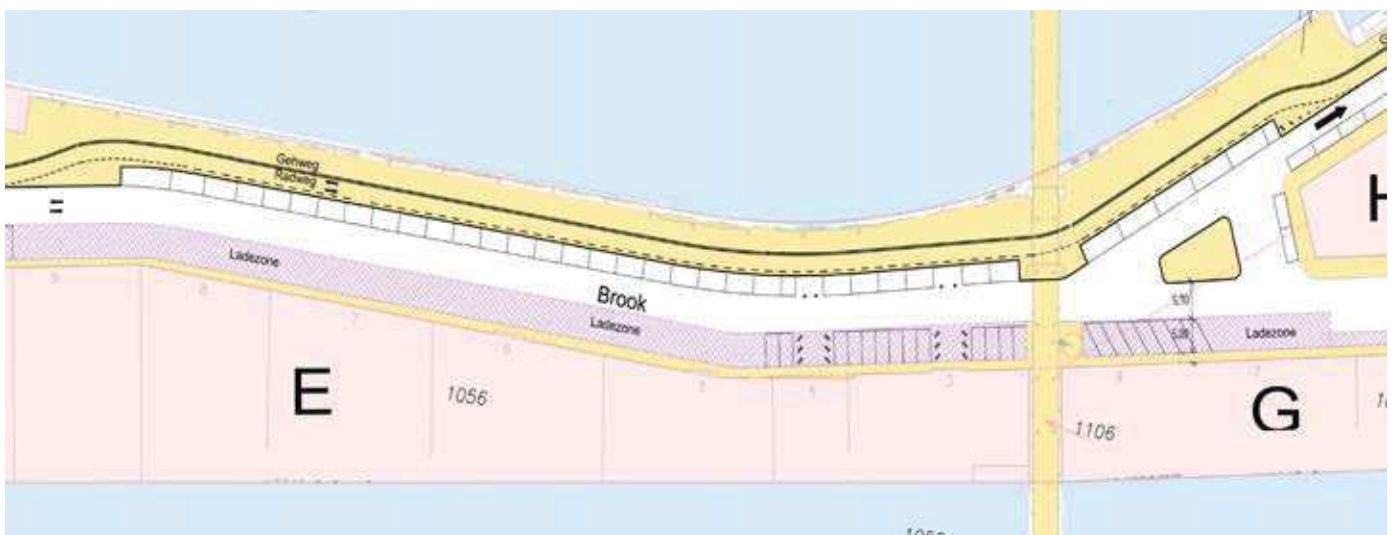
Figure 43: Plan

In the western section of Brook street the number of parked vehicles and the space available for loading and unloading will be reduced by the creation of a pavement and cycle path next to the Customs Canal. In the future, parking in this area will be parallel to the road.

At the point where Brook widens and intersects with Pickhuben there is a traffic island. This was extended in the past by the addition of a further traffic island. This latter island will be removed. The kerbs and level of the original traffic island will be raised to prevent cars from driving over it.

In order to retain the southern strip for parallel parking, this part of Brook will be converted into a one-way street with a 3.65 m-wide carriageway.

The row of parking spaces on the south side will be interrupted where there are entrances to warehouses. This will make crossing from the main footpath next to the Customs Canal easier and more comfortable for pedestrians. Because the street is relatively narrow at this point, parking spaces in the eastern part of Brook will be parallel to the road.



Neuer Wandrahm

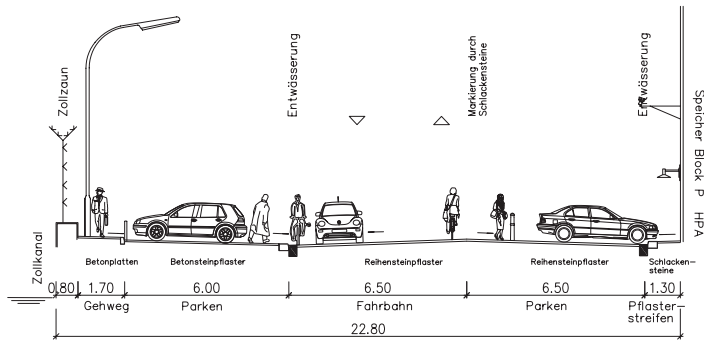


Figure 44: Current Situation

Like the eastern part of Brook, the existing street will become one-way in order to be able to maintain areas for parking.

In addition to the parking facilities for motorised vehicles there will be cycle racks.

In front of the warehouse buildings on Neuer Wandrahm there is a 1.5 m-wide row of cobble setts stones dividing the road from the footpath.

The parking strip is interrupted at the main entrance to the building of the Hamburg Port Authority (HPA) to allow pedestrians to cross comfortably. To the left and right of that crossing point, additional cycle racks could be provided.

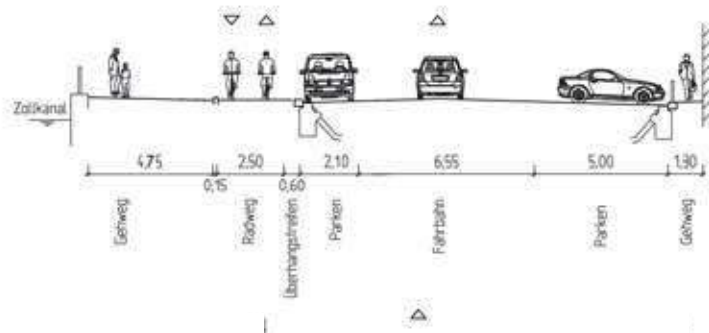
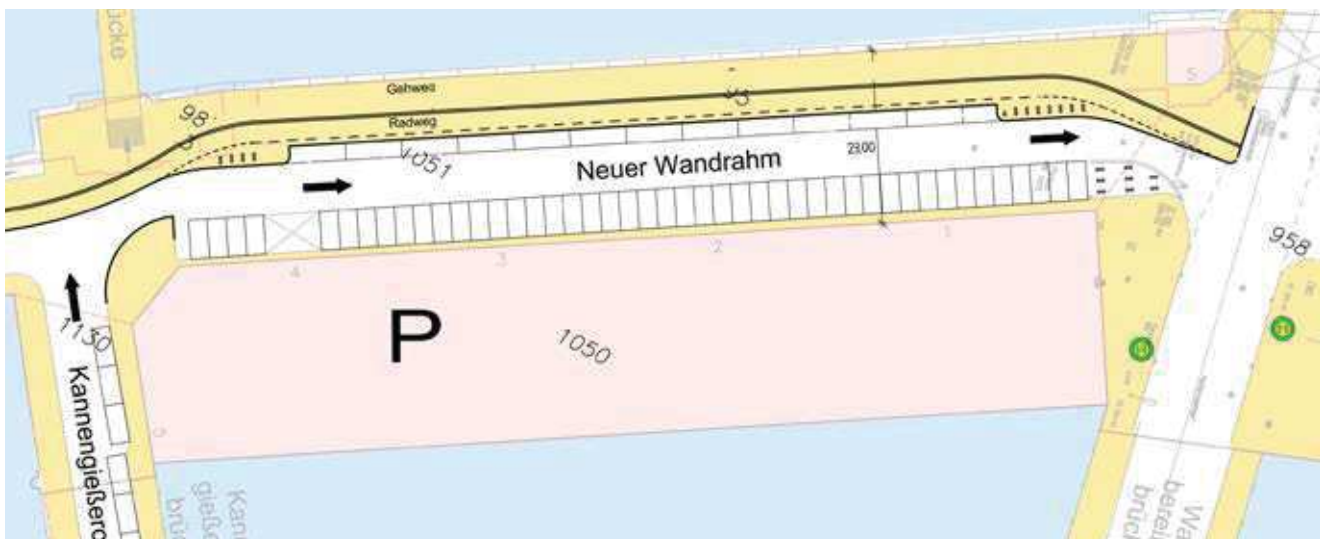


Figure 45: Plan



Alter Wandrahm und Kaizone am Zollkanal

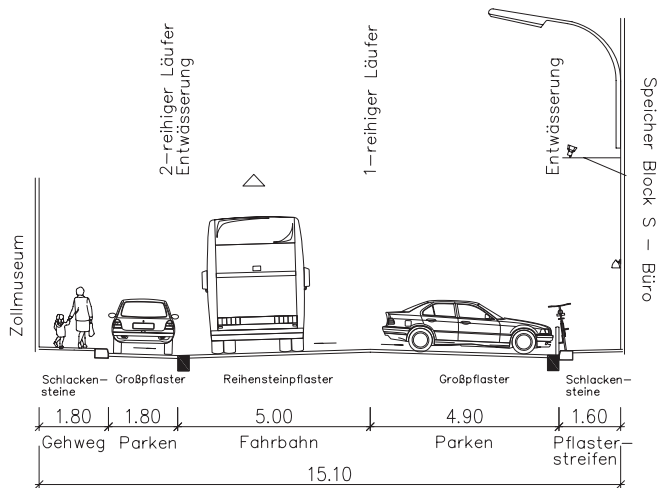


Figure 46: Current situation

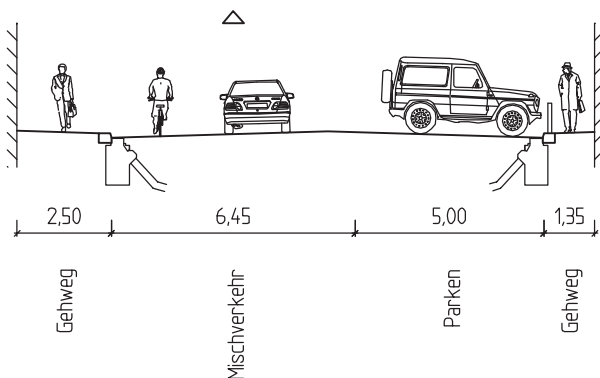
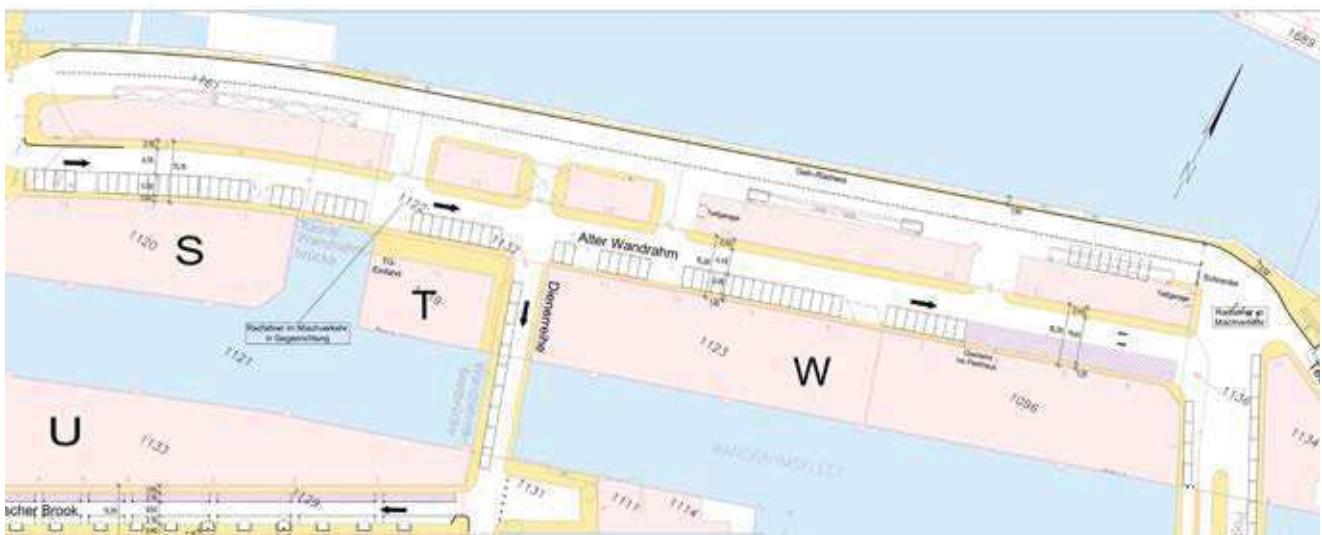


Figure 47: Plan

The plans for this area of the Speicherstadt take the street between the warehouse buildings and the quay area together. Some of the spaces on the Customs Canal quays are leased or belong to the Customs Museum. These areas are closed off by gates and are not open to the public. However, in the medium term, the River Elbe Long Distance Cycle Path will run through this section of the Speicherstadt. This means that a 7 m-wide strip needs to be kept open for the public promenade to be established for that purpose. Until this part of the plan is implemented, cyclists will be allowed to travel along Alter Wandrahm in both directions, although for motorists it is a one-way street. At the edges, the existing granite cobble or setts will be replaced by smooth granite, which will improve riding comfort for cyclists.

Pedestrians will be invited to use the pavement on the north side of Alter Wandrahm, which is between 2.1 and 2.5 m wide between Poggenmühle and Bei St. Annen. It is planned to establish a parking strip on the south side of the carriageway which, however, will be interrupted where there are warehouse entrances to enable pedestrians to cross the road more easily. It will no longer be possible to park on the north side of the carriageway.



St. Annenufer

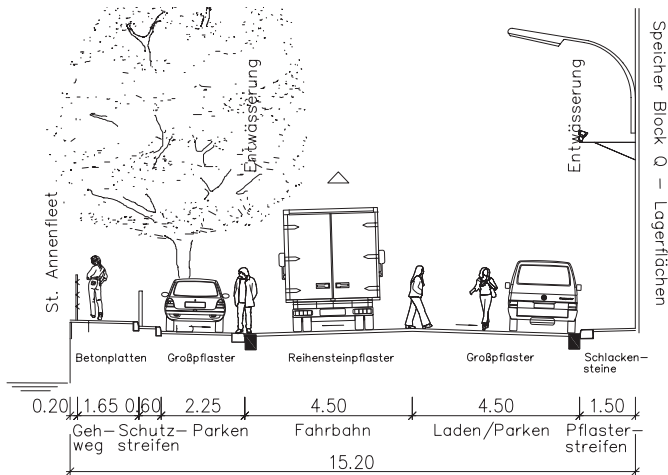


Figure 48: Current situation

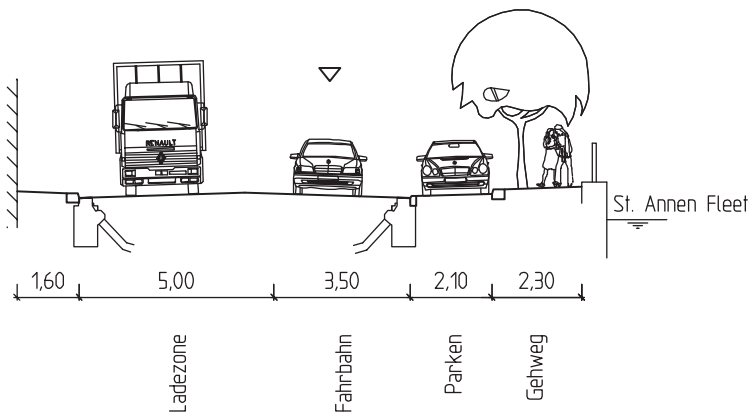
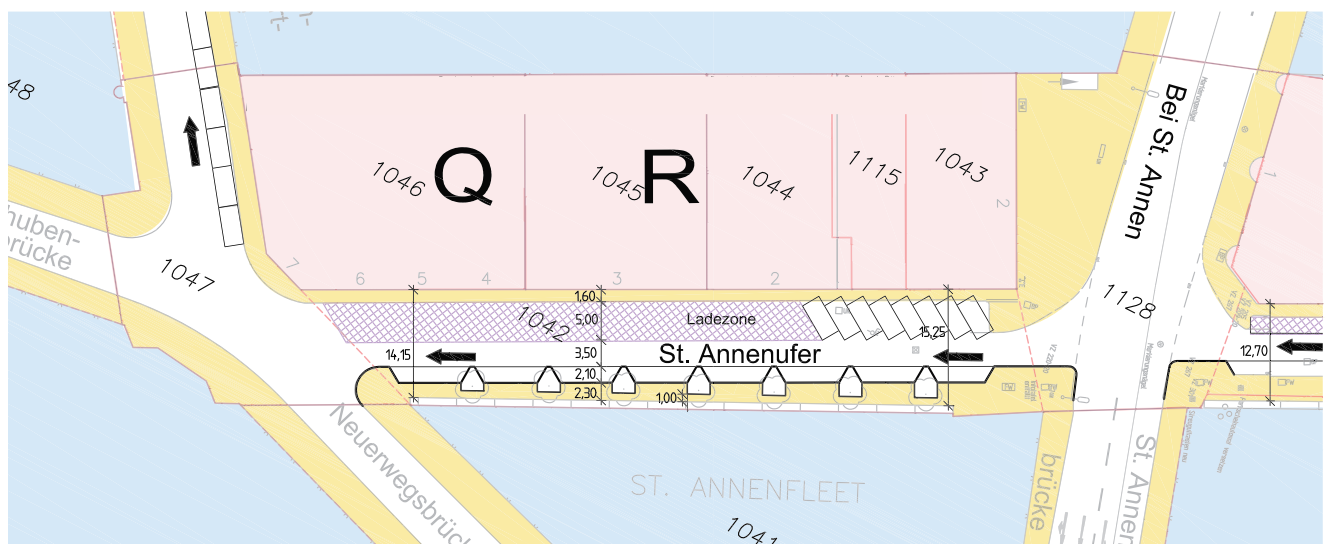


Figure 49: Plan



The existing street profile will in principle be left unchanged. The cross slope of the road will be modified, enabling the step in the pavement to be removed. This will create a level and even pavement with a width of 2.3 m, in places interrupted by trees and their roots.

The handrail between the pavement and the parking area will be removed. This will create more space for pedestrians.

Parking will be between trees.

Holländischer Brook

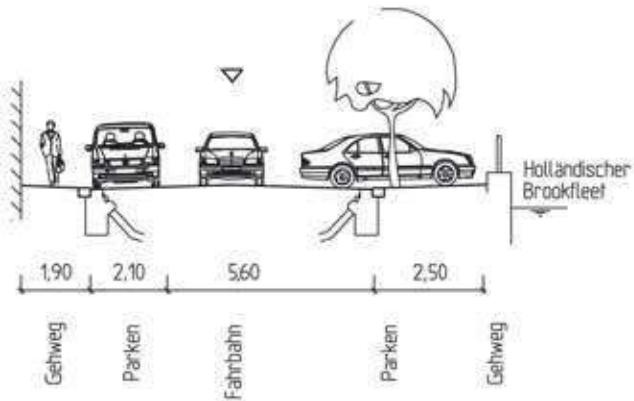


Figure 50: Current situation

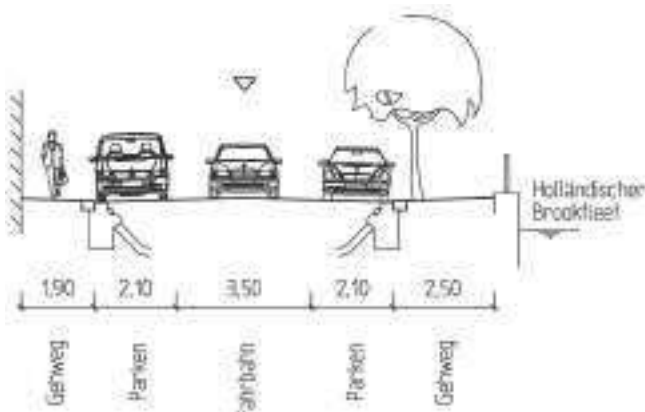
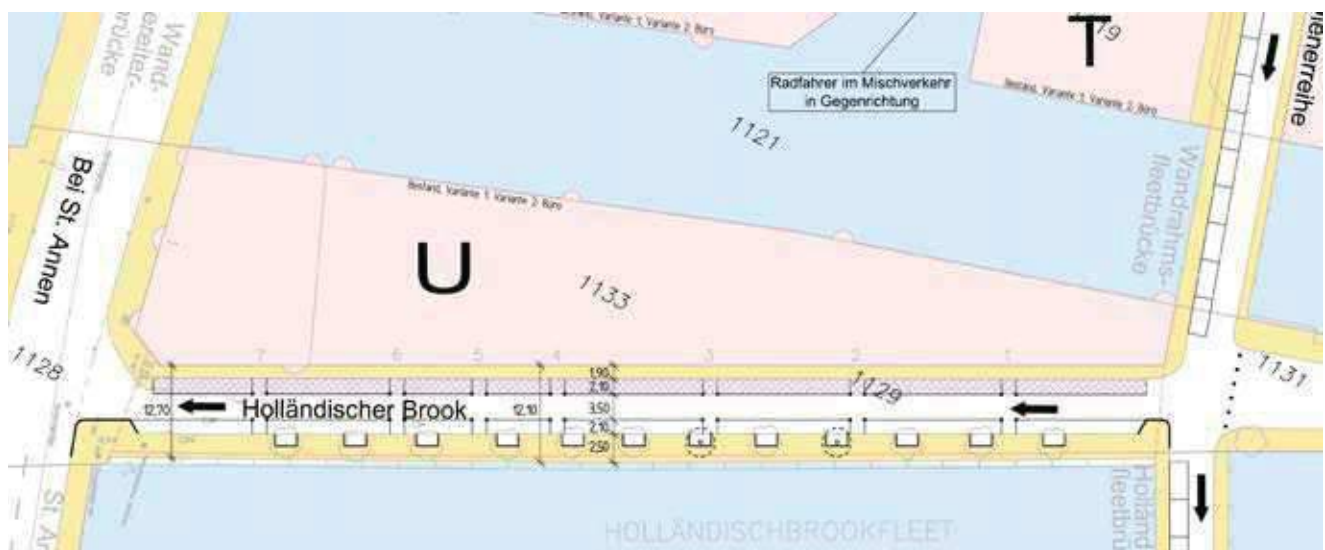


Figure 51: Plan

The main footpath will be along the water's edge. This means that parallel parking at the roadside will replace the current system of angle parking on the space to the south. The 2.5 m-wide strip, which is interspersed with trees, can then be reserved for pedestrians without having to move the kerb itself.

Future plans include the possibility of removing parking spaces to provide for more crossing points.

The two existing gaps in the row of trees on Holländischer Brook will be closed by planting new trees there.



6.7 Cost Estimates for Development and Access Improvements

Streets whose profile is going to be modified will be fully rehabilitated. Where existing road surfaces made of large granite cobble setts are uneven, the stones will be reset and made flush.

This cost estimate does not cover the restructuring of the St. Annen axis or the area where Bei St. Annen intersects with Holländischer Brook, since the measures planned for this part of the Speicherstadt have either already been implemented or are at an advanced planning stage.

The current low and temporary customs fence will be replaced by an appropriate one modelled on the historic fence. Like the original, it will be placed right on edge of the quay. Sewer rehabilitation costs have been included in the cost estimate.

The following items are included:

- Establishment of construction sites and ensuring road safety
- Earthworks
- Demolition and upgrading work
- Drainage
- Pipe connections
- Carriageways, parking and other ancillary areas as well as kerbs and road markings
- Infrastructure such as artificial illumination, road-side planting, street furniture, fences and traffic lights

- Rehabilitation of sewers
- Assessment of the state of preservation of old building materials
- Search for any unexploded war time bombs or ammunition
- Various other costs
- Secondary costs
- Contingency
- Engineers' fees (phases 1 to 9 plus supervision of construction work)

The cost estimate covers 14 individual road sections (cf. respective plans). The total cost has been put at EUR 18.75 million including VAT at 19%.

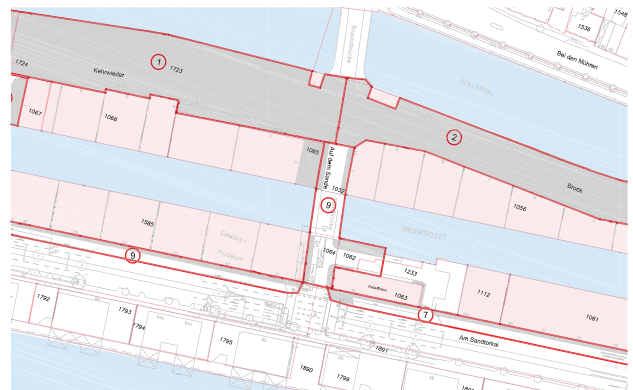
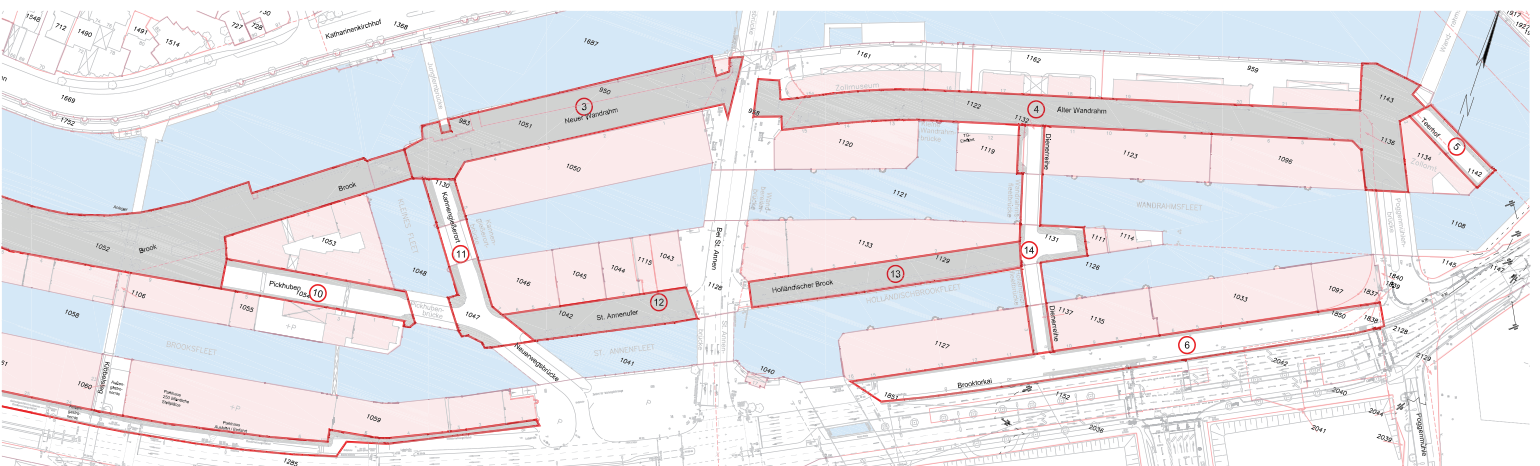


Figure 52:

Street sections: 1.Kehrwieher, 2.Brook, 3.Neuer Wandrahm, 4.Alter Wandrahm, 5.Teerhof, 6.Brooktorkai, 7.Am Sandtorkai, 8.Kehrwiehersteg, 9.Auf dem Sande, 10.Pickhuben, 11.Kannengiesserort, 12.St. Annenufer, 13.Holländischer Brook, 14.Dieerreihe Plan

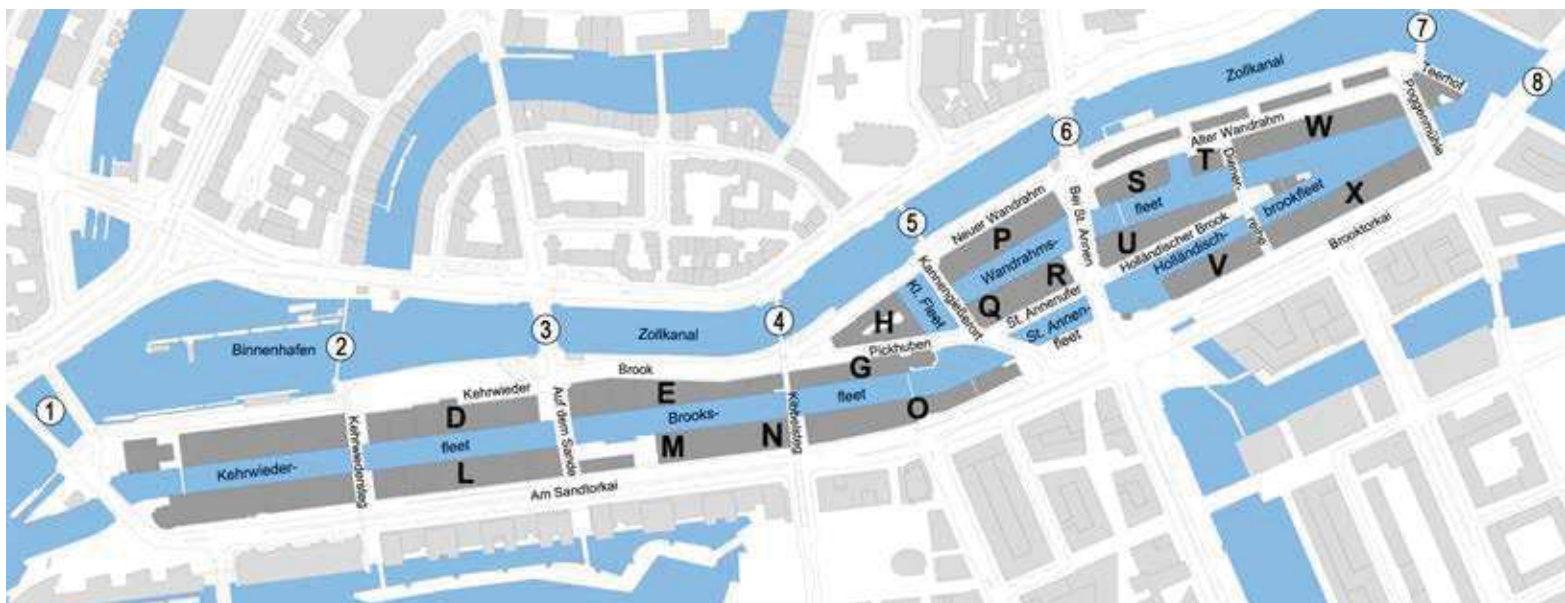


6.8 Access Bridges to the Speicherstadt

Together with the HafenCity, the Speicherstadt forms an island which can only be accessed via the following bridges, which are integral parts of the protected heritage zone:

1. Niederbaumbrücken
2. Binnenhafenbrücke
3. Brooksbrücke
4. Kibbelsteg
5. Jungfernbrücke
6. Kornhausbrücke
7. Wandrahmsteg and
8. Oberbaumbrücke

Most of the bridges in the port of Hamburg are arched bridges. Even the landing stages are arched or have inverse arches on the underside (Fischbauchträgerkonstruktion). As a rule, the only significant exceptions in the entire port zone are the large motorway bridge and the other major road and railway bridges. The only bridges which are not arched bridges in the Speicherstadt are Binnenhafenbrücke, Wandrahmsteg and Oberbaumbrücke.



Niederbaumbrücke

The two spans of the Niederbaumbrücke twin bridge form an arched bridge with a reinforced suspended roadway slab. The Niederbaumbrücke bridge is not flood-safe.



Binnenhafenbrücke

This asymmetrical cable-stayed bridge with a pylon and additional lattice work was built to provide a flood-safe emergency escape for the Hanseatic Trade Center. It can be used by pedestrians only, not by rescue vehicles. The pylon makes it very conspicuous and untypical of the type of bridge that is found elsewhere in the port of Hamburg.



Brooksbrücke

This bridge is one of the most important north-south entry points to the Speicherstadt and from there to the HafenCity. It is typical of the type of bridge most commonly found in the port of Hamburg, namely an arched bridge where the carriageway is level with the surrounding streets which, however, means that it is not flood-safe. It also features statues of St. Ansgar, Barbarossa, Hammonia and Europa on the bridge ends – not dissimilar to the bridge patrons found in southern parts of Central Europe.



Figure 53: Bridges into the Speicherstadt

Kibbelsteg

The ensemble of three arched bridges at Kibbelsteg meets all the criteria of a typical Speicherstadt bridge: It is flood-safe and serves as an emergency escape route. It can be used by rescue vehicles, its maximum height is approximately 8.0 m above sea level (tidal reference level) and it does not disrupt the heavy goods traffic on Brook and Am Sandtorkai. Via Kibbelsteg rescue vehicles will also be able to reach future apartments in blocks E, G and N as well as potential hotels at 4 and 5, Am Sandtorkai. The bridges can be used by pedestrians on two levels.



Jungfernbrücke

This arched bridge is a footbridge only. It is not flood-safe. The Jungfernbrücke is not typical of the Speicherstadt bridges in that its arch is very low.



Kornhausbrücke

A large proportion of the north-south traffic within and through the Speicherstadt is channelled via the Kornhausbrücke which takes you all the way to the HafenCity and further via Versmannstrasse to the southern part of the port of Hamburg. This bridge has to cope with significant traffic and is not flood-safe. The most characteristic features of Kornhausbrücke are the stone statues of Vasco da Gama and Columbus at the bridge ends and the position of the arch.



Wandrahmsteg

This footbridge is typical of the bridges of the post-war period: It has a simple design and does not betray any particular architectural ambitions. For pedestrians wishing to cross the Customs Canal/ Oberhafen to reach the eastern part of the Speicherstadt, Wandrahmsteg is an important connection from the Meißberg underground station and the Kontorhaus district (Hamburg's historic office district). The original Wandrahmsteg, which was destroyed during World War II led directly to the gate of the Chilehaus and Burchardplatz beyond. The current version is further to the east and formally speaking is not satisfactory. The load-bearing structure consists of all-steel trussed girders (Vollwandträger) instead of the arch construction otherwise typical of the port. The Wandrahmsteg is not flood-safe.



Oberbaumbrücke

This bridge is widely used by many motorists, cyclists and pedestrians travelling from the city centre to the Speicherstadt and the HafenCity. The Oberbaumbrücke is at the end of the east-west axis formed by Am Sandtorkai and Brooktorkai. It provides a flood-safe link from both the Speicherstadt and the HafenCity. Like the Wandrahmsteg, it is a "modern" bridge which fulfils its function, but is devoid of any architectural ambition in terms of its contribution to the townscape and the engineering skills employed.



Recommendations

Binnenhafenbrücke, Wandrahmsteg and Oberbaumbrücke do not represent examples of outstanding engineering skills nor are they worthy of being listed under the Heritage Protection Act. In the case of the first two, it is recommended that in the medium to long term, new designs be produced and implemented.

The Binnenhafenbrücke could be integrated into a future barrage, which would require it to be rebuilt.

The Wandrahmsteg bridge should be returned to its original position. It would be desirable to design it as a pedestrian bridge featuring a light-weight arch construction.

The Oberbaumbrücke is not regarded as crossing an important Hamburg water course, partly because it has neither a clear beginning nor a visible end. Although it connects the city centre to one of Hamburg's historically most significant districts, as well as to the HafenCity, this is not at all evident. It does not seem realistic to try to replace this "modern" bridge with a new one that is more typical of the area and that features an arched construction. However, it would be desirable to emphasize its character as a bridge a little more by, for example, making it easier to discern its beginning and end. Whether this can best be achieved by placing special sculptures on the Oberbaumbrücke, as there are on other bridges in the Speicherstadt, or by creating other 3D structures remains to be seen. As the Oberbaumbrücke is part of the Wallring Arts and Culture Mile, it seems natural that the idea of emphasising the bridge character of this construction be turned into an art project.

6.9 Bridges within in the Speicherstadt

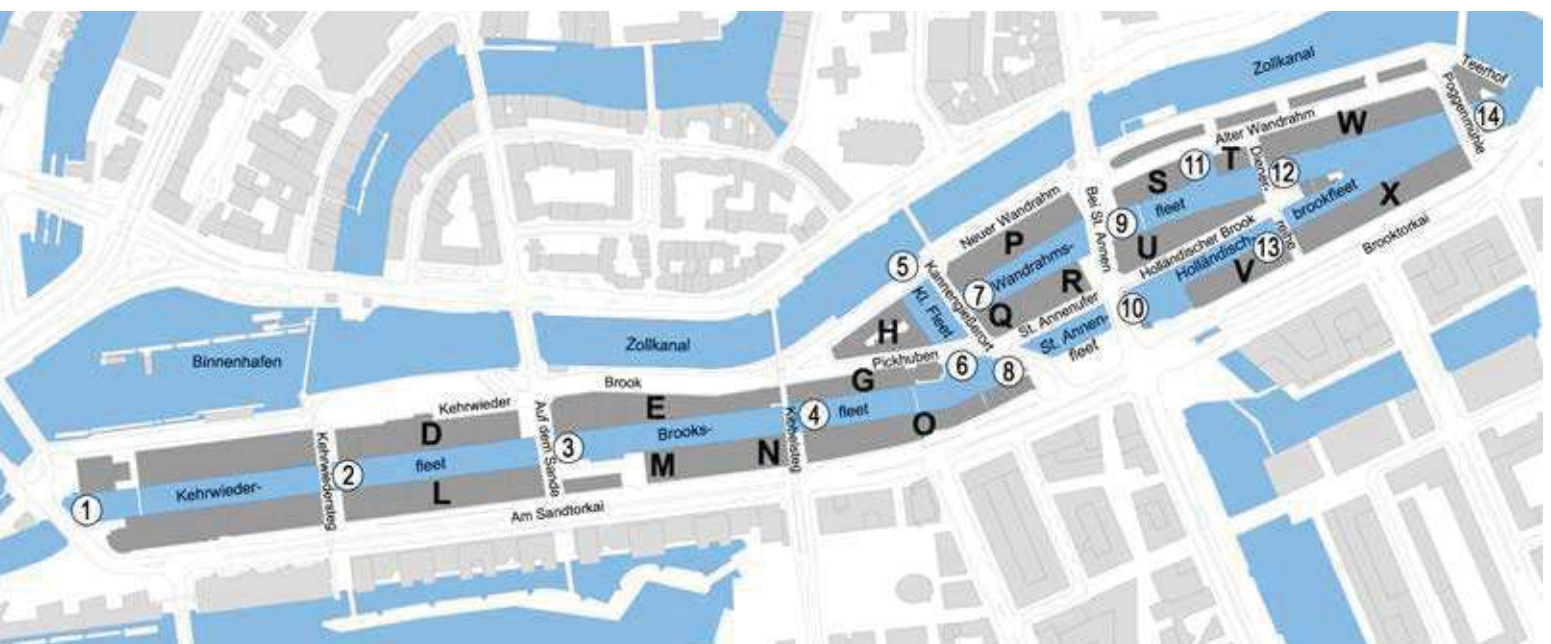
There are fourteen further bridges for pedestrians and motorists in the Speicherstadt:

- 1 The Wilhelminenbrücke over the Kehrwiederfleet. This is a historic deck bridge without an arch. The current road surface is mastic asphalt; the area immediately to the east is covered with a mosaic of carpets (art project) and the area immediately to the west is concreted.
- 2 The two-level Kehrwiedersteg bridge crosses over the Kehrwiederfleet waterway. At ground-floor level both the deck road bridge itself and the adjacent area are surfaced with mastic asphalt. At first-floor level is a modern arched footbridge, which was built in connection with the Kehrwiedersteg. It is currently surfaced with mastic asphalt.
- 3 The Sandbrücke crosses the Kehrwiederfleet and Brookfleet waterways. It is an historic arched bridge which was built in connection with Auf dem Sande. It is currently surfaced with mastic asphalt, while the adjacent areas are concreted.
- 4 The Kibbelstegbrücke crosses the Brooksfleet waterway. It is a modern arched footbridge at first-floor level. It was built in connection with Kibbelsteg. It can be used by pedestrians, cyclists and rescue vehicles. It currently has a wooden surface below which (at ground-floor level) is a modern deck bridge.
- 5 The Pickhubenbrücke crosses the Kleines Fleet and Brookfleet waterways. It is an historic arched bridge which was built in connection with Pickhuben and St. Annenufer. It is currently paved with large cobble setts, while the adjacent areas are surfaced with concrete.
- 6 The Kannengiesserortbrücke crosses the Kleines Fleet and the Wandrahmsfleet waterways.

Figure 54: Bridges within the Speicherstadt

It is an historic bridge whose carriageway is paved with large cobble setts. The adjacent areas are concreted.

- 7 The Kannengiesserbrücke crosses the Wandrahmsfleet waterway. It is an historic bridge whose carriageway is paved with large cobble setts. The adjacent areas are concreted.
- 8 The Neuerwegsbrücke crosses the Brooksfleet and St. Annen. It is an historic arched bridge which was built in connection with Kannengieserort and Am Sandtorkai. Its carriageway consists of large cobble setts. The adjacent areas are made of concrete.
- 9 The Wandbereiterbrücke crosses the Wandrahmfleet waterway. It is an historic arched bridge which was built in connection with Bei St. Annen. Its carriageway and the adjacent areas are surfaced with asphalt.
- 10 The St. Annenbrücke spans the St. Annenfleet and Holländischbrookfleet waterways. It is a modern and featureless road bridge which is devoid of architectural ambition. It was built in connection with Bei St. Annen. Both the bridge itself and the adjacent areas are surfaced with asphalt.
- 11 The Kleine Wandrahmsbrücke crosses the Kleines Wandrahmfleet waterway. It is an inconspicuous bridge, which was built in connection with Alter Wandrahm. It is paved with large cobble setts. The adjacent areas are surfaced with concrete.
- 12 The Wandrahmsfleetbrücke crosses the Wandrahmsfleet waterway. It is an historic arched bridge, which was built in connection with Dienerreihe. It is paved with large cobble setts, while the adjacent areas are surfaced with asphalt.
- 13 The Holländischbrookfleet bridge crosses the Holländischbrookfleet waterway. It is an historic arched bridge, which was built in connection with Dienerreihe. It is paved with large cobble setts and the adjacent areas are surfaced with asphalt.
- 14 The Poggenmühlenbrücke spans the confluence of the Wandrahmsfleet and Holländischbrookfleet waterways. It is an historic bridge with three arches. The bridge itself is surfaced with mastic asphalt, while the adjacent areas are surfaced with concrete.



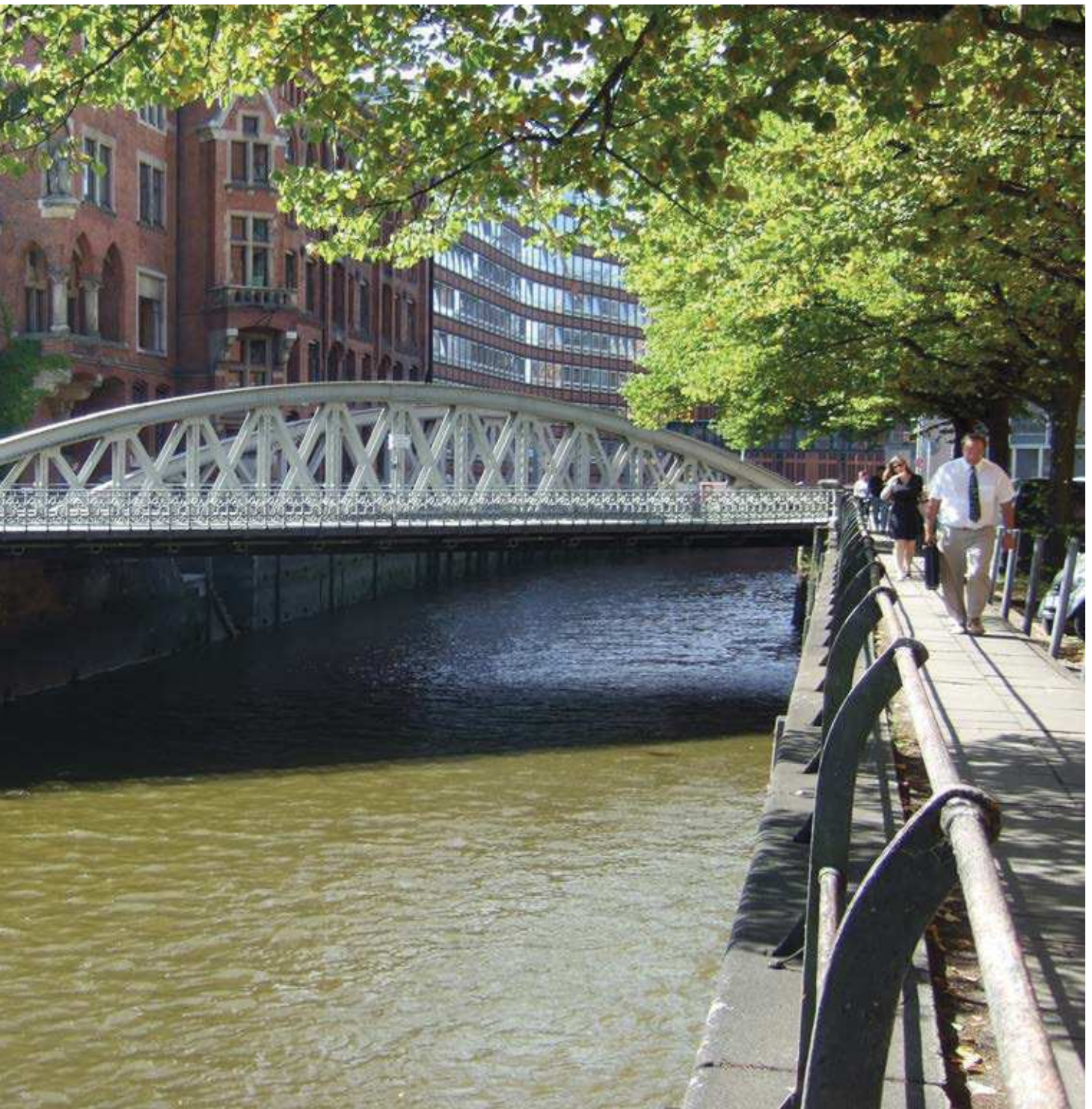
Recommendation

The bridges described are a characteristic part of the waterway area (Fleetraum) of Hamburg. They are popular vantage points, which is why they should be kept free of parked cars and street furniture. No advertising boards or posters will be permitted on the bridges.

The existing bridges in the area must be preserved. Roads will need to be paved with large cobble setts. The bridges on Bei St. Annen and Am Sandtorkai/ Brookbrücke are exempted from this requirement because they are on main access routes into the Speicherstadt and thus have to cope with heavy goods traffic, resulting in wear to road surfaces. The same applies to the Niederbaumbrücken, Wilhelminenbrücke, Oberbaumbrücke, Wandbereiterbrücke and St. Annenbrücke. The road surfaces of the access bridges leading into the Speicherstadt, which were described in section 6.8, will also be made of asphalt.

Footpaths will not be paved with cobble setts, as this would not correspond to the historic design. As detailed in the descriptions of Wandbereiterbrücke and St. Annenbrücke, pavements will be required to be surfaced with electric furnace slag bound with a transparent bonding agent.





7. Open Spaces

7.1 Open Space Planning on and around St. Annen

The area around St. Annen constitutes a central link between the Speicherstadt and the HafenCity. In 2006, an international competition was held to select the best new design for the open space in the Magdeburger Hafen. The area covered by the competition included the Überseequartier district and the areas to the east of the Magdeburger Hafen, as well as the entire area in and around St. Annen. The winner of the competition was the Spanish firm BB+GG. Their approach seeks to reunify the diverse open spaces in the Speicherstadt by using the same materials throughout. At the same time, their design seeks to emphasise the specific characteristics of individual spots by employing individual architectural designs.

St. Annen square is divided into several sections by the streets that cut through it. One is the triangular area to the south of the crossing (now called

Dar-es-Salaam Platz), which connects the Maritime Museum to Brooktorkai. This part of the design has already been implemented. To the north of Am Sandtorkai/Brooktorkai, the open space is, in turn, subdivided into three sections by the Pickhuben and Bei St. Annen streets. The central section constitutes an important link to the Überseequartier in the HafenCity.

By using the same large cobble setts and very bold lines made up of darker copper slag stones, the entire northern part of St. Annen-Platz will be given a uniform design, so that it appears to be one single space. There will be benches in both the northern and southern area of the square which will encourage visitors to linger there. The bases of the benches will be illuminated at night. The open spaces at the Fleetschlösschen for restaurants and bars form an integral part of the design..

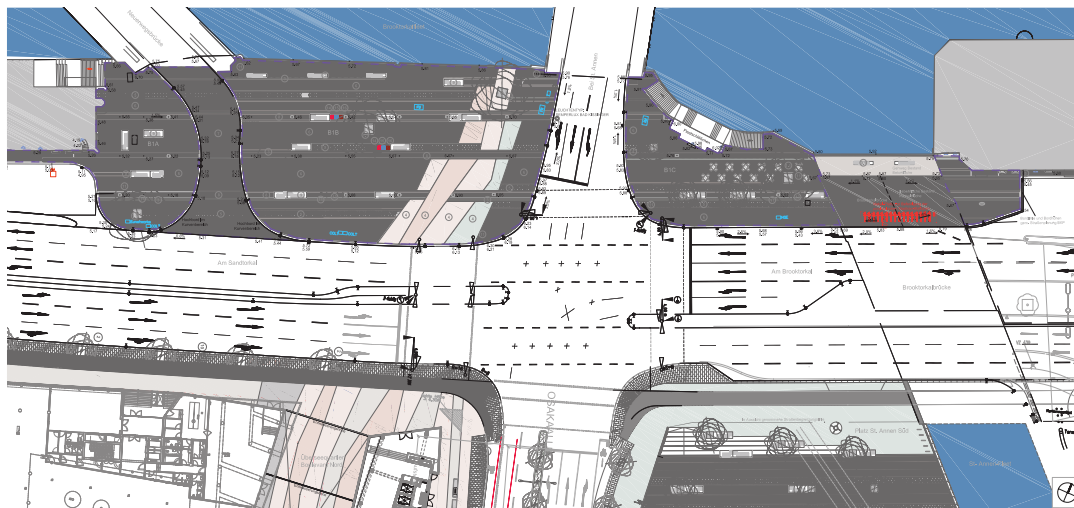


Figure 55: Open space plan for St. Annen, by BB+GG



Figure 56: Dar-es-Salaam-Platz

7.2 Canals and Quay Walls

The Speicherstadt owes much of its distinctive appeal to the fact that canals, quay walls and stairs form an organic whole. Glimpses of water from the bridges or views down the long, narrow canals reveal the ensemble of the Speicherstadt at its most impressive and become etched in visitors' memories: the chasms between the almost seamless rows of warehouses interrupted only by bridges; the water channelled between vertical brick walls. In order to preserve this unique scene there must be no constructions jutting out from the walls by the waterside or writing of any kind. The Ordinance on the Design of the Speicherstadt provides that there must be no protruding balconies, canopies, conservatories, loggias, sunblinds or external awnings on the façades overlooking either streets or waterways.

Moorings and Navigation Channels

The waterways were used for the delivery and transshipment of goods in the Speicherstadt. Jetties or pontoons would have obstructed the passage of boats and such structures must therefore be considered untypical of the Speicherstadt environment. No permanent constructions or long-term mooring facilities will be permitted. However, barges and pontoons will be permitted to dock there temporarily for logistical purposes or to facilitate construction work..

Quay Walls and Railings

The quay walls at the water's edge in the Speicherstadt are straight, vertical walls resting on wooden piles or sheet piling retaining walls, the surface of which consists of full-size clinker or bricks down to a level of 1.5 m below sea level (NN = tidal reference level). There are steel railings to protect against the risk of falling.



Whenever quay walls undergo repairs, red brick must be used and the flush surface of the walls restored. The size and colour of the bricks must correspond to the existing brickwork of the quay walls in the Speicherstadt. The faced brickwork must be continued to the edge of the wall at a depth of 1.5 m below sea level (NN = tidal reference level).

As regards railings, there are many different shapes and ornamental designs, but also straightforward steel railings. The aim is for all new railings in the Speicherstadt to be uniform. The materials and colours chosen must be aligned with the historic railings. New railings should imitate the ones in Sandtorhafen. The prescribed colour is DB 703.

Stairs Leading Down to the Water

The existing stairs have all been cut into the quay walls in order to maintain the straight edges of the waterways. They are sturdily built and - because they are set back into the walls - create the impression of positive-negative contrasts, as in a black-and-white photograph. This effect must be maintained wherever new sections of quay wall are planned or old ones renovated.



Figure 57: New railing at Sandtorhafen



7.3 Street Furniture

The Speicherstadt has always been a place for working, storage and transport, and the areas reserved for moving goods around were therefore functionally designed. The very clear and strictly aligned rows of warehouses are an important and characteristic feature of the Speicherstadt and must be preserved.

Customs Clearance Facilities and Customs Fences

The areas providing access to the Speicherstadt used to be characterised by their function, which was to mark the entrance to the free port. As the Speicherstadt recently lost its free port status, the customs clearance facilities including containers with offices and toilets at both ends of the access bridges have become superfluous and have been largely removed. For reasons of heritage protection, the customs gate at Kornhausbrücke with its two containers and the roofed gate should be preserved. Being in the immediate vicinity of the Customs Museum, this former customs transit point will remain visible from there. The two single-storey restaurant buildings at the Brooktorbrücke will be kept. With the exception of the section immediately opposite the Customs Museum, the historic customs fence along the Customs Canal has been reduced in height so that it is aligned with the railings.



Figure 58: Former Customs Gate at Kornhausbrücke



Figure 59: Historic customs fence opposite the Customs Museum

Front Doors

Entrance areas and facilities such as lifts and staircases must be set back from façades and integrated into the buildings themselves.

Essential means of access such as staircases and ramps in front of buildings must be lightweight steel constructions to set them apart from the historic buildings and the old quays. The colour used must be DB 703.

Terraces

Outdoor tables and chairs provided by cafés and restaurants are generally welcome because they lend a lively atmosphere to the Speicherstadt. They must, however, comply with certain design requirements and will only be permitted as non-permanent street furniture. In accordance with the Ordinance on the Design of the Speicherstadt, it is generally forbidden to enclose terraces and seating areas by putting fences or hedges around them. There should also be a general rule whereby the use of parasols is only permitted if they are free of advertising and in white or natural colours. The surfaces of tables and chairs must be made of natural materials. There must be no plastic furniture.

Refuse Containers

In accordance with the Ordinance on the Design of the Speicherstadt refuse containers must be kept inside buildings.

Cycle Racks

The Hamburg Building Code (HBauO) stipulates that parking spaces must be provided for bicycles. Within the Speicherstadt these spaces must be inside buildings. It seems conceivable that additional parking facilities for bicycles could be integrated into the loading and unloading zones, which will in future be private. In highly frequented areas such as Kehr wieder or around St. Annen square, public cycle racks also need to be provided. The design and shape of the racks must be the same as in the HafenCity, namely rectangular and painted in the colour DB 703.



Bike Rental Stations

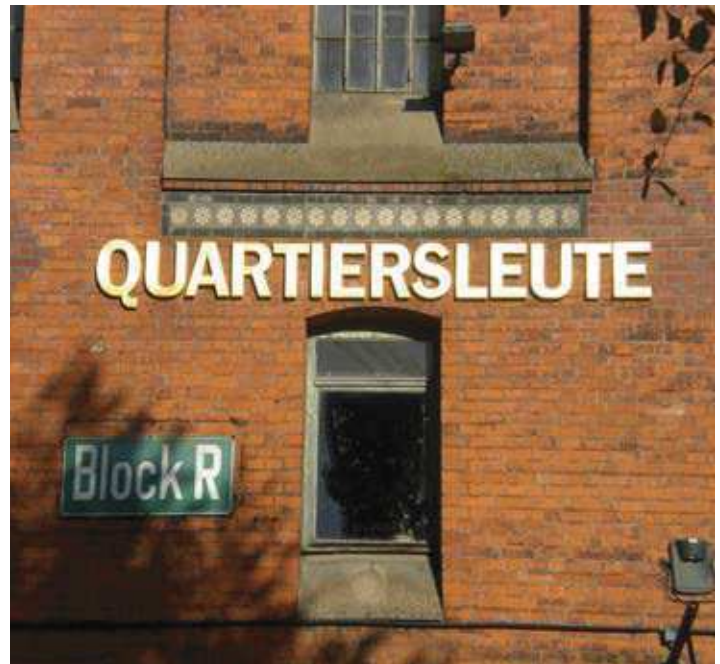
In 2009, Hamburg launched a rental bike system with a number of collection and drop-off points at central locations in the city. There will be one such point next to warehouse block D. It will be located on the corner of Auf dem Sande and Kehrwieder.



Advertising

The Ordinance on the Design of the Speicherstadt contains the following rules on advertising:

- Advertising is only allowed if it refers directly to the services performed in that particular location. It has to take the form of black plaques placed next to entrances and attached directly on to the façade of the building housing the company in question. The signs must have gold lettering or semi-relief golden letters and their size and design must be in keeping with existing plaques and name plates. There must not be more than one company name plate on each section of the façade and such name plates must not be too close to the corners of buildings. Nor must they cover or in any way interfere with the structural or ornamental elements of existing façades.
- Vending machines and display cases are not permitted close to façades.
- Other than the advertising on façades, advertising will not be permitted in the public spaces of the Speicherstadt. Exceptions are so-called “customer stoppers” or A-Boards, outside shops, which are in keeping with the requirements of heritage protection. These boards must have a black background and golden lettering. As well as being used for advertising, they also provide information about other sights and attractions in the Speicherstadt and the HafenCity.



Information and Signposting

Along the route formed by Am Sandtorkai and Brooktorkai there are five information boards, which are part of the pedestrian guidance system which was introduced in 2006.

In 2002, a series of information boards was introduced to provide visitors with information about cultural and leisure activities, cafés and restaurants in the Speicherstadt and the HafenCity. These billboards are very unobtrusive. In line with the other historic signs and plaques, they have to be black with gold lettering.

Benches and Litter Bins

With the exception of St. Annen square and one end of Jungfernbrücke, where the street widens, there will be no benches or other street furniture in the Speicherstadt. Litter bins in the Speicherstadt will have to be of a uniform design that has yet to be finalised and agreed. The colour to be employed is DB 703.



Figure 60: The Hamburg pedestrian guidance system

Figure 61: Signage Speicherstadt / HafenCity



Figure 62: Locations of information boards in the Speicherstadt and the HafenCity

7.4 Trees and Greenery in the Speicherstadt

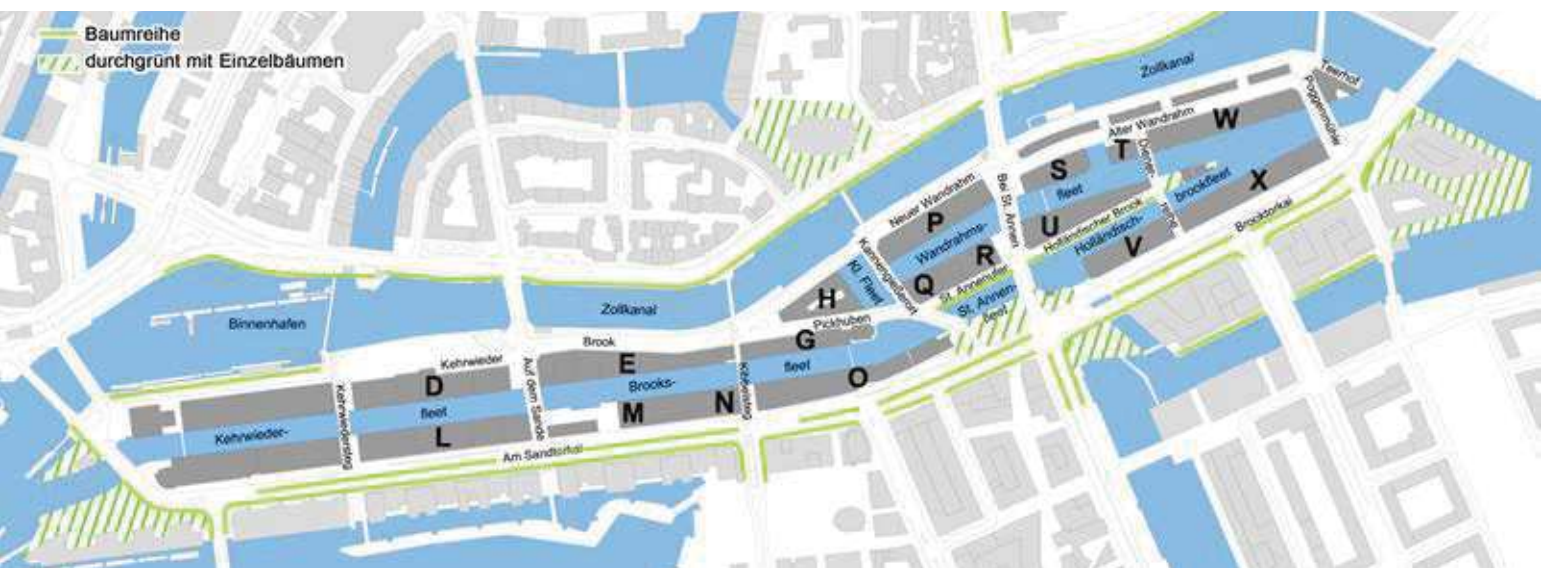
Traditionally, the Speicherstadt did not have much in the way of greenery, as this historic district was given to the storage, transshipment and transport of goods on streets and canals which were made of stone or masonry. Trees would have obstructed the waterways and thoroughfares and the land reclaimed was too precious to use for parks and the like. There are no plans to add more trees to the Speicherstadt in the future.

There are, however, some exceptions, such as the embankments on the St. Annenfleet and the Holländischbrookfleet waterways, in the central part of the Speicherstadt. Also, on Kehrwieder, on Dienerreihe, at the confluence of the Wandrahmsfleet and Holländischbrookfleet waterways and at 4, Dienerreihe, existing groups of trees will be supplemented and new ones planted where necessary. Another exception is along Am Sandtorkai and Brooktorkai. In this transition zone between the Speicherstadt and the HafenCity, there is an uninterrupted row of lime trees in both the central reservation and the adjacent areas to the south.

Flower beds and hedges have developed rather haphazardly in recent years and will be removed in the course of the rehabilitation and restructuring work.



Figure 63: Vegetation in the Speicherstadt



7.5 Artificial Illumination in the Speicherstadt

For more than a hundred years, the Speicherstadt was a dark silhouette against the night skies. The warehouses and stored goods did not need to be illuminated when dusk fell. Up until the year 2000, the Speicherstadt was a foreboding and inaccessible place at night.

Since 2001, the Speicherstadt has been illuminated at night thanks to the lighting concept developed by the illumination artist Michael Batz, whose non-profit making association Licht-Kunst-Speicherstadt e.V. (Light & The Arts in the Speicherstadt) funded the project. The illumination emphasizes the vertical structures of the buildings in the Speicherstadt, while leaving the rooftops in darkness and is reminiscent of the night-time scene in days gone by. The lighting design highlights the diversity of design and shapes in the Speicherstadt and for the general public creates the impression that they are walking through an almost medieval environment.

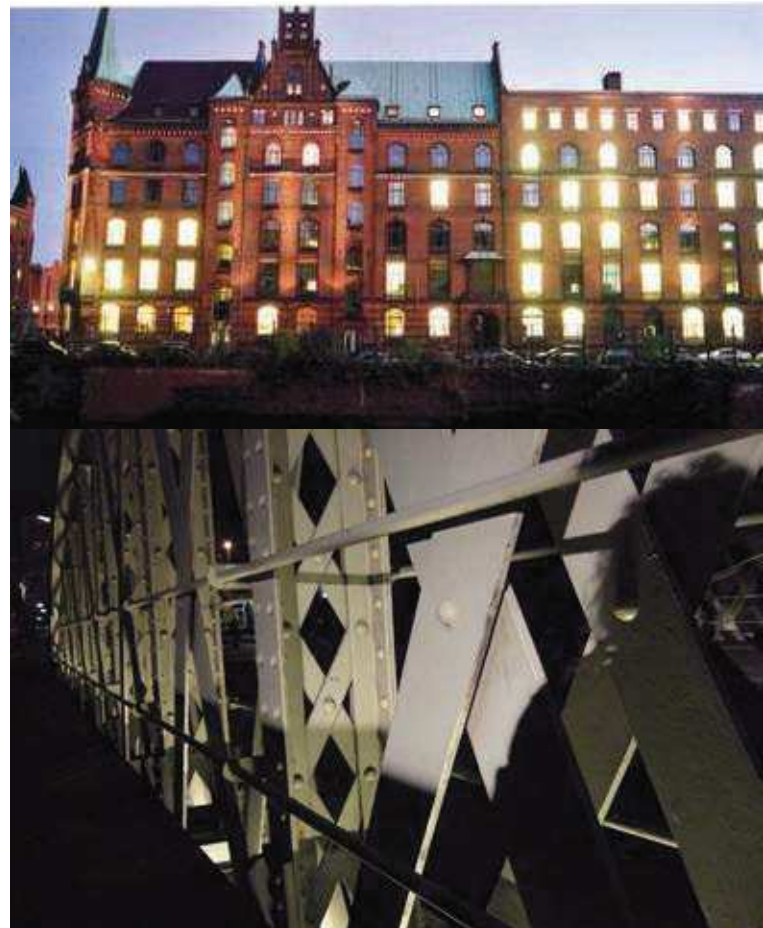
The Ordinance on the Design of the Speicherstadt contains the following requirements on artificial illumination:

- Outdoor lights are permitted provided that they match the existing simple wall lamps on façades.
- The type of light used must be warm white (3000 to 4000°K). There must be no coloured lighting on façades or in parts of buildings where such light would be visible from the street.
- During the hours of darkness, roof surfaces must remain unlit. It is not permitted to illuminate roofs and no light must emanate from sky lights or rows of roof top windows.

In addition, the water surface and the quay walls will not be lit. Rather, the waterways will mirror the night-time image of the Speicherstadt. The underside of bridges will be illuminated.



Figure 64: Illumination of the Speicherstadt



Front Doors

The illumination of front door areas currently varies considerably from building to building. HHLA and the competent authorities will shortly agree on a standard outdoor light that will be installed at all front doors.

Figure 65: Different types of wall lamps



Street Lights and Lighting in Public Spaces

Streets and other public spaces in the Speicherstadt are currently lit by standard linear luminaire street lamps, which are mounted on 18 bracket poles and 32 wall brackets. In Bei St. Annen, where new street lighting is being planned, it has been decided to use lamps based on a historic design. These Bad Kissingen lamps are similar to the lamps that were originally fitted on the tops of bridge rail-

ings. Elsewhere in the Speicherstadt, the intention is also to employ lamps based on historic designs. The current street lamps (Peitschenleuchten) will be replaced. Experts will be commissioned to consider public street lighting and draw up an overall lighting concept for the Speicherstadt. The public street lights and the artistic illumination by Mr. Batz should not detract from each other. Rather than lamps being mounted on façades, lamp posts should be placed away from the buildings on the opposite side of the street. Given that the streets in the Speicherstadt are relatively wide and the fact that it would be preferable to have lights only on one side of the street, sufficient lighting will only be achieved if the street lights are as high as the Bad Kissingen-type lamps.



Figure 66: Historic arc lamp in the Speicherstadt (centre) and a modern imitation, the so-called Bad Kissingen lamp (left); imitation of historic pontoon lighting (right)

8. Taking Stock of the Flora and Fauna in the Speicherstadt

In 1998/99 the Speicherstadt and the HafenCity were the subject of an environmental study which, amongst other things, mapped and classified all watercourses and structurally rich old warehouse buildings as valuable biotopes.

The study produced the following results: The Speicherstadt is characterised by small islands which are situated in the tidal estuary of the River Elbe. Together, embankments and watercourses occupy a large proportion of the space available in the Speicherstadt. The land has for the most part been sealed by backfilling and the construction of buildings on it. Despite the fact that the original river marshland has been significantly transformed from its natural state, the Speicherstadt ensemble of brickwork, quay walls, buildings and wood pilings, together with the biological activity in the water, features significant biological diversity, specificity and quality.

Quay Walls and Embankments

The species at significant risk can primarily be found in a limited number of areas, such as endangered ferns and mosses in the old quay walls in and around the Speicherstadt. In fact, some species have been found which are highly endangered

The old overgrown clinker and natural stone walls with their highly structured surfaces could provide good habitats for highly specialised rock crevice dwellers. No study has yet been carried out of the fauna of this tidal port basin biotope. Generally speaking, old walls tend to provide good habitats and breeding grounds for endangered arachnids, wild bees and certain types of wasps.



Figure 68: Noctule bats (*Nyctalus noctula*)

Structurally rich buildings

The old warehouse buildings in the Speicherstadt are valuable for fauna. The structured external walls provide niches for species which live in rocky environments. The daytime temperatures of south-facing walls can be particularly high, which means that certain invertebrate species could become established there outside their normal habitats. The hollows and niches around the eaves of buildings are important for nesting birds. The Speicherstadt

Figure 67: Endangered species



is a flying and feeding habitat for bats. Although the warehouse architecture, with its hollows, niches and entrance holes, makes it likely that bats also live in them, no proof of this has yet been found.

The Aquatic Environment

All the port basins, canals and waterways in the Speicherstadt are ecologically important reproduction zones for the aquatic communities typical of the limnic Elbe. There is less of a current in most of the watercourses of the Speicherstadt than in the open river, which means that waterways and port basins provide unique shelter for these aquatic communities. There is a significant community of sludge worms in the waterways and canals. In areas with good throughflow, such as the Ericusgraben, molluscs have been found, and it is likely that they would also be found in other spots.

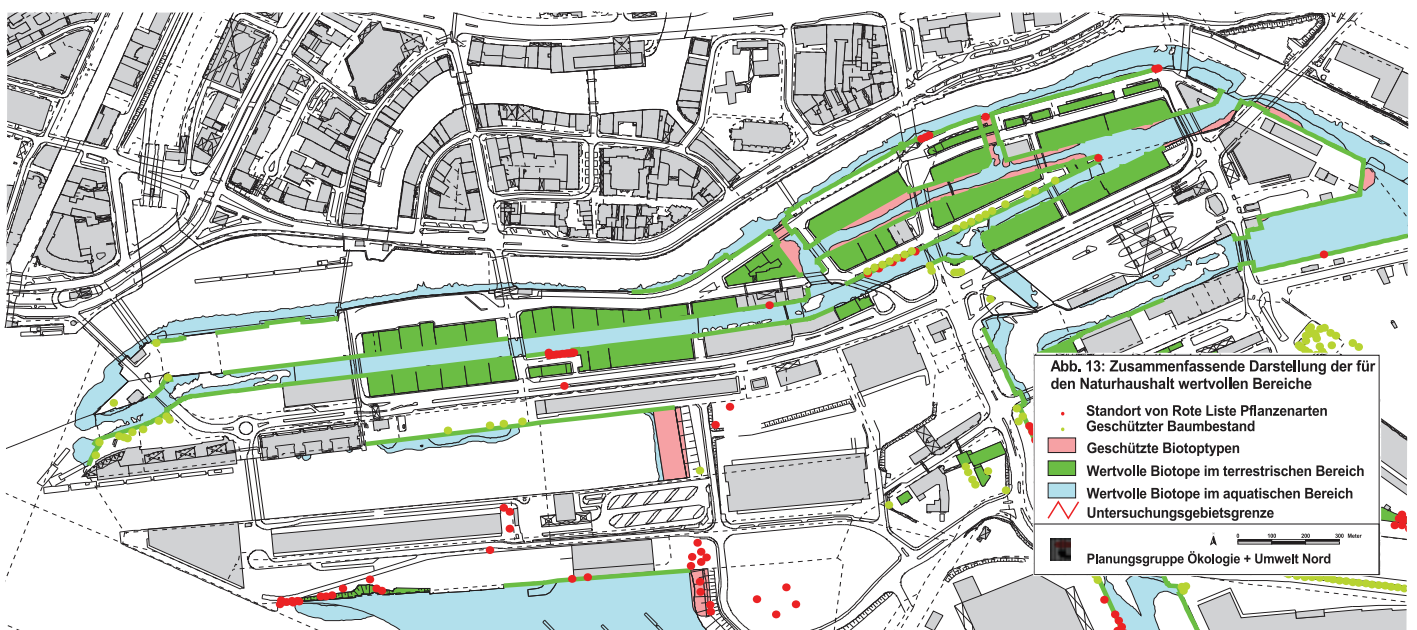


Figure 69: Sludge worms and large molluscs found in Ericusgraben

Conclusion

As the development of the Speicherstadt continues, it will be important to update our existing information about the occurrence of protected plant and animal species in the terrestrial and aquatic environments of the Speicherstadt. This will make it possible to take account of nature conservation and biodiversity requirements when drawing up detailed technical development plans.

Figure 70: Expert opinion on the Ecology of the HafenCity and the Speicherstadt, produced by Planungsgruppe Ökologie + Umwelt Nord, 1998



9. Detailed Descriptions of Individual Buildings

9.1 Warehouse Block D

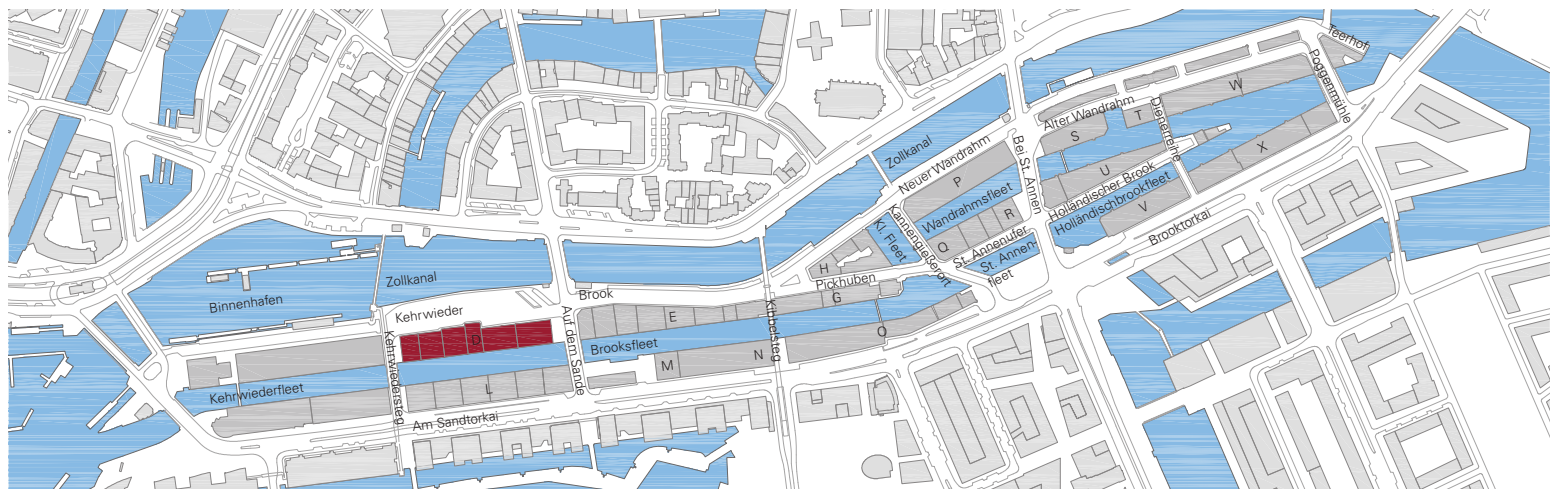


Figure 71: Location of warehouse block D

Address

1, Kehrwieierstieg and 2-7, Kehrwieier

Type of building, year of construction and name of architect/engineer

These warehouse buildings were erected during the first construction phase of the Speicherstadt between 1885 and 1889 under the leadership of Franz Andreas Meyer, Chief Engineer on the Parliamentary Consultative Committee for City Development (Baudeputation, later renamed Behörde für Stadtentwicklung und Umwelt, BSU) and with the involvement of the construction department at HFLG (now the Hamburg Port and Logistics plc = Hamburger Hafen- und Logistik Aktiengesellschaft, HHLA).

1, Kehrwieierstieg and 4-7, Kehrwieier:

These warehouse buildings were built to designs by the architect Georg Thielen in 1887 and 1888.

2, Kehrwieier:

This warehouse and shop (post office) building was built to designs by Franz Andreas Meyer between 1886 and 1888.

Current Uses

This block currently houses various cultural and commercial activities:

- Stage Entertainment – a production company that specializes in the production of shows and musicals
- Kehrwieier Theatre
- The Joop van den Ende Academy for the Training of Musical Performers
- The Kaffee-Rösterei café and restaurant
- The Miniature Toy Train Wonderland
- The Hamburg Dungeon

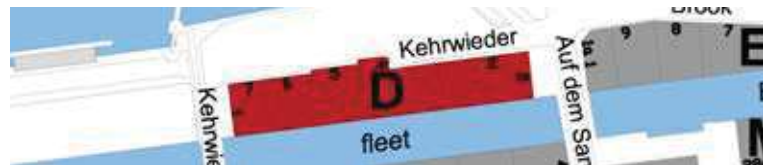
Potential for Future Uses

Continuation of current user profile with a focus on cultural activities

The Overall Architectural Design and Surrounding External Space

Block D is a typical warehouse building from the first construction phase of the Speicherstadt. The roof construction has been modified and the traditional ridge design replaced with a row of skylights. This allows more natural light to enter the building, thus ensuring that the adjoining rooms are well lit.

There is a very large open space in front of Block D with a depth of up to 40 m. It is currently being used as a car park, but urgently needs to be restructured. Because of its favourable situation within the Speicherstadt ensemble this space would be ideally suited for open-air performances such as concerts, plays, musicals, operas or operettas, as it would not cause significant conflicts of interest with neighbouring activities. While it appears to make perfect



sense to organise this type of activity in the open space in front of block D, the noise impact on neighbours would have to be assessed in detail.

Flood Protection

The only warehouse blocks with flood defences of their own are those at 4, 5 and 6, Kehrwieder. Otherwise, there is no flood protection.

Significant Conflicts and Defects

The current design of the open space in front of block D is not satisfactory.

Recommendations and Outlook for the Future

It would be desirable to redesign the open space in front of this warehouse block to align it with its surroundings. Whether parking spaces for cars and drop-off points for coaches should continue to be provided in the future is something that needs to be carefully assessed as part of that project.

Figure 72: View of warehouse block D from the north



9.2 Warehouse Block E

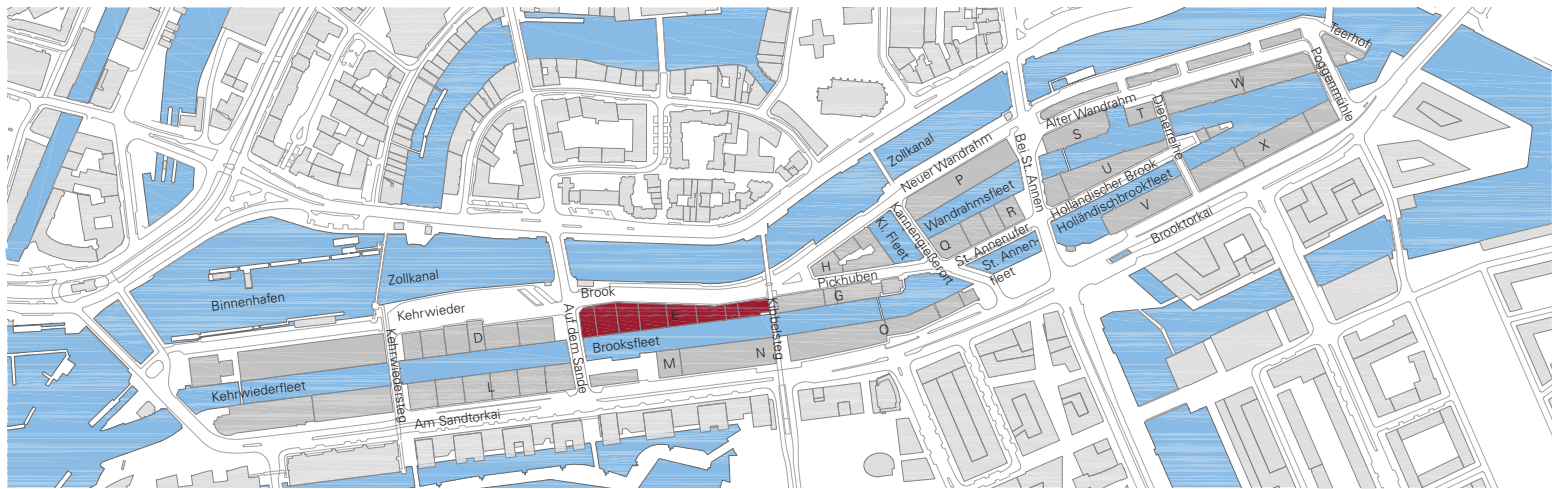


Figure 73: Location of warehouse block E

Address

1 and 1a, Auf dem Sande and 3 to 9, Brook

Type of building, year of construction and name of architect/engineer

These buildings were erected during the first construction phase of the Speicherstadt between 1885 and 1889 under the leadership of Franz Andreas Meyer, Chief Engineer on the Parliamentary Consultative Committee for City Development (Baudeputation, later renamed Behörde für Stadtentwicklung und Umwelt, BSU) and with the involvement of the construction department at HFLG (now the Hamburg Port and Logistics plc = Hamburger Hafen- und Logistik Aktiengesellschaft, HHLA).

The buildings at 1 and 1a, Auf dem Sande and 3-9, Brook were built to designs by the architect Georg Thielen in 1887 and 1888.

Current Uses

Storage, transshipment and processing of goods.
Cultural activities: film, theatre and television.

Potential for Future Uses

Continuation of current uses. In addition, after connecting the building to the Kibbelsteg, the

warehouses at 3 to 5, Brook could be used for residential purposes. This block is suitable for apartments because it is only 15 to 18 m deep. However, the windows on the north and south sides of the building are not particularly generous in size. If the entire Speicherstadt is integrated into a comprehensive flood protection system the western section of this block could also become eligible for residential use.

The Overall Architectural Design and Surrounding External Space

Block E is a typical warehouse building from the first construction phase of the Speicherstadt. The design of the open space between this building and the Customs Canal, which has a uniform depth of approx. 23 m, is unsatisfactory.

Flood Protection

The only warehouse blocks with flood defences of their own are those at 1, 5, 6, 7, 8 and 9, Brook. Otherwise there is no such protection.

Significant Conflicts and Defects

The current design of the open space in front of block E is not satisfactory.

Recommendations and Outlook for the Future

Assuming that commercial uses will dominate the semi-basement and ground-floor levels, it would be worth considering whether apartments could occupy the other storeys of block E. This warehouse is situated directly on Brooksfleet with a large open space to the north, including Brook street, which is very wide, and the Customs Canal stretching down to St. Katharinen Church. In other words, block E offers a fine view of Hamburg's city centre. The depth of the warehouse buildings at 3 to 6, Brook make them suitable for residential purposes while at 7 to 9, Brook and 1 and 1a, Auf dem Sande the buildings are up to 30 m deep. Interior courtyards will therefore be required, but thanks to the combination of gabled and flat roofs, will not necessarily have an adverse effect on the overall external architectural design.

It would be desirable to redesign the open space in front of this warehouse block to align it with its surroundings. In this context, the positioning and orientation of parking spaces should be reviewed.



Figure 74: View of warehouse block E from the north



9.3 Warehouse Block G

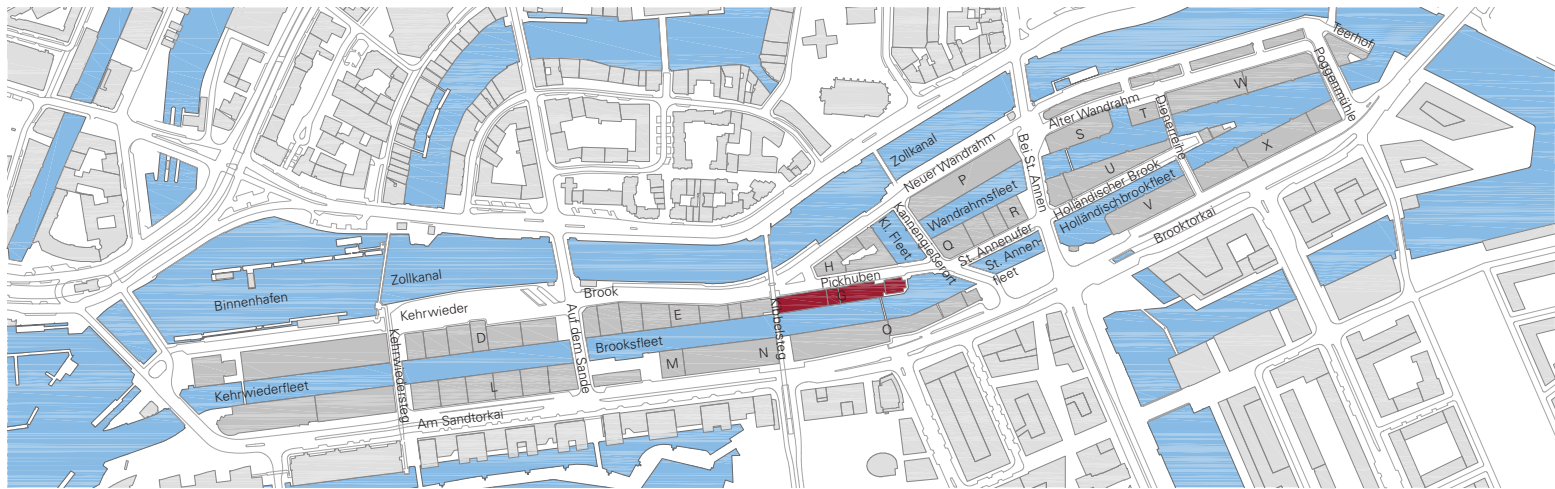


Figure 75: Location of warehouse block G

Address

Pickhuben 3, 5, 7 and 9

Type of building, year of construction and name of architect/engineer

These buildings were erected during the first construction phase of the Speicherstadt. The architect was Georg Thielen (1887/1888).

3, and 5, Pickhuben:

Both buildings were destroyed in the war in 1943. The former coffee exchange (at 3, Pickhuben) was replaced by a new building designed by the architects Kallmorgen, Schramm and Elingius in the years 1955/56. The building at 5, Pickhuben was rebuilt as early as 1953/54.

7 and 9, Pickhuben:

These warehouse buildings were built in 1887 and 1888 and were spared the destruction of World War II

Current Uses

3 and 5, Pickhuben:

Offices with garages

7 and 9, Pickhuben:

Storage, transshipment and processing of goods

Potential for Future Uses

3 and 5, Pickhuben:

Offices and/or a hotel/event venue

7 and 9, Pickhuben:

As the building is connected to the Kibbelsteg, it would be desirable to use this part of the building for apartments. If the entire Speicherstadt is integrated into a comprehensive flood protection system the eastern section of this block could also become eligible for residential use. If not, the current user profile would be maintained.

The Overall Architectural Design and Surrounding External Space

The footbridges 3, Pickhuben across Pickhuben street and the Brooksfleet waterway to warehouse blocks H and O are remarkable.

The ensemble of heterogeneous buildings of different heights in this location is similarly striking. The former coffee exchange (at 3, Pickhuben) boasts a very special auction hall where some of the original equipment has been preserved. This recalls the atmosphere of the old days when coffee auctions took place there

Flood Protection

The buildings at 7 to 9, Pickhuben are not flood-protected. The warehouse buildings at 3 and 5, Pickhuben have their own flood defences.



Significant Conflicts and Defects

No obvious problems

Recommendations and Outlook for the Future

Together with the office building at 4 and 5, Am Sandtorkai, which is connected by footbridge to 3, Pickhuben, block G could potentially be used as a hotel. Alternatively, its current use as an event venue could be extended. The buildings at 5, 7 and 9, Pickhuben would also easily qualify for residential use because they are not too deep.

Figure 76: View of warehouse block G from the north

Figure 77: View of the Coffee Exchange from the east



Flood Protection

This block is not flood-protected.

Significant Conflicts and Defects

No obvious problems

Recommendations and Outlook for the Future

It would be preferable not to restore the original roof as this would significantly undermine the architectural quality of the partial reconstruction and repair work performed after World War II.



Figure 79: View of warehouse block H from the north

9.5 Warehouse Block L

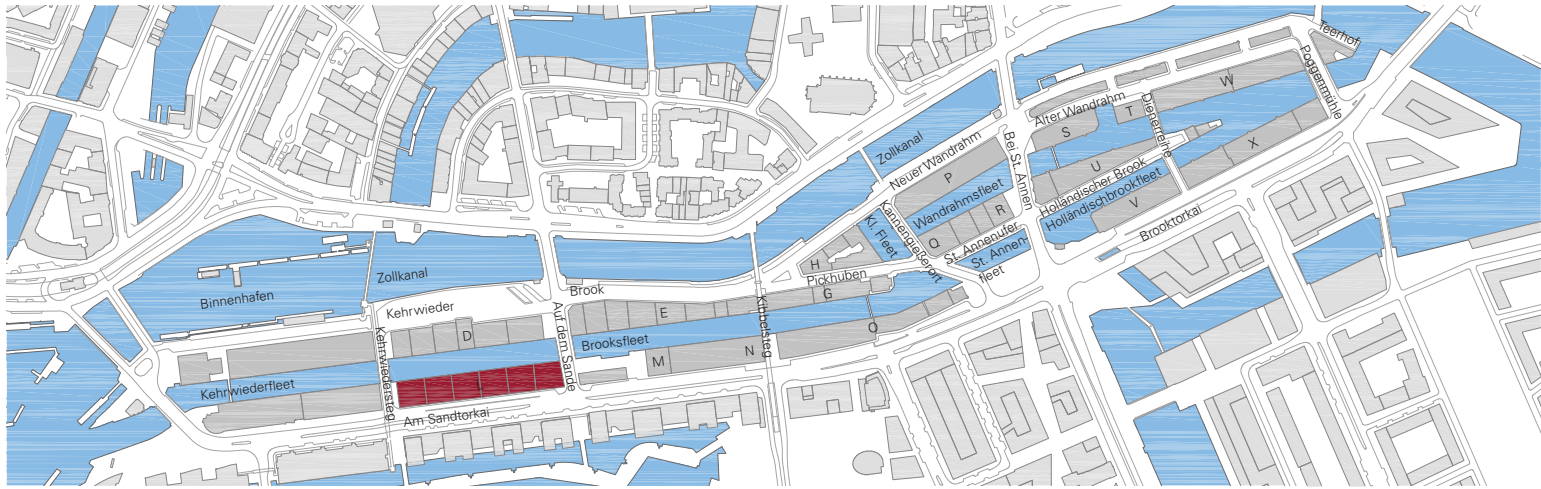


Figure 80: Location of warehouse block L

Address

31 - 36a, Sandtorkai and 4, Auf dem Sande

Type of building, year of construction and name of architect/engineer

These warehouse buildings were erected during the first construction phase of the Speicherstadt between 1885 and 1889. They were built under the leadership of Franz Andreas Meyer, Chief Engineer on the Parliamentary Consultative Committee for City Development (Baudeputation, later renamed Behörde für Stadtentwicklung und Umwelt, BSU) and with the involvement of the construction department at HFLG (nowadays: Hamburg Port and Logistics plc = Hamburger Hafen- und Logistik Aktiengesellschaft, HHLA).

The buildings at 31 – 36a, Am Sandtorkai and 4, Auf dem Sande were built by the architect Georg Thielen between 1887 and 1888.

Current Uses

Storage and transshipment of goods, mostly carpets
32, Am Sandtorkai:

“Spicy” – the Spice Museum and Afghan Museum

Potential for Future Uses

Mixed use including retail outlets, cultural activities and offices. If the Speicherstadt is integrated into a comprehensive flood protection system this block could potentially be used for residential purposes.

The Overall Architectural Design and Surrounding External Space

Its row of identical, individual warehouse buildings make this repetitive block a prototype for the warehouses of the first construction phase.

The southeast corner of block L was hit by a bomb during World War II, but was then rebuilt in 1957 in a very inconspicuous manner using a reduced version of the architectural language of the Speicherstadt. The reconstruction efforts are commemorated by the ornamental figure “1957” in the brickwork below the eaves at 31, Sandtorkai.

Flood Protection

The buildings at 35, 36 and 36a, Sandtorkai have flood defences of their own. Otherwise, there is no flood protection in this zone.

Significant Conflicts and Defects

No obvious problems

Recommendations and Outlook for the Future

Block L could be connected to block D by a bridge. This would allow existing cultural activities and other uses (such as the Miniature Toy Train Wonderland, Miniaturwunderland) to be further developed or new ones introduced, in combination with the offices in the end-of-row buildings. If the Speicherstadt is integrated into the flood protection systems of the city centre and the HafenCity, the upper storeys of this block could be used for residential purposes.

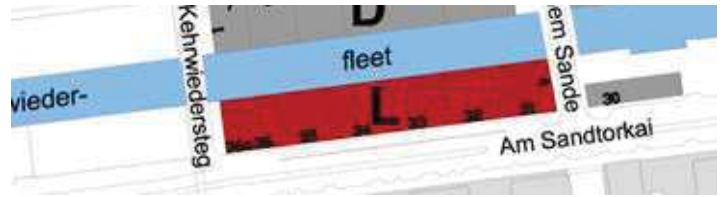


Figure 81: View of warehouse block L from the south



9.6 Warehouse Blocks M + N and Former Boiler House

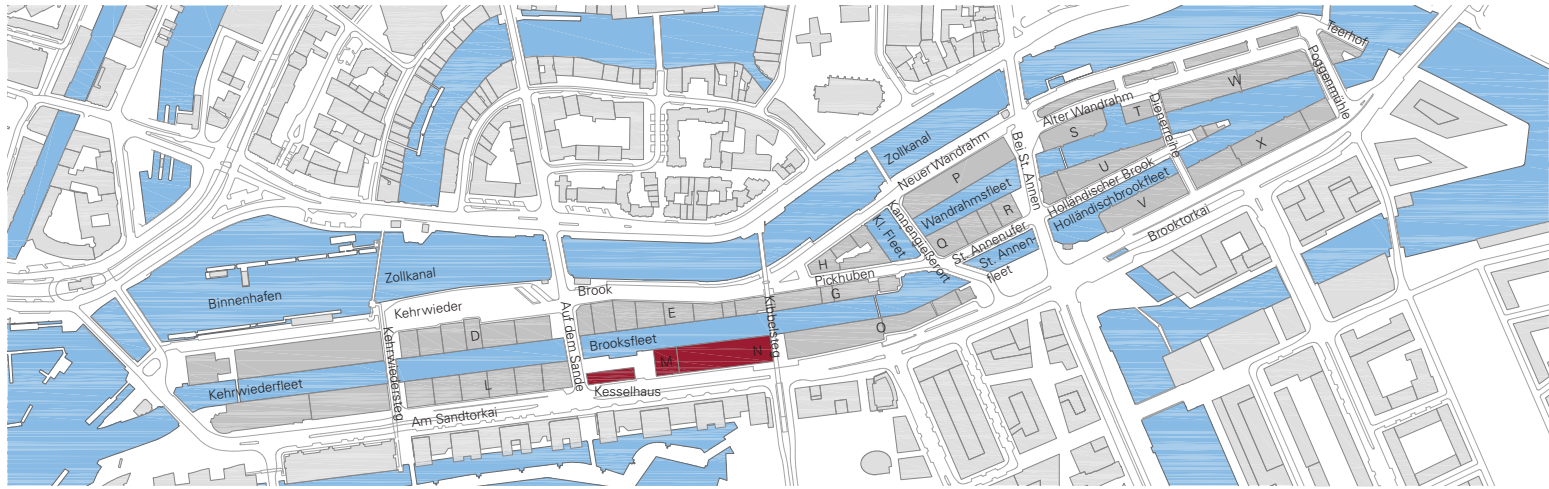


Figure 82: Location of warehouse blocks M + N

Address

23 -30, Sandtorkai

Type of building, year of construction and name of architect/engineer

These warehouse buildings were erected during the first construction phase of the Speicherstadt between 1885 and 1889. They were built under the leadership of Franz Andreas Meyer, Chief Engineer on the Parliamentary Consultative Committee for City Development (Baudeputation, later renamed Behörde für Stadtentwicklung und Umwelt, BSU) and with the involvement of the construction department at HFLG (now the Hamburg Port and Logistics plc = Hamburger Hafen- und Logistik Aktiengesellschaft, HHLA).

Warehouse block M:

The top floors of warehouse block M at 26 – 28, Am Sandtorkai were destroyed during World War II. These floors were rebuilt incorporating new winch bays after the war, but the building at 28, Am Sandtorkai was not restored to its original height. The plot of land at 29, Sandtorkai was not built on.

Former Kesselhaus (Boiler House):

The Boiler House at 30, Sandtorkai, was also se-

verely damaged during World War II. After the war, the Kesselhaus was only repaired temporarily while it housed the electricity power station, which was finally decommissioned in 1954. Between 1999 and 2001, the Hamburg-based architects GMP – Gerkan, Marg und Partner – and the Stuttgart engineering firm SBP – Schlaich Bergermann Partner – completely rehabilitated the boiler house building.

Current Uses

Storage, transshipment and processing of goods. At 23, Am Sandtorkai there is a market hall which is used by various restaurants and catering outlets. The former Boiler House at 30, Am Sandtorkai is now a HafenCity information centre and café.

Potential for Future Uses

The current mix of different uses can be continued.

At 23 and 25, Sandtorkai where there is a connection with the elevated Kibbelsteg, residential use would be possible on the upper floors. If the Speicherstadt is integrated into a comprehensive flood protection system the other sections of this block to the west could potentially also become suitable for residential use. If not, the current mixed use would be continued.

The Overall Architectural Design and Surrounding External Space

With its two “new” filigree steel chimneys, which architecturally resemble the original ones, and its modern interior, the former boiler house is a prime example of how to restore a building while retaining residual parts of the original building fabric. By contrast, the building at 28a, Sandtorkai, which lost its upper floors during the war, makes it look as though there is a gap in the restored blocks M + N.

Flood Protection

There is no flood protection.

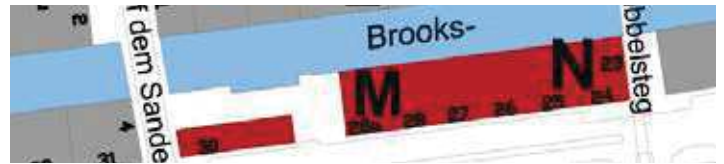
Significant Conflicts and Defects

The building at 28a, Sandtorkai is still not aligned with the neighbouring buildings, as the upper floors were never rebuilt.

Recommendations and Outlook for the Future

It is recommended that the missing upper floors of the building at 28a, Am Sandtorkai be rebuilt and that the vacant plot at 29, Am Sandtorkai be used for a new building.

If the Speicherstadt is integrated into the flood protection systems of the city centre and the HafenCity, permission should also be given to use the



sections further away from Kibbelsteg for residential purposes.

Alongside its current function as a HafenCity information centre, the Boiler House would be an ideal future location for a World Heritage Site Communication Centre, with exhibitions, events, guided tours and cafés. In fact, the creation of such a communication centre is one of UNESCO's requirements for world heritage sites.

Figure 83: View of warehouse blocks M and N from the south, together with the former boiler house



9.7 Warehouse Block O

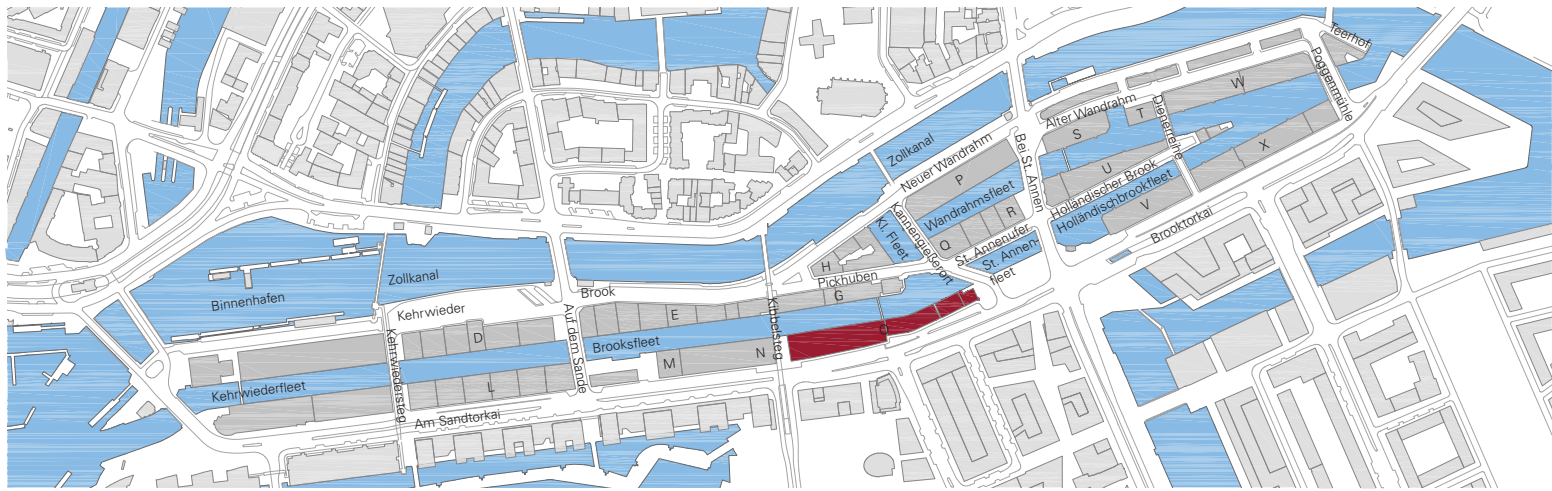


Figure 84: Location of warehouse block O

Address

1 – 8, Sandtorkai

Type of building, year of construction and name of architect/engineer

These buildings were erected during the first construction phase of the Speicherstadt between 1885 and 1889. They were built under the leadership of Franz Andreas Meyer, Chief Engineer on the Parliamentary Consultative Committee for City Development (Baudeputation, later renamed Behörde für Stadtentwicklung und Umwelt, BSU) and with the involvement of the construction department at HFLG (now the Hamburg Port and Logistics plc = Hamburger Hafen- und Logistik Aktiengesellschaft, HHLA).

1, Am Sandtorkai:

This office building was designed by the architects Hanssen & Meerwein and Stammann & Zinnow between 1885 and 1888. It was the first main administrative building of the HFLG (now HHLA).

2 – 3, Am Sandtorkai:

This warehouse was severely damaged during World War II. It was reconstructed after the war, closely following the original design.

4 – 5, Am Sandtorkai:

This office building was rebuilt by the architect Werner Kallmorgen between 1955 and 1959.

6 – 8, Am Sandtorkai:

Built in 1887, the original building in this location was flattened during World War II and reconstructed in a contemporary style to a design by Werner Kallmorgen in 1957. That building was demolished in 2003 to make way for a multi-storey car park, which was designed in co-operation with the architects GMP – Gerkan, Marg und Partner. The multi-storey car park has the same dimensions as the former building and attempts to emulate the characteristic Speicherstadt design. The multi-storey car park opened in 2004.

Current Uses

1 – 5, Am Sandtorkai:

Offices

6, Am Sandtorkai:

Multi-storey car park

Potential for Future Uses

These buildings will continue to be used as offices and a multi-storey car park. There are plans to convert the office building at 4 - 5, Am Sandtorkai into an hotel.

The Overall Architectural Design and Surrounding External Space

The office building at 1, Am Sandtorkai is characterised by an exceptionally romantic architectural style that is not typical of the Speicherstadt: It features bay windows, turrets and towers, balconies and a massive gable end. It housed the administrative headquarters of the HFLG – later renamed the HHLA – until 1904.

Flood Protection

Of the buildings described here, only the multi-storey car park has its own flood defence system, which protects it against floods of up to 7.50 m above sea level (NN = tidal reference level).

Significant Conflicts and Defects

No obvious problems

Recommendations and Outlook for the Future

The office building at 4 – 5, Sandtorkai could be made available for new uses while preserving its façade and supporting structure.

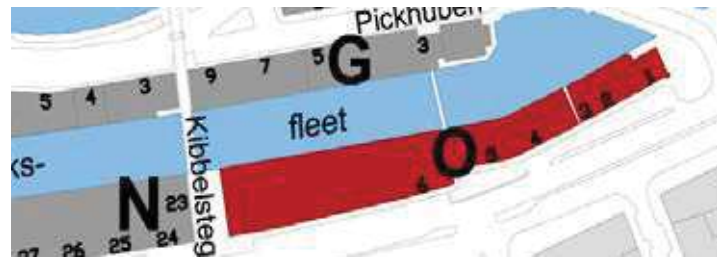


Figure 85: View of warehouse block O from the south multi-storey car park

Figure 86: View of warehouse block O from the south



9.8 Warehouse Block P

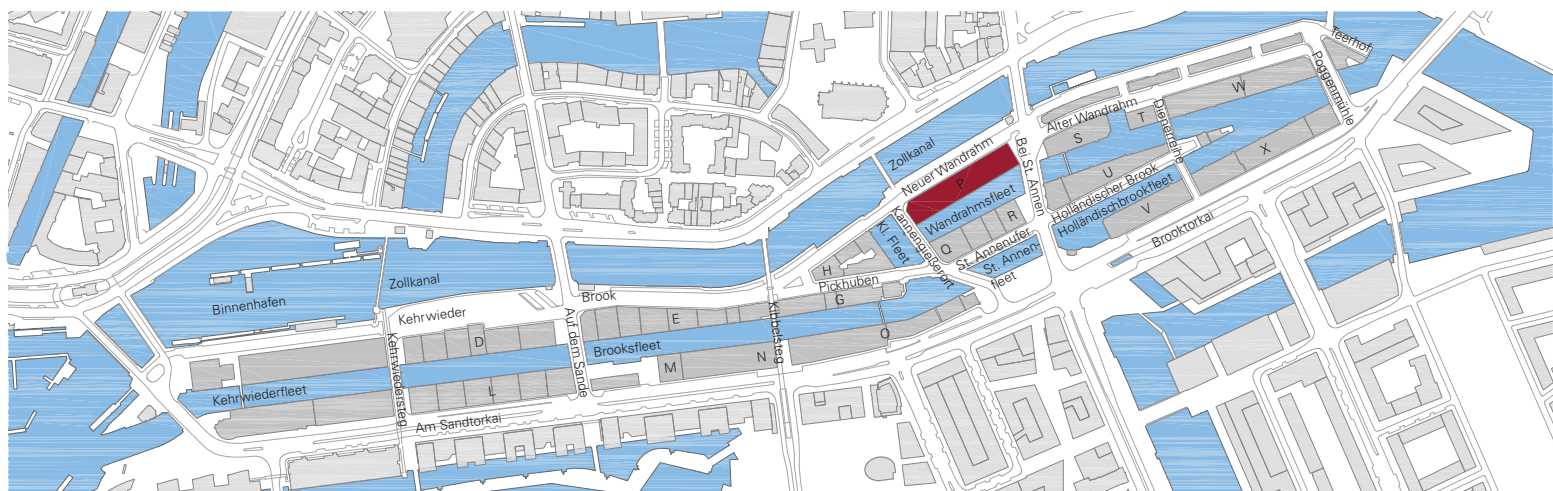


Figure 87: Location of warehouse block P

Address

5, Kannengiesserort and 1 – 4 Neuer Wandrahm

Type of building, year of construction and name of architect/engineer

These warehouse buildings were erected during the second construction phase of the Speicherstadt between 1890 and 1898. The buildings at 5, Kannengiesserort and 1 – 4 Neuer Wandrahm were built to designs by the architect Georg Thielen between 1891 and 1896.

Current Uses

5, Kannengiesserort:
Offices of the Hamburg Port Authority (HPA)
1 – 4, Neuer Wandrahm:
Offices (HPA)

Potential for Future Uses

Continuation of the current uses.

The Overall Architectural Design and Surrounding External Space

The bomb-damaged eastern front of the building at 1, Neuer Wandrahm was repaired by the architect Werner Kallmorgen after the war. The east gable of warehouse block P has a noteworthy modern

and unassuming façade, with simplified eaves and bright red roof tiles, which make it blend in well with the rest of the ensemble.

In the course of restructuring the building to convert it into an office block, an atrium was created, which is lit by a row of sky lights.

Flood Protection

There is no flood protection.

Significant Conflicts and Defects

No obvious problems.

Recommendations and Outlook for the Future

A comprehensive flood defence system will be necessary for block P.



Figure 88: View of warehouse block P from the north



9.9 Warehouse Blocks Q + R

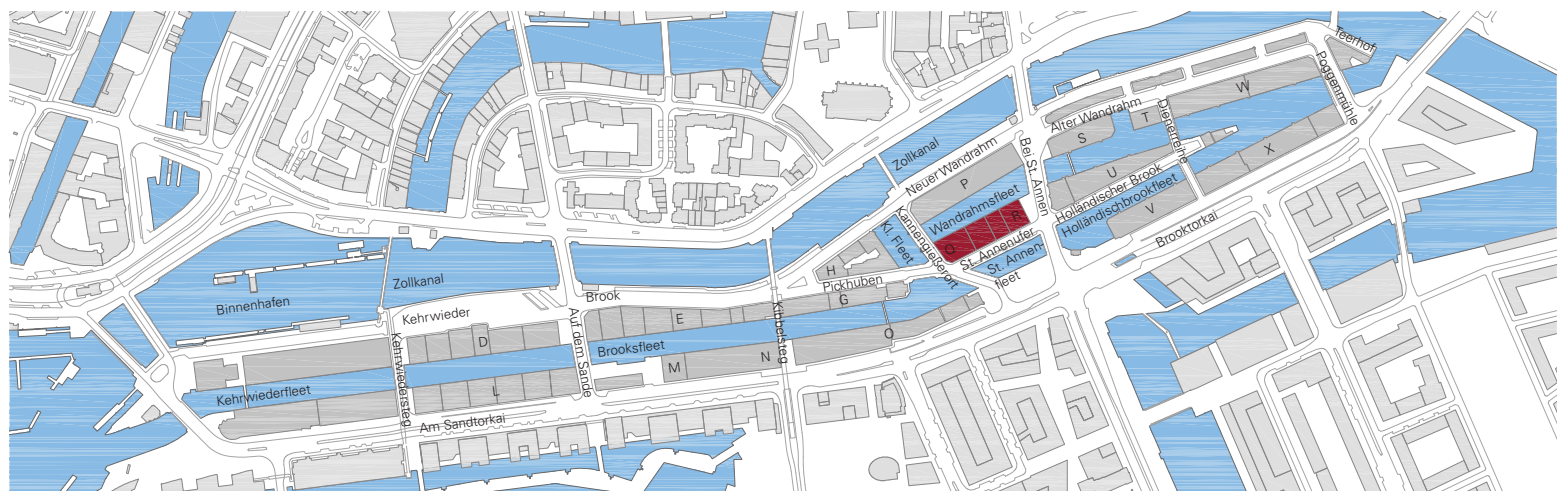


Figure 89: Location of warehouse blocks Q + R

Address

7, Kannengiesserort, 2 – 6, St. Annenufer and 2, Bei St. Annen

Type of building, year of construction and name of architect/engineer

These buildings were erected during the second construction phase of the Speicherstadt between 1890 and 1898.

The warehouse buildings at 7, Kannengiesserort and 2 – 6, St. Annenufer were built to designs by the architects Hannsen & Meerwein between 1881 and 1897.

The administrative building at 2, St. Annen (housing the Freihafenamt, Free Port Authority) was destroyed during the war and rebuilt by the architect Werner Kallmorgen between 1953 and 1954.

Current Uses

Storage, transshipment and processing of goods.

2, St. Annenufer:

Museum of the Speicherstadt

2, Bei St. Annen:

Offices (until recently: customs administration)

Potential for Future Uses

If the Speicherstadt is integrated into a comprehensive flood protection system this block could potentially be suitable for residential purposes or as an hotel. If not, the current mixed use including offices would be continued.

The Overall Architectural Design and Surrounding External Space

Next to the “classical” warehouses on St. Annenufer, the end-of-row building at 2, Bei St. Annen is a remarkable modern building. With its skeleton frame construction, its well-proportioned yet rigorous façade and its brickwork, it fits in perfectly with the surrounding buildings. This symbiosis of old and new is crowned by a “reduced” gallery at roof level. A simple series of pillars replicating the grid of the reinforced concrete skeleton structure behind the brickwork façade surrounds the top floor.

The buildings at St. Annenufer, Holländischer Brook and Bei St. Annen form a central square in the Speicherstadt. Together with the St. Annenfleet waterway and the neighbouring waterways, its rows of trees and bridges, this area also forms the heart of the Speicherstadt.

Flood Protection

There is no flood protection.

Significant Conflicts and Defects

There are visible defects on St. Annenufer which require urgent rehabilitation. The road surfaces are inadequate considering the significance of the location, and the embankment with its row of trees is in a poor state of repair. Conflicts of interest are also apparent from the traffic in this area: Heavy goods lorries bound for the Speicherstadt still mingle with through-traffic to the HafenCity and motorists looking for somewhere to park.

Recommendations and Outlook for the Future

As regards block Q, the intention is for it to be mixed use and to include storage areas, showrooms, retail outlets and offices. The block R end-of-row warehouse at 2, St. Annen will continue to be developed for office and other commercial uses. The flag posts attached to the corner pillars of the roof gallery at 2, St. Annen should be removed.



Figure 90: View of warehouse blocks Q and R from the south



9.10 Warehouse Blocks S + T

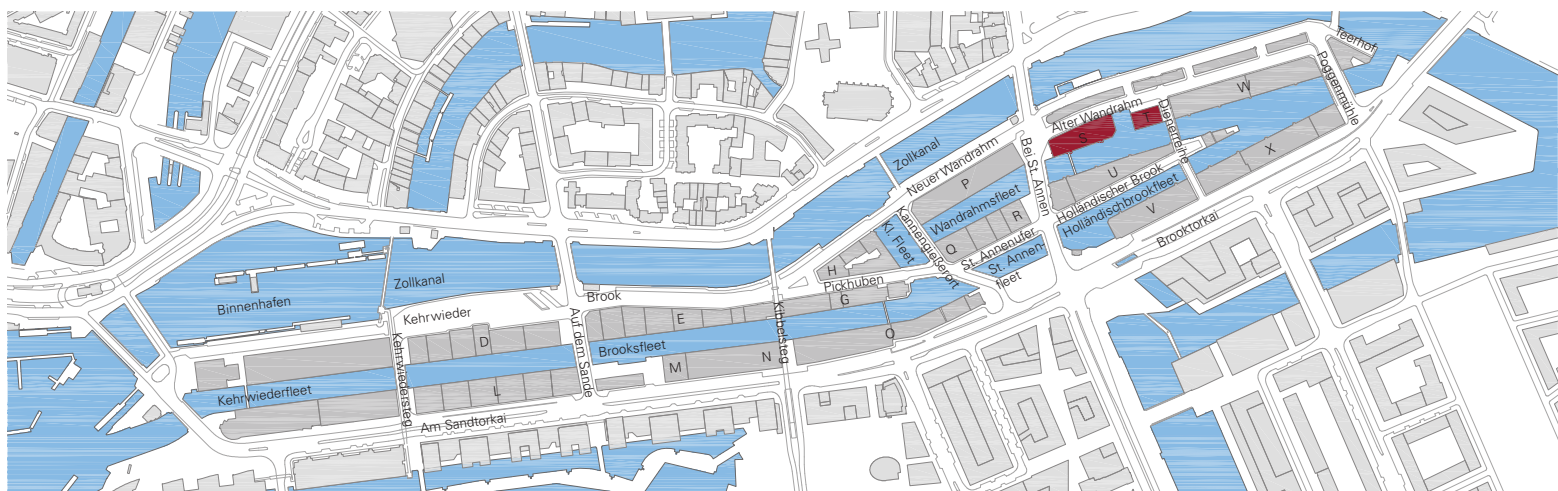


Figure 91: Location of warehouse blocks S + T

Address

12 – 15, Alter Wandrahm

Type of building, year of construction and name of architect/engineer

These buildings at 12 – 15, Alter Wandrahm were erected during the third construction phase of the Speicherstadt, i.e. between 1899 and 1927.

Block S:

The warehouses at 13 – 15, Alter Wandrahm were built to designs by the architect Gustav Schrader between 1899 and 1912.

Block T:

This warehouse at 12, Alter Wandrahm was destroyed during WW II and rebuilt to designs by the architect Werner Kallmorgen between 1965 and 1967.

Current Uses

Block S: The HHLA (Hamburger Hafen und Logistik Aktiengesellschaft) currently uses this as an office building. There is also a restaurant on the ground floor (15, Alter Wandrahm).

Block T: Used by the HHLA as office building. It is also used as a garage.

Potential for Future Uses

Continuation of the current uses.

The Overall Architectural Design and Surrounding External Space

Block S reflects the traditional Speicherstadt style whereas, much like the end-of-row building in block R, block T is a modern building. It is built in a confident architectural style, free of any specific architectural trends.

Flood Protection

Part of block T has its own flood defences.

As regards block S, there are no flood defences except for at 13, Alter Wandrahm.

Significant Conflicts and Defects

No obvious problems.

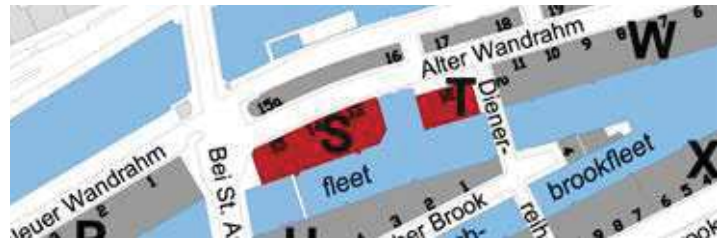


Figure 92: View of warehouse block S from the south

Figure 93: View of warehouse block T from the south



9.11 Warehouse Block U and „Wasserschlösschen“

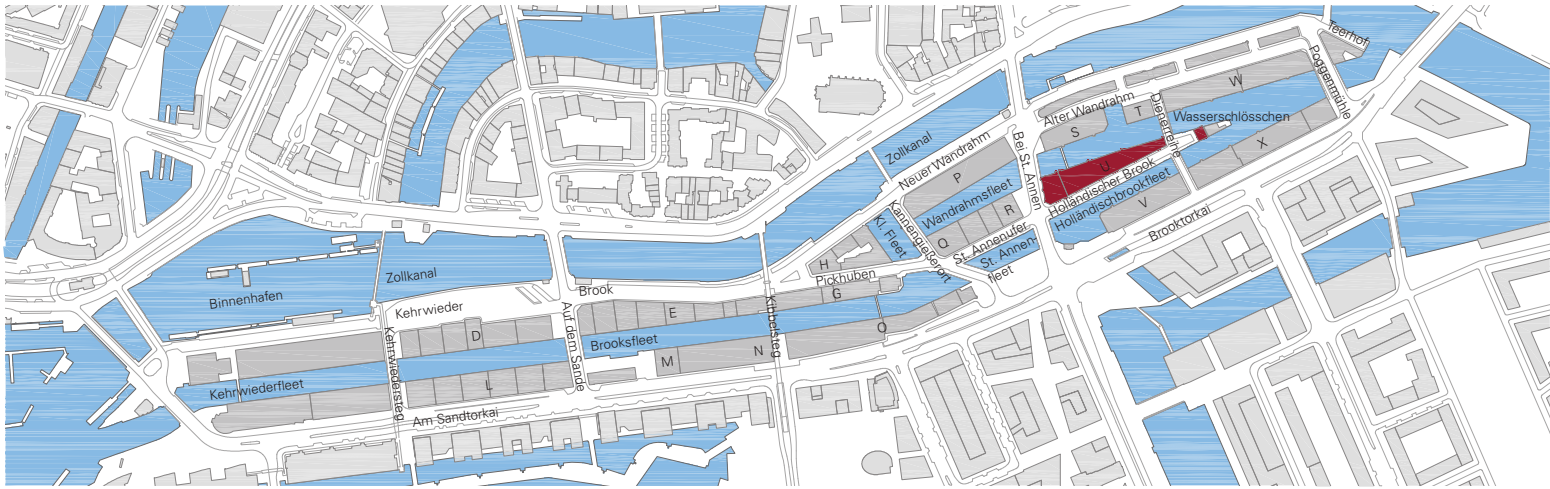


Figure 94: Location of warehouse block U

Address

1, St. Annen, 1 – 7, Holländischer Brook and 4, Dienerreihe

Type of building, year of construction and name of architect/engineer

These buildings were erected during the third construction phase of the Speicherstadt, i.e. between 1899 and 1927.

1, Bei St. Annen:

The so-called town hall of the Speicherstadt, now the head office of the HHLA, was built to designs by the architects Hanssen & Meerwein and Johannes Grotjan between 1902 and 1903.

1 – 7, Holländischer Brook:

These warehouses were built to designs by the architects Hanssen & Meerwein around 1903. Since 2000 they have been used as offices.

4, Dienerreihe:

This building, which is affectionately known as the “little water castle” (Wasserschlösschen) was built between 1899 and 1912 as a residence for the Director of the Port of Hamburg.

Current Uses

Block U has been the head office of the HHLA since 1904.

Wasserschlösschen:

A flat and various other small-scale activities

Potential for Future Uses

Will continue to be used as offices. If the Speicherstadt is integrated into a comprehensive flood protection system, the upper floors of the Wasserschlösschen should be made available for residential purposes. On the ground floor, a new retail outlet with a clear connection to the Speicherstadt should be created, together with a restaurant.

The Overall Architectural Design and Surrounding External Space

For more than 100 years, the grand Neo-Renaissance building at 1, Bei St. Annen has been the head office of the HHLA. It is commonly known as the ‘townhall of the Speicherstadt’. This building is situated in a very prominent location along the north-south route from the Rathausmarkt to the HafenCity. The Wasserschlösschen, an eclectic variant of late Dutch Renaissance style is, by contrast, located inconspicuously between the Holländischerbrookfleet and Wandrahmsfleet waterways.

Flood Protection

There is no flood protection, except for the buildings at 2 - 6, Holländischer Brook which have their own flood defences which protect them from floods of up to 6.75 m above sea level (NN = tidal reference level).

Significant Conflicts and Defects

No obvious problems.

Recommendations and Outlook for the Future

The prestigious embankment promenade along the Holländischbrookfleet waterway and the open space in front of the Wasserschlösschen need to be restored to their former glory. This is particularly important in the light of their prominent location.



Figure 95: "Town Hall" of the Speicherstadt

Figure 96: View of warehouse block U from the south

Figure 97: View of the Wasserschlösschen (Little Water Castle) from the west



9.12 Warehouse Block V

and Fleetschlösschen ("Little Castle on the Canal")

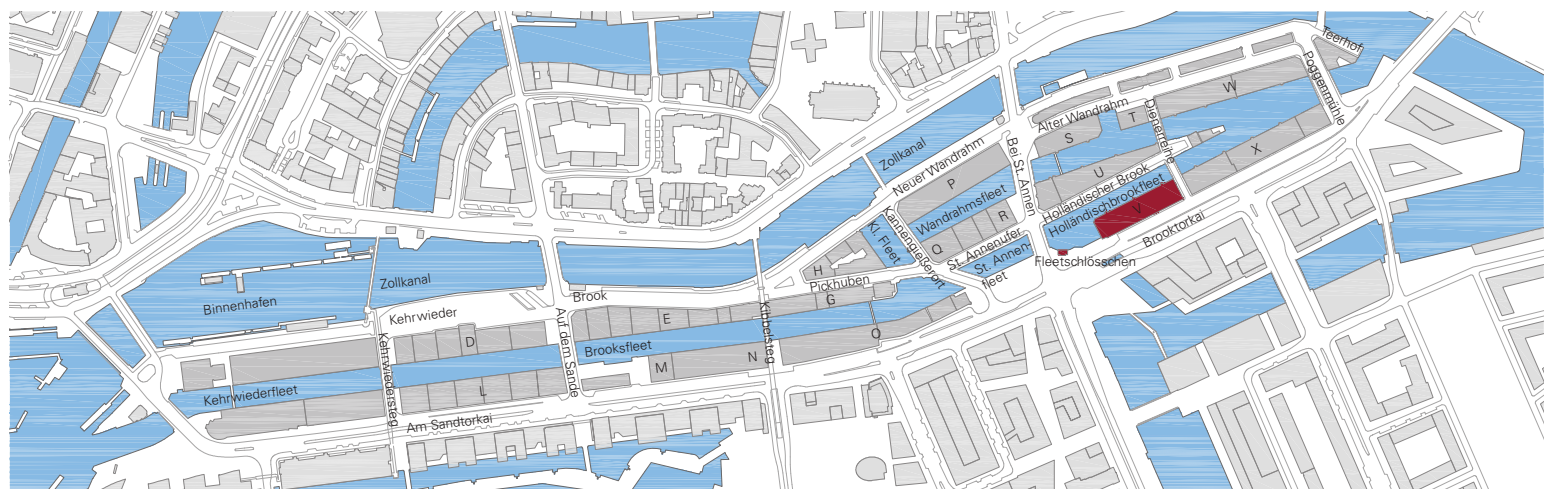


Figure 98: Location of warehouse block V

Adress

11 – 17, Brooktorkai

Type of building, year of construction and name of architect/engineer

These buildings were erected during the third construction phase of the Speicherstadt, i.e. between 1899 and 1927.

Block V:

The warehouses at 11 – 16, Brooktorkai were built to designs by the architects Hanssen & Meerwein between 1905 and 1907.

17, Brooktorkai:

The so-called Fleetschlösschen, formerly an informal cafeteria for blue-collar port workers and white-collar office staff, was built around 1900.

Current Uses

11 – 15, Brooktorkai:

Warehouses – storage and transshipment of goods with a focus on the carpet and textile trades, fashion and artists' studios.

End-of-row building at 16, Brooktorkai:

Offices (formerly also storage)

Potential for Future Uses

If the Speicherstadt is integrated into a comprehensive flood protection system, the upper floors could potentially be suitable for residential purposes. If not, continuation of current uses plus extension of studio space.

The Overall Architectural Design and Surrounding External Space

Though closely resembling the buildings of the first and second construction phases of the Speicherstadt, this row of warehouses has a strikingly different façade: It is in two colours, namely red brick and white plaster.

The Fleetschlösschen is particularly valuable for its function, history and architecture. Its prominent location between the Speicherstadt and the Hafen-City makes it a useful orientation point in the city.

Flood Protection

There is no flood protection.

Significant Conflicts and Defects

Heavy goods vehicles currently pass the front of block V and go along the narrow delivery road at the south front of the Speicherstadt. Unfortunately this is unavoidable at present, but it is a nuisance to pe-

destrians walking between the warehouse buildings and Brooktorkai.

Recommendations and Outlook for the Future

If the Speicherstadt is integrated into the flood protection systems of the city centre and Hafen-City and if the space in block V, which is currently used for storage, were to be converted for other uses, it is conceivable that Block V could be used for residential purposes. This possibility should be reviewed.

It will be necessary to create a sufficiently wide and flood-safe pavement for pedestrians next to the supporting wall opposite blocks V and X.

The open space in front of the Fleetschlösschen, which is currently used by cafés and restaurants, needs to be reordered.



Figure 99: View of warehouse block V from the south

Figure 100: View of Fleetschlösschen (Little Castle on the Canal) from the south



9.13 Warehouse Block W

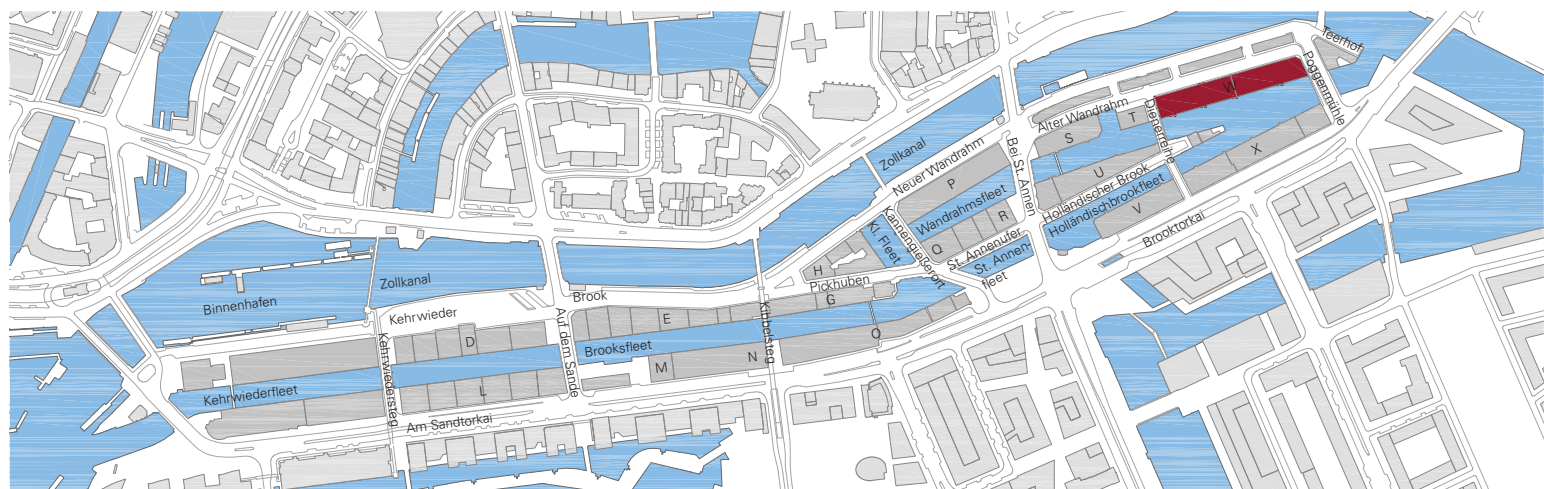


Figure 101: Location of warehouse block D W

Adress

2, Dienerreihe, 4 – 11, Alter Wandrahm and 3, Poggenmühle

Type of building, year of construction and name of architect/engineer

These warehouse buildings were erected during the third construction phase of the Speicherstadt, i.e. between 1899 and 1927. Together with the warehouses at 3 – 7, Alter Wandrahm they mark the end of that construction phase.

4 – 7, Alter Wandrahm:

These warehouses were built under the supervision of the construction department at HFLG (now the Hamburg Port and Logistics plc = Hamburger Hafen- und Logistik Aktiengesellschaft, HHLA) to designs by the architect Raywood between 1925 and 1927.

8 – 11, Alter Wandrahm:

These warehouses were built to designs by the architect Gustav Schrader between 1899 and 1912.

3, Poggenmühle:

This building was erected between 1925 and 1927.

Current Uses

Storage, transshipment, processing of goods as well as offices and cultural activities such as Dialog im Dunkeln (Dialogue in the Dark) in the warehouse at 3 and 4, Alter Wandrahm.

Potential for Future Uses

HHLA is currently looking into the possibility of converting parts of block W into an automatic multi-storey parking garage, focusing in particular focus on whether such a construction would be compatible with heritage preservation considerations. The end-of-row building which houses the Dialogue in the Dark would not form part of this scheme.

Even if the Speicherstadt is integrated into a comprehensive flood protection system block W would offer only limited possibilities for residential use, as the windows in this warehouse are quite small. Alternatively, more of block W could be devoted to offices.

The Overall Architectural Design and Surrounding External Space

Being designed almost exclusively for storage purposes, the modern warehouses at 3 – 7, Alter

Wandrahm made a significant contribution to the Speicherstadt's historic townscape when they were built.

Flood Protection

There is no flood protection.

Significant Conflicts and Defects

The many lorries and parked vehicles in this area are almost continually in conflict with pedestrians frequenting this part of the Speicherstadt. Measures should be taken to solve this problem, particularly in view of the fact that the number of pedestrians and visitors to the Speicherstadt is likely to increase in the future.

Recommendations and Outlook for the Future

Measures to reduce traffic flows in this part of the Speicherstadt and the creation of additional parking space by converting block W into a multi-storey car park must be assessed for their compatibility with the requirements of heritage protection. If an automatic parking garage is built, no visible alterations must be made to the warehouse's external appearance or internal structure, which must remain visually intact.

Figure 102: View of warehouse block W from the south



9.14 Warehouse Block X

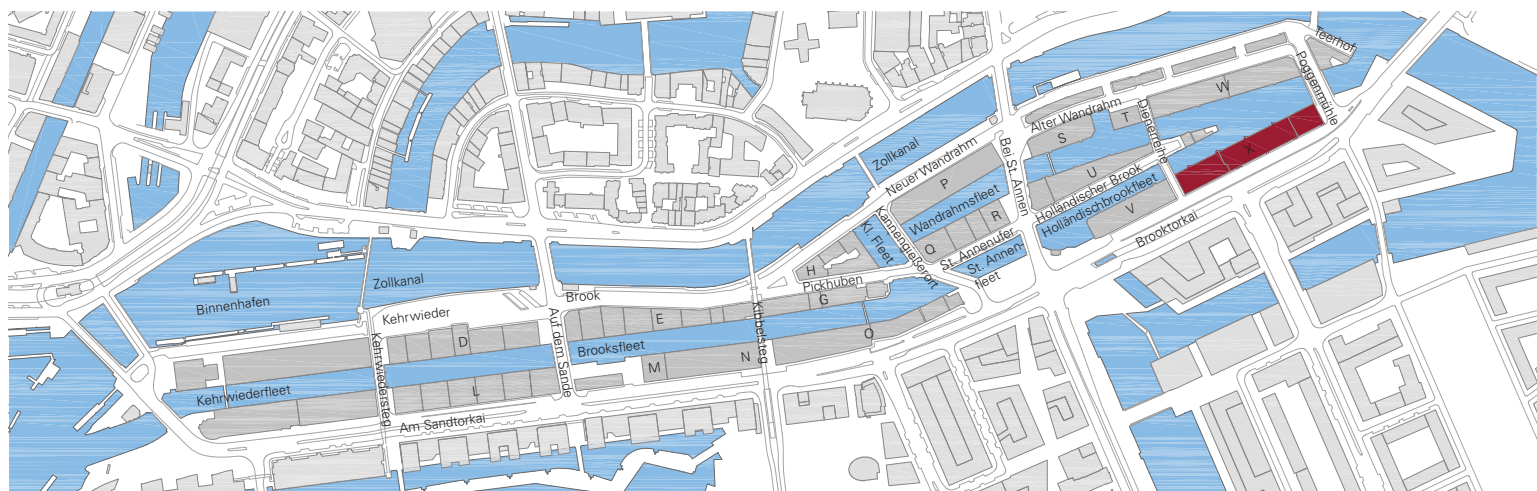


Figure 103: Location of warehouse block X

Adress

1 – 10, Brooktorkai

Type of building, year of construction and name of architect/engineer

With the exception of the office building at 1, Brooktorkai, all of the buildings in block X were erected during the third construction phase of the Speicherstadt, i.e. between 1899 and 1927.

1, Brooktorkai: This office building (completed in 2002) was designed by the architects gmp – Gerkan, Marg + Partner.

The warehouses of block X were built under the supervision of the construction department at HFLG (now the Hamburg Port and Logistics plc = Hamburger Hafen- und Logistik Aktiengesellschaft, HHLA) to designs by the architect Raywood between 1899 and 1912.

Current Uses

1, Brooktorkai:

Offices

3 – 10, Brooktorkai:

Storage, transshipment and processing of goods, primarily carpets

4, Brooktorkai

The fourth floor of this building houses the Archive of the Hamburg Chamber of Architects

Potential for Future Uses

If the Speicherstadt is integrated into a comprehensive flood protection system, the upper floors of block X could potentially become suitable for residential purposes. If not, continuation of current uses.

The Overall Architectural Design and Surrounding External Space

These warehouses are largely a continuation of Block V. However, the end-of-row building at 1, Brooktorkai is much more modern. It has been inserted compellingly into the contours and texture of the Speicherstadt by a new generation of architects who seem to share the planning and design approach pursued by Werner Kallmorgen.

Flood Protection

The buildings at 1, Brooktorkai and 3 – 7, Brooktorkai have their own flood defences.

Significant Conflicts and Defects

The open space in front of the office building at 1, Brooktorkai and the area around the Poggenmühlenbrücke, together with the access to Alter Wandrahm, are cluttered and need reordering.

Recommendations and Outlook for the Future

If the Speicherstadt is integrated into a comprehensive flood protection system, the upper floors of block X should be converted to residential use.

It will be necessary to create a sufficiently wide and flood-safe pavement for pedestrians next to the supporting wall opposite blocks V and X.

It would be desirable to redesign the area between the Poggenmühlenbrücke and the Customs Canal.



Figure 104: View of warehouse block X from the south



9.15 Customs Head Office

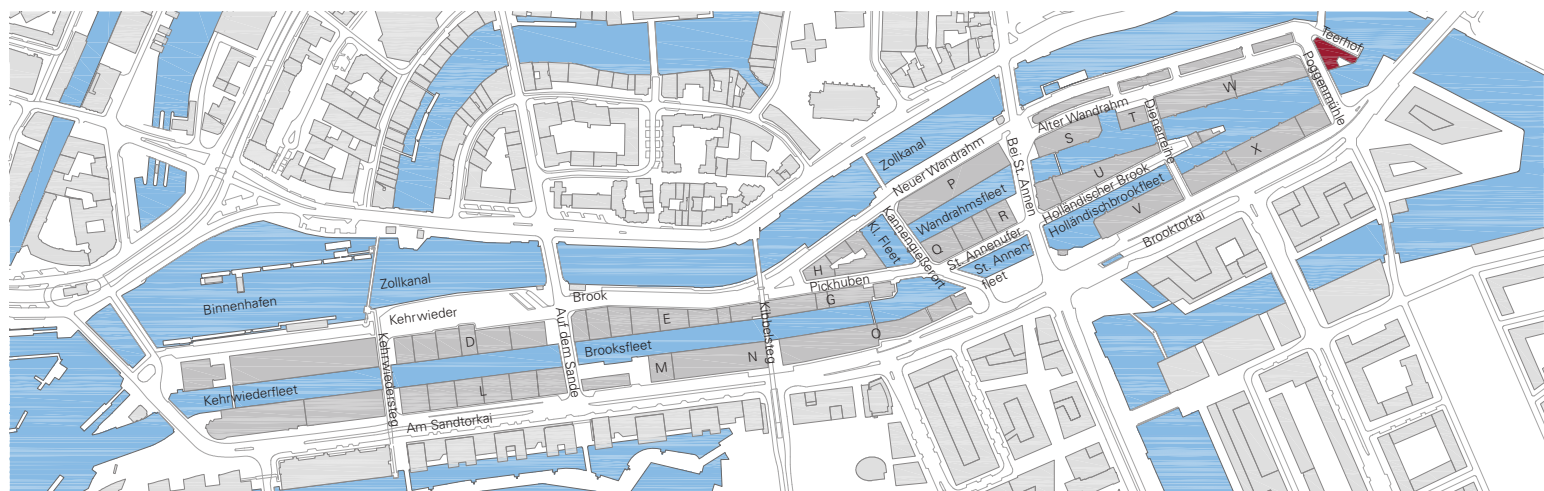


Figure 105: Location of the Customs Head Office

Address

2, Poggenmühle and 1, Teerhof

Type of building, year of construction and name of architect/engineer

Office buildings, built between 1899 and 1912 (1, Teerhof) and in 1908 (2, Poggenmühle) respectively. The architect is unknown.

Current Uses

Office buildings and Customs Head Office

Potential for Future Uses

Continuation of office use. The Customs Head Office would be suitable for conversion to residential use. Potential for cafés and restaurants on the ground floor.

The Overall Architectural Design and Surrounding External Space

Situated at the eastern access to the Speicherstadt, on the Customs Canal and Wandrahmsfleet waterways, and close to the Oberbaumbrücke, the Customs Head Office occupies a prominent position. Its architecture is rather untypical of the Speicherstadt.

Significant Conflicts and Defects

No obvious problems

Recommendations and Outlook for the Future

The ground floor areas should be converted to new uses with a stronger affinity to the public domain. There could be a restaurant, café or bar with outdoor tables and chairs. Suitable for conversion to residential use.

If the building is converted the roof area should be redesigned.



Figure 106: View of the Customs Head Office from the north-east

9.16 German Customs Museum and Adjoining Buildings

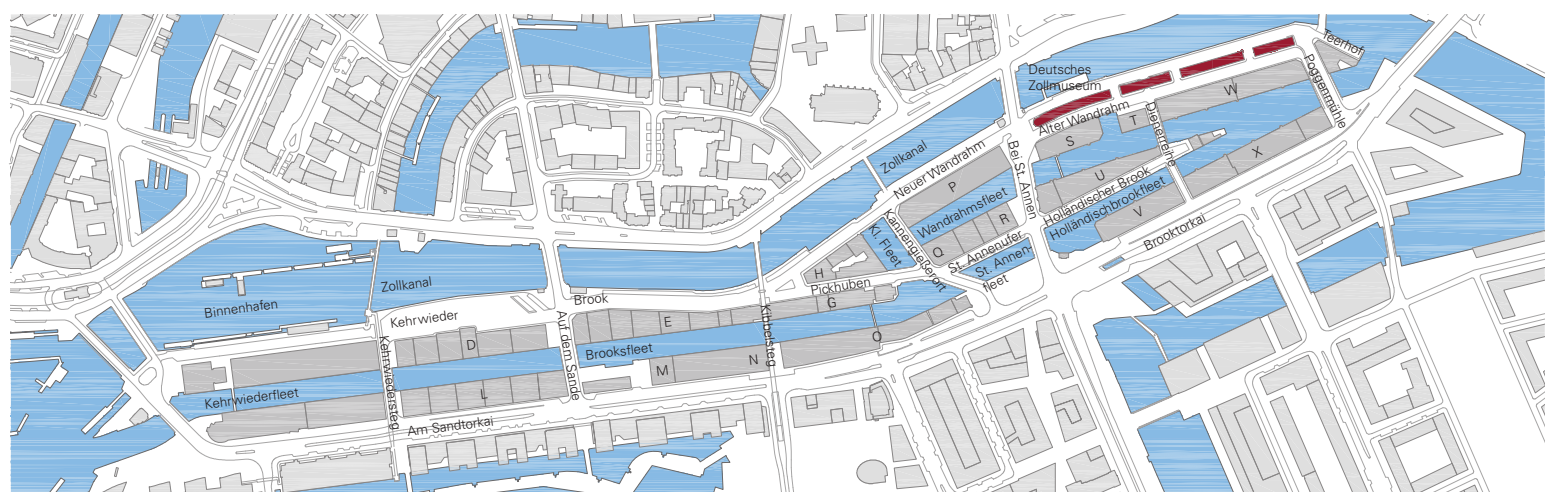


Figure 107: Location of the German Customs Museum and adjoining buildings

Adress

16 – 21, Alter Wandrahm and 1, Poggenmühle

Type of building, year of construction and name of architect/engineer

The Customs Administration Buildings were built by unknown architects between 1899 and 1912.

Current Uses

This row of two- and three-storey buildings originally housed the Customs Head Office of the Speicherstadt. The jetty in front of it was reserved for customs vessels.

16, Alter Wandrahm:

Since 1992, the German Customs Museum has been located on the premises of the former customs office at Kornhausbrücke.

17 and 18, Alter Wandrahm:

Offices

19 and 20, Alter Wandrahm:

Event venue (Nordevent) and offices

21, Alter Wandrahm and 1, Poggenmühle:

Offices

Potential for Future Uses

Continuation of current uses.

The Overall Architectural Design and Surrounding External Space

This group of buildings was originally built in the Neo-Renaissance style, but was damaged several times during the war so that today parts of it are more minimalist in style. Functionally speaking, this ensemble clearly belongs to the Speicherstadt, but its architecture sets it apart from the other warehouse blocks.

Significant Conflicts and Defects

No obvious problems.

Recommendations and Outlook for the Future

It would be desirable to improve the access area to the museum and make it more stylish. On the ground floor, there should be more restaurants, cafés and bars.



Figure 108: View of the German Customs Museum from the north



Annex

Annex 1: Ordinance on the Design of the Speicherstadt

Ordinance on the Design of the Speicherstadt of 5 August 2008

Having regard to Paragraph 81, Sub-paragraph 1, Section 2 and Sub-paragraph 6, Section 3 of the Hamburg Building Code (HBauO) of 14 December 2005 (HmbGVBl pages 525, 563), as amended on 11 April 2006 (HmbGVBl, page 157), the following provisions are adopted:

§ 1

Geographical scope

This ordinance applies to the areas of the Speicherstadt which are cross-hatched on the attached map.

§ 2

Façades

(1) Façades must be designed in such a way that the surface area of their openings is smaller than that of the wall area. Structural elements must be used to divide the ground floor, upper storeys, attic and roof areas into clearly distinguishable sections. The colour of these structural elements must resemble that of the surrounding brickwork.

(2) Façades visible from the street must be made of brick, the colour and size of which must echo those of the existing brickwork.

(3) Projecting façade sections must blend in with the rest of the building in question and must not protrude by more than 0.75 m. There must be no balconies, galleries, loggias, conservatories or sun blinds on façades overlooking streets or waterways.

(4) Any openings in the outer walls, such as windows, doors and gates, must be clearly set back from the front line of the façade. The design of each storey must reflect that of the other storeys. Windows must be in portrait format. Sun blinds and

roller shutters on the outside of windows are not allowed. Windows must be divided by stay bars. All the windows and doors within one building or block must be painted in the same colour. Curved, tinted and reflective glass must not be used. The sizes and shapes of shop windows must be in line with other windows in the same building. To close off the loading bays, it is permissible to put in additional glazing if the latter is set back by at least 1.5 m from the front line of the façade. Window and door frames in these loading bays must be the same colour as the original loading doors.

(5) No plants may be grown on façades.

§ 3

Roofs

(1) Roofs may be finished in unpainted slates or copper without artificial patina. Each block must have a uniform roof covering.

(2) Balconies, cut-away sections and skylight windows at roof level are only allowed in areas where these cannot be seen from publicly accessible places. Skylight windows must not constitute more than ten per cent of the overall roof area. However, sky lights are permissible near roof ridges if they do not exceed 25 per cent of the roof area.

(3) Roof-top superstructures such as transverse roof sections and dormers are permissible in the case of buildings where the roof has a pitch of more than 27 degrees. These roof-top superstructures must correspond to existing superstructures on the respective block in terms of shape, size and design and must be positioned along the axes of façades.

§ 4

Building Technology

(1) Any externally visible technical equipment such as aerials and outlets of heating and ventilation systems must be limited to the minimum technically required and must be placed on the side of the

buildings that does not face the street.

(2) Refuse containers and recycling bins must be located inside buildings.

§ 5

Advertising and Vending Machines

(1) Advertising is only allowed if it refers directly to the services performed in that particular location. It must take the form of black plaques placed next to entrances and attached directly on to the façade of the building housing the company in question. The signs must have gold lettering or semi-relief golden letters and their size and design must be in keeping with existing plaques and name plates. There must not be more than one company name plate on each section of the façade and such name plates must not be too close to the corners of buildings. Nor must they cover or in any way interfere with the structural or ornamental elements of existing façades.

(2) Vending machines and display cases are not permitted close to façades.

§ 6

Design of the Surrounding External Space

(1) The existing open spaces in front of buildings must be kept empty up to the road boundary. Fences or other boundary markers, such as bollards or plant pots, are not permitted.

(2) Pavements must be surfaced in granite or copper slag stones.

(3) Outdoor lights are permitted provided that they match the existing simple wall lamps on façades.

(4) The type of light used must be warm white (3000 to 4000°K). There must be no coloured lighting on façades or in parts of buildings where such light would be visible from the street.

(5) During the hours of darkness, roof surfaces

must remain unlit. It is not permitted to illuminate roofs and no light must emanate from sky lights or rows of roof-top windows.

§ 7

Exemptions

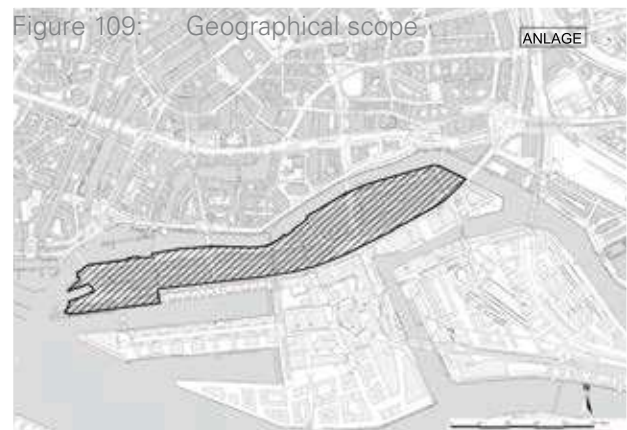
On application, the competent authority may grant exemptions from the requirements laid down in the present ordinance, provided that such exemptions do not detract from the historic image of the Speicherstadt. Applications must be made in writing.

§ 8

Final Provisions

The present ordinance is without prejudice to the Regulation on Heritage Protection in the Speicherstadt of 30 April 1991 (HmbGVBl., page 214), as amended.

Done by the Senate of the Free and Hanseatic City of Hamburg on 5 August 2008.



12.5. Management Plan for the Speicherstadt and Kontorhausviertel (2013)



Nomination for the UNESCO World Heritage List Management Plan

The Speicherstadt and Kontorhaus District with Chilehaus

Imprint

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scheuevens + wachten (Dortmund)

» Print

elbblood, Hamburg

NOMINATION FOR THE UNESCO WORLD
HERITAGE LIST

THE SPEICHERSTADT AND KONTORHAUS
DISTRICT WITH CHILEHAUS

MANAGEMENT PLAN

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1. Introduction

1.1 Objective of the Management Plan

The Free and Hanseatic City of Hamburg intends to nominate the “Speicherstadt and Kontorhaus district with Chilehaus” for UNESCO’s World Heritage List. Once inscribed on that list, the ensemble would, in accordance with the World Heritage Convention, become the property of mankind as a whole. At the same time, the Free and Hanseatic City of Hamburg has an obligation to do all it can to preserve the future World Heritage site for coming generations, as stipulated in the World Heritage Convention. The decision to nominate the “Speicherstadt and Kontorhaus district with Chilehaus” for the World Heritage List therefore places far-reaching obligations on the Free and Hanseatic City of Hamburg. However, nomination for UNESCO’s World Heritage List also represents a significant opportunity: By safeguarding a unique testimony to Hamburg’s cultural and historical development, it should be possible to maintain or even increase the quality of life of the people of Hamburg, while at the same time making the city a more attractive tourist destination. It was with this in mind that the Free and Hanseatic City of Hamburg drafted this Management Plan, the objective of which is to define the main guidelines, instruments and organisational structures, which will be required in the future to successfully accomplish the tasks associated with the World Heritage nomination.

Hamburg is a dynamic, constantly changing city. In recent years, the area around the Speicherstadt and Kontorhaus district has undergone significant change, and is expected to be further transformed in the future. These changes will also affect the traffic planning. The intention is for the area nominated for UNESCO World Heritage status to be managed under market economy conditions, which requires flexibility. In that sense, the “Speicherstadt and Kontorhaus district with Chilehaus” represents a “living protected asset.” The objective of this Management Plan is therefore, in particular, to reconcile safeguard-

ing the “outstanding universal value” of the future World Heritage site on the one hand, with taking the necessary measures to provide for its sustainable further development, on the other. In this context, the Management Plan serves as a strategic instrument, defining objectives for preservation and sustainable development, assessing the work that needs to be done, identifying areas of conflict and potential synergies, and establishing priority measures and projects.

The Free and Hanseatic City of Hamburg has entered into a legal obligation to protect its cultural heritage and has been working to safeguard and



Fig. 1: Aerial view of the Speicherstadt



Fig. 2: Aerial view of the Kontorhaus district

preserve the “Speicherstadt and Kontorhaus district with Chilehaus” for many years. The Speicherstadt and the Kontorhaus district have been listed under the Hamburg Heritage Protection Act since 1991 and 1983 respectively. The vast majority of the Speicherstadt buildings are owned by the Hamburger Hafen und Logistik AG (HHLA). Together with the handful of other Speicherstadt owners and the various owners of the properties in the Kontorhaus district, it is supporting the city in its efforts to preserve those areas by contributing expertise and experience. Since that experience is of prime importance for the successful management of the future World Heritage site, it is also taken into account in this Management Plan.

A further major objective of the Management Plan is to tie in the preservation of the future World Heritage site with the other planning objectives of the Free and Hanseatic City of Hamburg. The City has already produced planning guidelines at various levels for the future development of the World Heritage area.

The Management Plan builds on those guidelines and seeks to ensure that they are compatible with the international requirements for World Heritage sites. The guidelines and organisational channels, which are required to achieve this, are also identified. In addition, it is important to take account of the various interests of users, residents and the growing number of visitors to the future World Heritage area in the management of the World Heritage site. The Management Plan indicates how these various institutions, planning instruments, stakeholders and levels of action fit in with UNESCO’s Operational Guidelines and its Advisory Bodies, ICOMOS and ICCROM.

Overall, the Management Plan for the future World Heritage site is addressed to all those who have a stake or interest in the protection and sustainable future development of the “Speicherstadt and Kontorhaus district with Chilehaus”: administrators, property owners, residents, commercial and private ten-

ants, those involved in business or tourism and the public.

The nomination of the “Speicherstadt and Kontorhaus district with Chilehaus” for UNESCO’s World Heritage List is a project which was initiated jointly by the Free and Hanseatic City of Hamburg and the owners of the properties concerned. Together with the Federal Republic of Germany, the Free and Hanseatic City of Hamburg and the owners are making every possible effort to reconcile far-reaching protection with the sustainable development of the future World Heritage site and, in so doing, to comply with the requirements of the World Heritage Convention. The nomination is being followed with great interest at political level and by the public as a whole, and enjoys unreserved support.

1.2 The Idea of World Heritage and the World Heritage Convention

UNESCO works worldwide to preserve the cultural and natural heritage and promote cultural diversity. Its “Convention concerning the Protection of the World Cultural and Natural Heritage” (World Heritage Convention) is the most extensive international treaty which has ever been adopted by the international community to preserve its common cultural and natural heritage. It was adopted by the 17th General Conference of UNESCO on 16 November 1972 and entered into force on 17 December 1975. To date, it has been ratified by more than 185 States, which means that the World Heritage Convention can be regarded as applying worldwide. The Federal Republic of Germany acceded to the Convention on 23 August 1976. In Section 7, Paragraph 8, of its Heritage Protection Act, the Free and Hanseatic City of Hamburg undertook to take account of its obligation under the Convention to preserve the cultural heritage when adopting measures and plans. By signing the World Heritage Convention, the States Parties recognise their international obligation to protect the World Heritage sites situated on their territory and

to preserve them for future generations. Today the World Heritage List includes more than 900 cultural and natural sites in all the regions of the world. In 2012, Germany had 36 World Heritage sites on the list.

The World Heritage Convention is based on the idea that “parts of the cultural or natural heritage are of outstanding interest and therefore need to be preserved as part of the world heritage of mankind as a whole” (preamble to the World Heritage Convention). In accordance with that Convention, cultural monuments and natural heritage sites such as the pyramids of Giza, the Taj Mahal, the ruins of ancient Olympia in Greece, Ayers Rock and the Grand Canyon do not therefore belong solely to the State on whose territory they are located. Rather, they are, conceptually, the property of mankind as a whole. If any one of these extremely precious sites were to become dilapidated or destroyed, its loss would diminish the heritage of all the peoples of the world. Consequently, the international community must also take joint responsibility for the world’s heritage. Since recognition as a World Heritage site does not involve any financial assistance from UNESCO, the governments and local authorities concerned undertake to fund the protection and preservation measures independently.

The World Heritage Committee selects World Heritage sites on the basis of criteria which are laid down in the World Heritage Convention. The most important selection criterion is that the cultural or natural heritage be of “outstanding universal value”. Other essential criteria are the uniqueness, authenticity (historical genuineness) and integrity (intactness) of the site. Key instruments for preserving World Heritage sites are international appeals, resolutions, recommendations and charters. The primary objective of this Management Plan is to guarantee that the features of the “Speicherstadt and Kontorhaus district with Chilehaus” that make it of unique universal value are safeguarded, and that the measures envis-

aged to achieve this are in accordance with the Operational Guidelines for the Implementation of the World Heritage Convention.

1.3 Coordination of the Nomination Process

Within the Free and Hanseatic City of Hamburg, it is Hamburg's Regional Ministry of Culture, led by Senator Prof. Barbara Kisseler, which has overall responsibility for the nomination. The Heritage Protection Agency, which is responsible for coordinating the nomination, is part of that Regional Ministry. The contact details of the colleagues concerned in the Heritage Protection Agency are as follows:

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The same staff in the Heritage Protection Agency are also responsible for liaising with UNESCO's international Advisory Bodies, in particular ICOMOS, and with the World Heritage Centre, which is the Secretariat of the World Heritage Committee and will ultimately decide whether or not to include the site on the World Heritage List.

1.4 Legal Status of World Heritage Sites and of this Management Plan

UNESCO World Heritage sites are nominated by States Parties to the World Heritage Convention for inscription on UNESCO's World Heritage List. Of-

ficially, then, it is the Federal Republic of Germany which is responsible for nominating the "Speicherstadt and Kontorhaus district with Chilehaus". However, given that Germany's federal system devolves cultural affairs to the individual federal Länder, the nomination and management of UNESCO World Heritage sites require close cooperation between the Federal Government and the Länder. UNESCO World Heritage sites are situated on the territory of individual States, which pledge to preserve them for future generations. Legally, then, they are subject to international law. The result is that international, national and regional laws overlap. That is precisely why UNESCO's Operational Guidelines call for "Management Plans" to be drawn up.

In principle, Management Plans do not have the same legal status under German planning law as traditional building and planning legislation. However, given the complex legal and organisational context, and in the light of the technical expertise required to safeguard and sustainably develop complex sites such as the "Speicherstadt and Kontorhaus district with Chilehaus", particularly in terms of coordinating and integrating the different implementing bodies involved, this Management Plan is extremely important. If it is to be workable, it is vital that it dovetails perfectly with the existing laws, planning regulations and planning guidelines of the Free and Hanseatic City of Hamburg, and in particular with the Heritage Protection Act and the existing general development and construction frameworks. At the same time, it is very important for there to be optimal coordination between the Management Plan and existing sets of plans and planning objectives of the Free and Hanseatic City of Hamburg. In that sense, the Management Plan seeks to serve as a reference point for all stakeholders.

1.5 Structure of the Management Plan

The structure of the Management Plan is as follows:

» Part I – Description:

History and description of the site; proposed assessment of the site's significance; explanation of how the World Heritage area has been defined; main protection objectives and other key goals, and legal instruments for the preservation and sustainable development of the future World Heritage site.

» Part II – Administration and Management:

Details of administration and management; key objectives for the development of the nominated property and potential threats.

» Part III – The Future of the nominated property:

Details of essential plans and implementation pathways for the preservation and sustainable development of the nominated property.



Fig. 3: View from the east to the Speicherstadt and the Kontorhaus district

Part I Description

2. Description of the Site

2.1 Characteristics of the Site and its Surroundings

» Name:

“The Speicherstadt and Kontorhaus District with Chilehaus”

» State, province or region:

Federal Republic of Germany / Free and Hanseatic City of Hamburg

» Location:

The World Heritage area lies in the north of Germany in the Free and Hanseatic City of Hamburg, immediately to the south of the historic city centre. The World Heritage area measures around 1.5 km from west to east.

» Coordinates:

UTM 32N: East 56605; North 593343

» Extension:

Nominated property: 26.08 hectares

Buffer Zone: 56.17 hectares

2.2 History and Description of Hamburg's Speicherstadt and Kontorhaus District

In the 19th century, the pace of globalisation in business and trade began to accelerate. This development not only had a major impact on the world economy, but also on the urban development of port and trade cities. In the late 19th and early 20th centuries, new kinds of cities began to be formed in metropolises the world over. This process affected the centres of more and more cities and increasingly led to their becoming functionally segregated. The concomitant expansion of the services sector drove residents and other users out of the city centre.

Within just a few decades, Hamburg became one of the most important port cities in the world. This expansion led to a radical restructuring and systematic transformation of the city centre. Two events at the end of the 19th century were critical here: Hamburg's accession to the German Customs Union in



Fig. 4: Location of the nominated property in Hamburg

1888 and the devastating cholera epidemic of 1892.

Even before full integration into the German Customs Union, the Speicherstadt project led to the displacement of the 16,000 inhabitants of the Brookinseln (Brook islands), to make way for the new warehouse district. The cholera epidemic claimed some 8,600 lives and provided the impetus for the rehabilitation of large parts of the city centre. The Hamburg Senate systematically bought up land, had most of the buildings on the acquired plots demolished and, after adopting a comprehensive urban restructuring programme, put the land back on the market. The plots were purchased by private investors, who built new buildings on them. Nearly 50,000 inhabitants were affected by these rehabilitation measures.

In other words, within only a few decades at the end of the 19th and the beginning of the 20th centuries, Hamburg's city centre changed from a pre-industrial town into a modern city with monofunctional districts, which exclusively served the economic needs of the metropolis, more particularly those of global trade and Hamburg's international port. Two of these districts, one in Hamburg's old town and the other immediately to the south of it, are of major historical and economic importance for Hamburg as a port and trading city. These complementary districts, which are closely related both physically and functionally, are:

- Hamburg's Speicherstadt, a district of warehouses for the storage, processing and transshipment of goods imported through the port.
- The Kontorhaus district to the north of the Customs Canal, with the offices of companies engaged in shipping and port-related activities.

2.2.1 Historical Background to the Building of the Speicherstadt

The Speicherstadt was built in the context of Hamburg's integration into the Customs Union of the German Empire. In 1866, Prussia annexed both Schleswig-Holstein and the Kingdom of Hanover, making it Hamburg's direct neighbour and interlocutor. Hamburg joined the North German Confederation and became part of the German Empire in 1871. Initially, this unification policy had a positive impact on the Free and Hanseatic City: A treaty with Prussia on the transfer of certain waterway and port management rights (Köhlbrandvertrag) enabled the port to be modernised and extended to the islands in the River Elbe (the Sandtorhafen was built in 1866 using the southern section of the city moat; it was Hamburg's first artificial port basin). Three hitherto unconnected railway lines were also linked up in Hamburg in the years following 1866, making the city the most important transport hub in the north. But the protectionist measures introduced by Otto von Bismarck, in response to the economic depression and competition from England, threatened Hamburg's privileged free trade position and with it the very basis of Hamburg's trade. A compromise was struck, which granted Hamburg the privilege of continuing to operate a limited free port.

2.2.1.1 The Origins of the Speicherstadt

A large number of new warehouses had to be built to store goods which were exempt from customs duties. The technical master plan for the free port, which was drawn up in 1882, drew a distinction between two types of goods handling. Quick transshipment was to be performed on the quays themselves, where seagoing vessels could moor. On these quays there would be long rows of large, mainly one-storey, sheds designed for sorting goods, ready for distribution and onward transport. However, goods which required longer-term storage and processing were to be stored in a complex of large multi-storey warehouses, which would be built alongside narrow canals, which

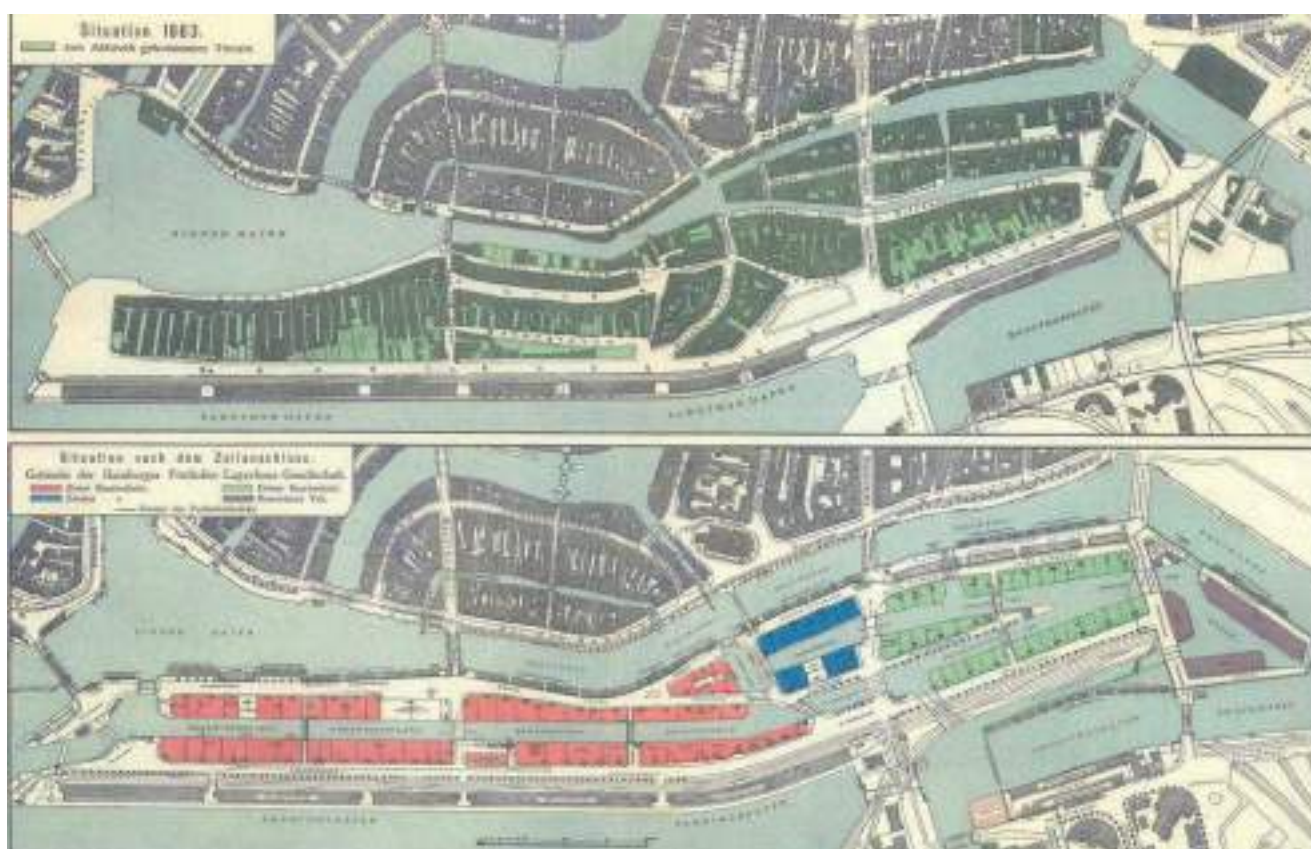


Fig. 5: The Brookinseln (Brook islands) before and after the Speicherstadt was built

would be navigable only by barges. This type of handling necessitated a two-stage loading and unloading process, but this was deemed acceptable: for these goods careful handling rather than speed was of the essence.

After a prolonged debate about various alternative locations, a decision was made about where best to site the new complex of warehouses. Mindful of the fact that trading companies and the stock exchange were keen to have the Speicherstadt close by, the southernmost part of the city centre was chosen: the Brookinseln (Brook islands), a narrow strip of islands running from east to west, immediately to the north of the Sandtorhafen, which was the most modern part of the port at the time. In 1883, the western part of the district as far as Kannengiesserbrücke was demolished. The existing waterways were straightened and dredged to create permanently navigable canals. The first section of the Speicherstadt was con-

structed here between 1885 and 1888; the second between 1891 and 1896, and the third between 1899 and 1912. The only later addition was the eastern section of warehouse block W which was not built until 1927, when the first office buildings in the Kontorhaus district were being erected, also in a comparatively progressive style.

After 1883, some 1,000 houses in the Kehrwieder- viertel and Wandrahmviertel districts were cleared and demolished to make way for the new warehouse blocks. 16,000 people were evicted from their homes, and the historic topography of a whole area, dating from the 17th and 18th centuries, was obliterated.

2.2.1.2 Owners and Users of the Speicherstadt

On 7 March 1885, the Hamburg Free Port Warehouse Association (HFLG) was founded to raise private funding for the building of the Speicherstadt and other

warehouses in the Free Port. However, the land on which the Speicherstadt was to be built remained in state hands. It was leased to HFLG on the condition that the city would get a share in the proceeds. Also, the city was authorised successively to acquire all of the shares in the HFLG joint stock company. This objective was not reached until 1928, but in practice the HFLG acted as a state-owned enterprise right from the outset. For instance, it was obliged to submit cost estimates and development plans to the Senate and was not even allowed to fix the level of rents independently. In 1935 the HFLG was merged with the Administrative Agency for Quays (Staatlichen Kaiverwaltung) and in 1939 it was renamed the Hamburg Port and Warehouse Association (HHLA). In 2005, its name was changed again to Hamburg Port and Logistics plc. Before the initial public offering in 2007 the HHLA was split into two separate enterprises, one for port logistics and the other for real estate. The Speicherstadt shares belong to the real estate group and have remained the property of the city. In other words, the Speicherstadt has practically never changed hands.

2.2.1.3 The Building of the Speicherstadt

Building the Speicherstadt was an outstanding achievement in terms of the technical, urban planning and architectural challenges it presented. This achievement was mainly credited to Franz Andreas Meyer, Chief Engineer in the Parliamentary Consul-

tative Committee for City Development (Baudeputation), who was regarded as having masterminded the project and held in high esteem as a result, even during his lifetime. In reality, Franz Andreas Meyer only drew up the plans for the publicly funded part of the Speicherstadt, namely the bridges, the two state-owned warehouses and the buildings housing technical facilities. But it is safe to say that the Speicherstadt's specific qualities would have been quite inconceivable without his influence.

When designing the warehouse blocks, Franz Andreas Meyer drew on traditional models of Hamburg warehouses: Storage was arranged over several storeys, to and from which goods were lifted and lowered with the help of winches, as they had been for centuries. The winch wire cables were attached to the top of the warehouse façades. Each storage space was equipped with hinged or sliding wooden loading doors on both the water and land sides, known as Luken (hatches). These loading doors were arranged one above the other, terminating in gables at roof level. The winch derricks were protected by copper-covered pediments.

But that is where the similarities between the old warehouses and the new Speicherstadt ended: The new Speicherstadt warehouses were modern constructions equipped with innovative technical systems such as electric lighting and hydraulic systems for driving the winches and platform lifts. The ware-



Fig. 6: Construction phases of the Speicherstadt

houses also featured improved fire protection. In addition, the floor plans were designed for maximum efficiency, giving the Speicherstadt an almost proto-modern character.

The first construction phase, during which blocks A to O were built, was already completed in time for the opening of the Free Port on 15 October 1888, and covered an area of some 250,000 square metres, i.e. about two thirds of the total Speicherstadt area. In order to cope with the sheer volume of construction in the three years prior to accession to the Customs Union in October 1888, the builders had to use pre-fabricated construction modules and standardised floor plans, and had to streamline many other parts of the process. While considerations of economic efficiency were strictly observed, no compromises were made when it came to craftsmanship and the technical quality and sturdiness of the buildings.

The second construction phase from 1891 until 1896 encompassed blocks P and Q/R, while the third included blocks S to X. It lasted from 1899 till 1927, but most of the construction was complete by 1912.

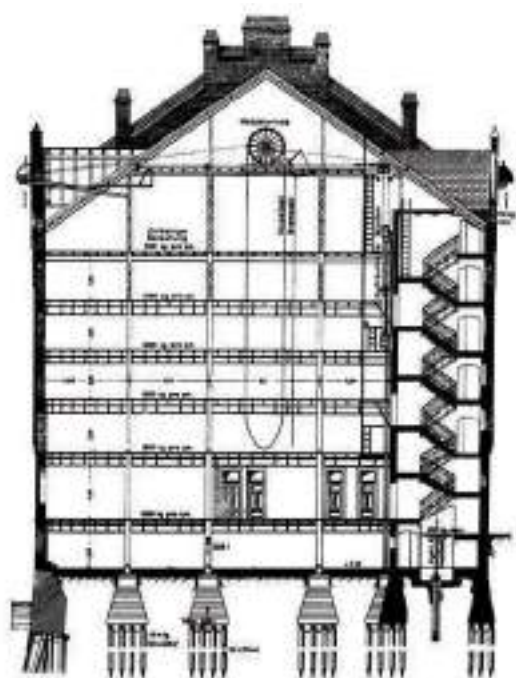


Fig. 7: Cross-section through a warehouse building (block D)

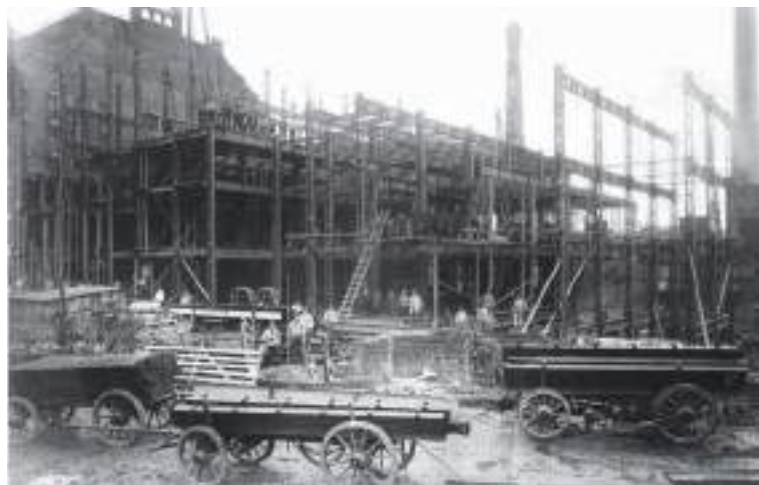


Fig. 8: Block E under construction

The eastern half of block W was an exception, since it was built after World War I (1925-1927). It is likely that plans for the fourth construction phase (blocks Y and Z) had been conceived by 1914, but their implementation was thwarted by World War I and the economic crises that ensued during the Weimar Republic. The Ericusspitze in the south-east of the Speicherstadt therefore remained undeveloped until very recently.

The entire Speicherstadt was built on wooden foundation piles. The warehouses, which were separated into fire sections by transverse walls, were built as skeleton constructions to enable large, undivided, and therefore flexible storage spaces to be produced. The wrought-iron skeleton structures from the first construction phase had proved not to be fire-resistant, which is why wooden skeleton constructions were used from 1892. From 1903 onwards, concrete floors and clad cast iron support pillars were used, and later sheathed steel skeletons were employed. Buildings which have been reconstructed since World War II have generally used concrete skeletons.

Most skeleton constructions were erected independently of the outer walls so that the latter do not really have any load-bearing function. Rather, they provide the outer shells for the warehouses, keep-



Fig. 9: Overall view of the Speicherstadt and the Customs Canal

ing their indoor temperature constant, an important precondition for the storage of sensitive goods.

By 1927, 17 large warehouse complexes with between five and seven storeys had been built. In addition, there were a total of six free-standing individual buildings or groups of buildings, which were part of the technical infrastructure of the Speicherstadt or served other purposes directly connected with the warehouses. Among these were the Central Power House, the Boiler House and buildings used for administrative and customs purposes.

The Design of the Historic Warehouse Blocks

All the blocks in the first construction phase, plus block P from the second, had the same structure. The water and land side façades were very similar in design: The base of the buildings, consisting of one or two storeys, had large windows, since these lower storeys were designed to house the offices of storage and trading companies, but could also be used for storage. There were three or four upper storeys, which were intended exclusively for storage, which is why they had smaller windows. All the blocks were built with hipped, steeply pitched roofs, whose large surface areas were punctuated



Fig. 10: Historical photograph block O

by the gables of the winch dormers. In most blocks the vertical loading door axes extended from the ground floor to the pedimented winch dormers thus conferring an architectural unity on these three heterogeneous zones of the façades. The ends of the blocks and other exposed parts were given prominence through gables and towers, making the Speicherstadt visible from afar.

Blocks N, O and H feature variations on this structural schema. Blocks N and O were reserved for cof-



Fig. 11: Historical photograph Speicherstadt with blocks O, G, Q und Rd R

fee trading companies. Their three lowest storeys were exclusively reserved for office space, which is why they had large windows throughout. The three upper storeys were for storage only, something that again was indicated by the difference in window sizes and the existence of loading doors (there were no loading doors on office floors). Because of its trapezoid floor plan, block H was particularly suitable for use as office space. It did not offer much storage space, though, which is why it only had loading doors on the interior courtyard façade, and why all the storeys had large windows.

Blocks Q and R from the second construction phase and blocks S, T, U, V, W (its western half) and X from the third phase were designed in the same way. However, in contrast to the older blocks, which all had steeply pitched roofs, these warehouses were built with flat gable roofs. This offered the advantage of being able to increase the number of standard storeys from five to seven. On their water side, these blocks have Westphalian Towers: round tower bays containing spiral stairways, which served as emergency escape routes.

All the façades were faced in red brick and lavishly decorated with friezes, cornices, dripstones, blind arcades, bays, consoles, thin risalto projections and tower bays, as interpreted by the Hanover School. The upper-storey window axes were also generally set back into the compact brickwork, creating a powerful relief effect thanks to the different façade layers. There were decorative strips made of coloured ornamental bricks, some of them glazed, clinkers or, in a few cases, small wall sections containing tiles and dark green glass bricks. These decorative elements accented the red brick façades, thus adding to the impression that the Speicherstadt warehouses really were the treasure chest of Hamburg merchants containing their most precious wares. Except for the administrative buildings of the HFLG, cut stone was not widely used in the Speicherstadt, being reserved only for certain ex-

posed parts of the buildings such as their entrance portals. Thus, the choice of material reflected the status of the buildings.

The two administrative blocks of the HFLG (now Hamburg Port and Logistics plc) were built on the ends of blocks O and U respectively. They were thus fully integrated into the block structure of the Speicherstadt. However, in contrast to the other blocks, their façades were ennobled by prestigious structural effects and decorative sandstone



Fig. 12: First administration building of the HFLG

features. Whereas the first administration building had been designed to respect the neo-Gothic character of block O, in the second administration building these decorative elements were executed as a mix of Renaissance and late Gothic styles. As both administration buildings were built on the end of existing blocks, they were free to display their full potential on three sides, which gave them a greater presence in the Speicherstadt than their relatively small size warranted. This prominence was further enhanced by their rich roofscapes, featuring gables, tower bays, pedimented dormers and small transverse gables.



Fig. 13: The “town hall of the Speicherstadt,” now the head office of HHLA, and block U

The present head office of HHLA, which was designed by Johannes Grotjan and Hanssen & Meerwein, is much more ostentatious than the uniform rows of warehouses. This lavishly structured end-of-row building between Holländischer Brook and Wandrahmsfleet (1, Bei St. Annen) is often referred to as the “town hall of the Speicherstadt.”

The building of block X (1908-1912) and the eastern



Fig. 14: Speicherstadt block W

half of block W (1925-1927) marked the arrival of Modernity in the Speicherstadt. Under the eaves, block X was admittedly decorated with arched friezes featuring historical motifs, but for the remaining surfaces abstract geometrical shapes were chosen, in line with the general trend in German architecture towards more rational designs, a trend which was emerging around 1910. The brickwork in the upper storeys was unstructured and there were no coloured accents or decorative strips. The eastern half of block W, by contrast, is clearly different from the earlier warehouse blocks in that it has very expressive pillared facades made of dark red clinker and features much simpler forms. However, it does incorporate some of the characteristic motifs of earlier blocks, such as the loading door axes, the Westphalian Towers and the distinctive division of the façades into the base storeys and upper storage floors.

The Historic Customs Buildings

For functional reasons, or because the ownership structure was different, some buildings in the Speicherstadt were not part of the block structure. Prime examples are the customs buildings on the Customs Canal and in the Binnenhafen, the southern bank of which marked the boundary of the Free Port until 2003. Originally, the customs buildings and the large



Fig. 15: Customs buildings on the Customs Canal and block W

sheds for clearing the goods ready for release to the Oberländer Kähne formed an almost uninterrupted row of single- or two-storey buildings on both sides of the canal. As a result, from the city centre the Speicherstadt looked as though it was almost hermetically sealed.

On Alter Wandrahm, a total of four very similar individual buildings were erected, three of which housed customs clearance halls on their ground floors, with administrative offices above, while the fourth exclusively served administrative purposes. This group of buildings was designed by the architects of the Baudeputation, more particularly of its Department of Hydraulic Engineering and Construction. Its lavish design was typical of the Hanover School and reflected Hamburg's position as a sovereign city state: As explained above, within the Free Port the city state did in fact have a claim to sovereignty.



Fig. 16: Winch Operators' House (Wasserschlosschen)

The Winch Operators' House (Wasserschlosschen) and the Manned Fire Alarm Station (Fleetschlosschen)

Other individual buildings are the manned fire alarm station on St. Annenbrücke and the so-called Winch Operators' House on Dienerreihe. The latter contained the official apartments for the technicians who were responsible for maintaining and repairing the hydraulic winches, but also a garage and workshop on the ground floor. This compact building with a hipped roof, a clock turret and bays was built on a peninsula between Wandrahmsfleet and Holländischbrookfleet. It is a "point de vue," which explains its sophisticated design elements such as decorative strips of glazed green bricks and cut stone features, which accentuate the neo-Gothic brick façades.

Because of its very exposed position, the design of the small, single-storey neo-Gothic gable roof building housing the manned fire alarm station is more elaborate than might be expected from its function: It rests on two round granite pillars and overlooks



Fig. 17: Manned Fire Alarm Station (Fleetschlosschen)

Holländischbrookfleet.

The infrastructure of the Speicherstadt

In addition to its buildings, it is in particular the infrastructure of the Speicherstadt that still gives it its distinctive appeal.

a) The Waterways

Traditionally, goods were transported around Hamburg Port by barges, the so-called Schuten. To enable them to access the Speicherstadt, three 20 to 25-metre-wide canals were built. The main canal extended the entire length of the Speicherstadt from the Kehrwiederspitze in the west to the Oberhafen in the east. Parallel to it, Wandrahmsfleet was built providing access to the warehouses from the second and third construction phases only. Kleines Fleet connected the two. The main canal was not named as one, but its designations matched the respective streets to which it ran parallel: Kehrwiederfleet, Brooksfleet, St. Annenfleet and Holländischbrookfleet. The Speicherstadt is separated from the city centre by the 45-metre-wide Customs Canal, its continuation to the west, the Binnenhafen, and the adjoining the Oberhafen to the east. Together they constitute the former boundaries of the Free Port.

b) The Streets

With the exception of the streets on the quays in the Sandtorhafen and later in the Brooktorhafen, which just had to be widened, the entire street network in the Speicherstadt had to be built from scratch. In the east-westerly direction, three streets were built which, wherever possible, ran parallel to the canals. The objective was to produce regular plots for the proposed blocks, although the irregular topography of some parts of the Brookinseln meant that this was not always possible. These three long streets were intersected by seven smaller ones running from north to south and by 10 bridges linking the Speicherstadt with

the city centre. All the streets were paved with rows of granite cobbles.

Next to the roads, cobbled pavements were built, which were separated from the carriageway by granite kerbstones. Since the warehouses did not have loading ramps, the pavements were also used to place goods which had either just been lowered to street level or were waiting to be lifted up and into the warehouses. In the 1950s, the warehouse blocks were equipped with basement hatches, which were inserted into the pavements and covered by steel doors.

c) Bridges

As well as the street and canal network, all the bridges in the Speicherstadt had to be newly built. The only exception was Wandrahmsbrücke at the Oberhafen, which was built in 1859 and not replaced until 1909.

The bridges were designed by Franz Andreas Meyer and his successors Eduard Vermehren and Friedrich Sperber. By World War I, no fewer than 19 bridges had been built, 22 if you include the ones providing access to and from the Ericusspitze, although no warehouses were built there.

The sheer magnitude of the Speicherstadt project meant that it could only succeed if there was a degree of standardisation in terms of both construction and design. This explains why nearly all of the Speicherstadt bridges were arched bridges made of riveted profiled iron with low carriageways. The bridges built during the first and second construction phases, including Wandbereiterbrücke, were all designed by Franz Andreas Meyer and feature elaborate wrought-iron railings. In contrast, the later bridges are equipped with simple railings consisting of horizontal and vertical round bars.



Fig. 18: Kornhaus bridge across the Customs Canal

The basic construction of the bridges over the Customs Canal – Brooksbrücke and Jungfernbrücke (both built in 1886/87) – and Grosse Wandrahmsbrücke (1907-1909) is essentially no different from that of the other Speicherstadt bridges. However, they were made more prominent by the addition of towers and gate buildings at their ends. These additions are reminiscent of medieval fortifications and thereby complete the image of a “city of warehouses”. Combined with the water of the Customs Canal, these bridges also helped to create a vivid backdrop to the Free Port boundaries.

The fourth bridge across the Customs Canal, Kornhausbrücke (1887/88), is a special construction of an arched bridge: The carriageway of this bridge is suspended by tie rods from steel trusses resting on four granite plinths. The bridge has no gate; instead

Kornhausbrücke was adorned with four larger than life red sandstone sculptures, which were placed on the plinths: Christopher Columbus and Vasco da Gama on the north side (sculpted by Carl Boerner and Hermann Husaeus respectively) and Thomas Cook and Ferdinand Magellan on the south side (the sculptor of these figures is unknown). The sculptures were created in 1903.

The bridge abutments were faced in brick and are richly ornamented with cut stone details such as consoles and balustrades and imitation stone work at the edges. Inserted into some of the abutments are stairways leading to the water. At Kannengiesserortbrücke and Kornhausbrücke these stairways provide access to public toilets, whose cut stone window and door frames were designed to blend in with the overall appearance of the bridge. At St. Annenbrücke the stairways were combined with the Speicherstadt’s manned fire alarm station.

2.2.1.4 WarTime Destruction and Reconstruction

Despite the damage sustained during WW II and the recent trend (over the last one-and-a-half decades) to use the warehouse blocks for other purposes, the Speicherstadt has retained its unique urban and architectural character, and boasts a high degree of integrity and authenticity. Its original function as the storage centre of Hamburg’s port is still obvious today. What is more, purpose-built buildings such as the Coffee Exchange and the customs buildings on Alter Wandrahm provide physical evidence of



Fig. 19: Cross-section of the Speicherstadt



Fig. 20: Speicherstadt, block L after restoring

the Speicherstadt's erstwhile importance as a trading centre and its former affiliation to the Free Port. This is in no small measure thanks to The Hamburg Port and Warehouse Association (HHLA), which has owned the vast majority of the Speicherstadt's buildings ever since it was constructed. This continuity of ownership is one of the key factors which has enabled the authenticity of this great ensemble to be preserved – despite the damage caused during the war and recent changes of use.

The network of streets and canals within the pro-



Fig. 21: Speicherstadt, Pickhuben Bridge



Fig. 22: Speicherstadt, Brooksfleet with block M/N and E

spective World Heritage area remains as originally constructed. No major changes have been made to the profiles of either the streets or canals. The clinker-faced quay walls, cobbled streets and pavements have also largely been preserved in their original state. The only exceptions are Am Sandtorkai and Brooktorkai along the southern edge of the Speicherstadt, which were tarmacked after World War II. Of the original 14 historic bridges in the area nominated for World Heritage status, 12 remain completely or predominantly in their original condition, so that the Speicherstadt infrastructure is virtually the same as it was when it was first built. However, some modifications were made to the surviving historic bridges during the post-war period. In the early 1950s, Brooksbrücke and Jungfernbrücke had to sacrifice the bridge-end gates which had been damaged during the war, as their carriageways had to be raised to improve the navigability of the Customs Canal.

The technical equipment of the warehouse blocks is also largely intact, and continues to constitute one of the characteristic features of the Speicherstadt to this day: the operating rods for the winches, attached to the outer walls next to the loading doors, the winch bay roofs and the steel wire winch cables with their integrated round counterweights. On the

land side of the warehouses all the counterweights are still intact, while on the canal side most of them were removed when the winches stopped being used more than 20 years ago. Most of the electrical motors driving the winches have been preserved, however, and a large proportion are still operational.

Of the 15 warehouse blocks in the nominated Speicherstadt area, eleven suffered severe damage during World War II. However, most of the blocks were not affected in their entirety: Often, only single fire sections were damaged while the adjoining sections were left almost intact. In some of the severely damaged fire sections only parts of the façades collapsed, while others remained completely intact and were integrated into reconstructed buildings. The wood pile foundations of the Speicherstadt, too, only sustained minor damage in World War II and, together with the old quay walls, they were re-used when the Speicherstadt was reconstructed.

The two administrative buildings of the Hamburg Free Port Warehouse Association, the Winch Operators' House (Wasserschlosschen), the Manned Fire Alarm Station (Fleetschlosschen) at St. Annenbrücke and the four customs buildings on Alter Wandrahm, are among the most prestigious of all the buildings in the Speicherstadt and contribute significantly to its specific urban and architectural character. Fortunately,

they suffered only minor damage during World War II. However, one of the four customs buildings was modified during the 1950s: Additional storeys were added and a drive-through passage was incorporated. The former Boiler House is also in its original condition, with the exception of its two chimneys, which were lost. In 2002, the Boiler House was modernised in a way that was compatible with its status as a listed heritage asset: Two lattice constructions modelled on the two original chimneys were erected and the characteristic outline of the building was thus restored.

As described above, most of the warehouse blocks which had been damaged during the war were faithfully reconstructed to their original design. Blocks M and R 3 were so badly damaged that only their street-side façades could be reconstructed. These were integrated into new buildings. While the rebuilt façade of block R 3 largely resembled the original, except for the roof area, which was simplified, the façade of block M was reinterpreted and given a heightened facade and modern winch gables.

In some cases, such as with the western sections of block O and the eastern sections of blocks G and R, this approach was impossible due to the extent of the damage and a desire to reorder storage and office areas. The ruins of these warehouse blocks



Fig. 23: Speicherstadt, restored block M / N



Fig. 24: Speicherstadt, new eastern section block R

were therefore demolished to the level of the foundations and the gaps left by the ruins were filled with suitable buildings. Of all the buildings within the area nominated for the World Heritage site only block T was so severely damaged that, except for the foundations, hardly any of the original building fabric remains. In the place of this small block, a new building was erected.

Werner Kallmorgen developed a new contemporary type of grid facade for the new office buildings in block T and the eastern sections of blocks R and G. However, while they were modern in design, they featured some of the characteristics of the historic warehouses, such as almost uninterrupted red-brick facing and detailed craftsmanship in the shape of brick-on-edge rowlock lintels, which gave them a traditional feel. The precision with which all the façade details were crafted from standard brick sizes is reminiscent of the aesthetics of the Hanover School as far as the materials are concerned. Both the new façade of block P and the dome-shaped windows of blocks R and T recall the historic Speicherstadt architecture.

The new coffee exchange, which was built to designs by Kallmorgen and Schramm & Elingius in 1955/6, is the only building to depart from that approach in



Fig. 25: The new coffee exchange

terms of both the architectural language and the materials used. This underlines the importance of the coffee trade in the Speicherstadt.

The new buildings from the post-war period are almost entirely original. The only exceptions are the two western sections of block O, which were demolished in 2003 and replaced by a multi-storey car park of a sympathetic size and design.

The historic wooden pile foundations, complete with the quay walls, were all re-used when the Speicherstadt was restored and new buildings were erected. To this day, therefore, with the sole exception of the new car park, the entire Speicherstadt rests on its original foundations.

2.2.1.5 The Development of the Speicherstadt from 1945 to the Present

While some of the Speicherstadt buildings continue to be used for storage, since 2000 many blocks have been converted into offices and a few now house retail shops and catering outlets on their ground floors. Other warehouses have become the homes of cultural attractions, such as the Speicherstadt Museum, the Miniature Toy Train Wonderland and the Dialogue in the Dark. Apartments are few and far between.



Fig. 26: Speicherstadt, Modernisation block U

Any modifications to buildings can only be carried out in close cooperation with the heritage protection authorities.

As far as possible, the historic building fabric is only altered to accommodate new sanitary facilities and to improve access, e.g. by installing lifts, and to fit room partitions, which are made of glass so that it is still possible to appreciate the full extent of the spacious warehouses. The outer appearance of the buildings remains largely unchanged and inside they are still characterised by their original steel skeleton constructions, with wooden or cast iron pillars. The original access routes to the different parts of the building are also respected. Blocks D, P, Q, R, S, U and the western half of block W have already been revitalised in accordance with these criteria.

The second HFLG administration building in block U was also modernised in keeping with heritage protection requirements. It was amalgamated with the adjoining warehouse block and now houses the headquarters of Hamburg Port and Logistics plc (HHLA). To achieve this, the atrium of the administration building immediately adjacent to block U was given a filigree glass roof and this area now serves as lobby for both buildings. A lift with a glass tower was also added in the interior courtyard, providing barrier-free access to all offices.

Since 2010, efforts have also been underway to rehabilitate and modernise some of the Speicherstadt's post-war buildings, also in keeping with heritage protection guidelines, in some cases making it possible to use them for new purposes. They are predominantly office buildings with reinforced concrete skeletons. While their interiors are upgraded, the facades, the skeleton constructions and the internal access routes are retained. The former office complex operated by the coffee trading companies in block O is currently being converted into a hotel. The former Coffee Exchange, which is connected to the hotel by a glass walkway, is being annexed by the

hotel to function as its catering and event complex.

New uses have also been found for other special-purpose buildings in the Speicherstadt. For example, the former customs building at 15 – 16, Alter Wandrahm, which, as well as having offices upstairs, boasts a large former customs clearance hall on the ground floor, was ideally suited for the German Customs Museum. The workshops of the former Winch Operators' House on Dienerreihe now house a restaurant.

In recent years, cultural and tourist activities have become established in the Speicherstadt. Each year they help to attract millions of visitors to the Speicherstadt, visitors who are looking not only for the standard popular tourist attractions but also want to experience the authentic atmosphere of Hamburg as a port and trading city.

In a bid to preserve this authentic character in the future, a Development Concept for the Speicherstadt was recently drawn up and has been agreed by all the parties involved.

2.2.2 The History and Development of the Kontorhaus District

In the wake of the devastating cholera epidemic of 1892, the Senate decided to rehabilitate large areas of the so-called old and new town (Alt- und Neustadt). The latter was the first area to be tackled.

Since the redevelopment area in the old town city was very extensive, the project was carried out in several phases. First, the area to the north of Steinstrasse was redeveloped, which also involved the construction of the around 750-metre-long Mönckebergstrasse (1908-13), which was reserved exclusively for offices and retail outlets. The next area to be tackled was the south-eastern part of Hamburg's Altstadt district, between Steinstrasse and the Messberg, the area of the present Kontorhaus district.

The south of the Kontorhaus district borders the Speicherstadt, and is only separated from it by the Customs Canal. Grosse Wandrahmsbrücke, which was replaced by a footbridge in 1962, originally provided a direct connection between the two ensembles. The Kontorhaus district's favourable location, with good transport links, was a decisive factor in

its success. It was primarily used by companies involved in trade and shipping, which benefitted from the district's proximity to the eastern part of the Free Port, and the fact that it was within walking distance from the warehouses of the Speicherstadt.

The Kontorhaus district was constructed at a time of political and economic upheaval. The first buildings were erected during the inflation years, when there was a chronic shortage of capital. However, soon after the end of the war, the port and traders benefitted from the German economy's strong focus on exports, particularly since the steady decline in the German currency gave German exports a competitive advantage. The port was able to recover quickly after the period of hyperinflation in 1923.

Progress on the construction of the Kontorhaus district reflects this historical context. The Chilehaus, Messberghof and Miramar-Haus were built during the period of high inflation (all 1922-24). After the end of the inflation period, the following buildings were constructed: the Montanhof (1924/25), Haus Gülden Gerd (1924/25), the Post Office Building in Niedernstrasse (1924-26), the Mohlenhof (1927/28), the first two sections of the Sprinkenhof (1927-30), Haus Hubertus (1930/31) and the Rodewaldthaus (1930/31).



Fig. 27: Urban renewal area old town district



Fig. 28: Chilehaus and Old Wandrahms Bridge

The Bartholomay-Haus (1937/38), the Pressehaus (1938/39) and the third section of the Sprinkenhof (1939-43) were constructed during the Nazi period. The two residential complexes on Steinstrasse (1935/36 and 1936/37 respectively) were a special case. They were planned soon after the global depression of the 1930s, when there was clearly no demand for more office space. After World War II, any undeveloped plots were again used for office buildings.

2.2.2.1 The Infrastructure of the Kontorhaus District

Once the original buildings had been demolished, the road network was improved and extended. Some of the existing streets, such as Niedernstrasse, Mohlenhofstrasse and Fischertwiete, were simply widened and straightened. However, others were re-designed completely, including Altstädter Strasse, the central Burchardplatz and Burchardstrasse, which cut diagonally across the entire district, and formerly led to Bergedorfer Strasse, which no longer exists today. It was this radical redesign of the original road infrastructure that produced the oblique-angled plots, which so challenged the architects' creativity. The Chilehaus is a particularly good example of the outcome.

To this day, the unaltered parts of the road network still feature the original large granite cobble setts, which are arranged in rows with tar in the gaps between them. The granite kerbstones are also original. At that time, trees were a rare sight in Hamburg's city centre streets. Neither were there any fountains, monuments or other decorative features, with the exception of the square in front of the Messberg. As a result, Burchardplatz and the south-eastern end of Burchardstrasse, which is like a square, are still used as car parks today. However, it was precisely this austere design, which has only been softened in the last 20 years by the addition of trees and plants, which gave the Kontorhaus district its particular character. Thanks to that, the Kontorhaus build-

ings could completely dominate the urban space.

2.2.2.2 The Nominated Property of the Kontorhaus District with Chilehaus, Messberghof, Sprinkenhof and Mohlenhof

The Kontorhaus district is striking in its architectural consistency. The buildings constructed before 1931 are predominantly large-scale edifices, which in some cases fill entire blocks. They have clinker façades, white lattice windows, flat roofs and stepped-back upper storeys. The buildings from the Nazi period follow the same pattern except that they have pitched roofs, apart from the Pressehaus which, when it was rebuilt after World War II, was also given stepped-back upper storeys.

The buildings in the Kontorhaus district which are being nominated for the World Heritage List – the Chilehaus, Messberghof, Sprinkenhof and Mohlenhof – stand out from the other buildings in the Kontorhaus district because of the exceptional quality of their architecture. These buildings, which were constructed between 1922 and 1930, under the Weimar Republic – with the exception of the third section of the Sprinkenhof, which was only completed in 1943 – are amongst the most significant office block designs of the period. But these edifices broke new ground not only in qualitative, but also in quantitative terms: The Chilehaus offered 36,000 m² of gross floor space; the Sprinkenhof, which for a time was one of the largest office buildings in Europe, as much as 52,000 m². Even the Messberghof managed 18,200 m² in 1924. In comparison, the Mohlenhof, with 7,800 m², was merely a medium-sized office building by the standards of the time in Hamburg. The Kontorhaus architecture in Hamburg was virtually without precedent, not only in Germany but also in Europe, a fact which was already recognised at the time. In 1914, for example, the Deutsche Bauhütte magazine wrote: "The demands of this commercial city have presented the private construction industry



Fig. 29: The Messberg (around 1950)

[in Hamburg] with an extraordinary task, the like of which is otherwise only seen in London and in the major cities of the United States – to construct office buildings.”

2.2.2.3 Fritz Höger and the Chilehaus

Fritz Höger, the creator of the Chilehaus and, in cooperation with Hans and Oskar Gerson, the Sprinkenhof, is one of the most renowned German architects of the 20th century, whose work also attracts significant international interest. Like Hans and Oskar Gerson, Höger was one of the generation of reformers who, in the years just before World War I, prepared to breathe new life into architecture, without denying tradition. The result was a regional version of the modern, whose functionalism was softened by conventional structural elements, traditional – often traditionally crafted – materials, and sparse decoration. Brickwork was the order of the day, particularly using clinker bricks. In Höger’s case, this objectiv-



Fig. 30: Chilehaus

ism emerged particularly clearly in his Kontorhaus designs, which increasingly sought to achieve a harmony of line, culminating in the verticalism of the Chilehaus.

Höger justified this uniformity primarily by economic reasons, as he explained in 1925 in the *Zentralblatt der Bauverwaltung* magazine: “The only correct choice for a building which, after completion, will be leased by the square centimetre and for which maximum freedom is required when dividing the space into rooms, is the single rhythmic pattern. A double pattern or any irregularity on the fronts of the buildings, regardless of whether it is the result of errors in the construction or misunderstood architecture, is an irreparable mistake.” However, there were also aesthetic reasons. The façades were more severe more homogeneous, and above all more dynamic as a result, corresponding to the expressionist style of decoration which became current at the beginning of the 1920s.

The Chilehaus, a major work by Fritz Höger, was built between 1922 and 1924. It was commissioned by Henry Brarens Sloman, who owned saltpeter mines in Chile and therefore had a ready supply of foreign currency, which is why he was able to construct the building during the inflation years. Only parts of the planning history can be pieced together, since the majority of Höger's archive was destroyed by fire in an air raid. Designs were also submitted by Hans and Oskar Gerson and by Puls & Richter, who competed with Höger for the commission.

The idea of spanning Fischertwiete, which split the plot in two and led across the Wandrahmsteg to the Speicherstadt, thus providing a direct connection between the two districts, featured in Höger's design from the outset, whereas the building's distinctive silhouette and the characteristic structure of the façades only emerged gradually. This is suggested by the only one of Höger's early draft designs to have survived, which is dated 19 January 1922 and has been deposited in the building's official documentation archive. It shows a view of the northern façade, whose square corner pillars, oriel windows and historically inspired forms on the gateway to Fischertwiete are reminiscent of his Rappolthaus. The only hint of the building's final appearance in this early sketch was the stepped-back upper storeys.

Alongside the shape of the main body of the building, Höger was particularly concerned with the detail on the façades, although here it is striking that he has reined in his sometimes over-exuberant imagination when working with clinker bricks and has restricted himself to one single structural motif. In front of the pillars on the façades, buttress-like supports jut out at an angle of 45 degrees to the building, so that they look like tapered ridges. When viewed from a particular angle, they appear to be so close together that the windows are no longer visible, and the façades appear to be homogeneous, uniform brick surfaces. Or, as Höger himself put it in 1925 in the *Zentralblatt der Bauverwaltung*: "The



Fig. 31: Chilehaus, entrance hall A

main feature of the Chilehaus's aesthetic quality is its single, rhythmic pattern. The many windows on the façades cause the building to lose its solidity, but the single, repeated pattern restores the façades to tranquil surfaces, which, in their uniformity, again reveal the monumental body of the building."

The Chilehaus did not sustain any substantial damage in World War II and, with the exception of the loss of a few minor features in the entrance area of gate B and the terracotta decoration on gate C, to the south, it has remained virtually unchanged, with its sculptures, its countless white painted lattice windows and its sumptuously decorated hallways and staircases. Only the shop windows were no longer original and were therefore replaced with windows designed as a free interpretation of the originals, as part of a project to modernise the entire complex (1990-93). The project was carried out by the architects WGK Planungsgesellschaft mbH in collaboration with the Hamburg Heritage Protection Agency, in line with heritage protection guidelines. At the same time, Fischertwiete was pedestrianised, and the original paving replaced by granite slabs.

2.2.2.4 The Messberghof

The Messberghof was constructed between 1922

and 1924 to a design by Hans and Oskar Gerson. It was funded by a limited liability company, Ballinhaus GmbH, which had been formed by a group of several different firms.

In contrast to its neighbour, the Chilehaus, the Messberghof has smooth façades, which are largely without decoration. The focus is on the workmanship in the technically demanding brickwork, which lends the building its particular quality. This purist aesthetic based on materials is in fact a general characteristic of the designs of Hans and Oskar Gerson, who were able to formulate their design creed in an article about clinker brickwork, which appeared in the *Tonindustrie-Zeitung* in 1925: "The interplay between the many slightly different bricks with their various different hues and the joins between them gives the surface its distinctive aesthetic appeal. We find it so appealing that, as a rule, we do not try to enliven the surfaces with anything else and, if possible, avoid fragmenting the structures [of the buildings]."

In World War II, the Messberghof sustained only relatively minor damage. The roof and part of the stepped-back storeys on Pumpen street were destroyed in an air raid in 1945 and rebuilt in a simplified design soon after the end of the war. The building was given a flat roof, with the original tower rising straight out of it. In another change, two large shop windows were fitted into the ground floor of the western façade. In addition, the sandstone sculptures by Ludwig Kunstmann, which had been placed on the pillars of the main façade, were removed in 1968 because of severe weather damage and were then misplaced, so that it was no longer possible to reconstruct them. Otherwise, the Messberghof remained in its original condition, both externally and internally.

All of the detrimental changes were remedied by the architects Schweger & Partner, in consultation with the Hamburg Heritage Protection Agency, as part of a project to modernise the building in line with



Fig. 32: Messberghof

heritage protection guidelines (1995/96). The original curvature of the roof area was restored, with a conscious decision made to use modern structures and materials such as titanium zinc sheeting. The lost sculptures were replaced in 1997 with abstract bronze statues by Lothar Fischer.

2.2.2.5 The Sprinkenhof and Mohlenhof

The majority of the Sprinkenhof was a joint project by Fritz Höger and Hans and Oskar Gerson, who together were responsible for the first two phases of its construction, from 1927 to 1928 and from 1929



Fig. 33: Messberghof, stairwell

to 1930 respectively. The third section of the building, which was constructed between 1939 and 1943, was designed by Höger alone. Apart from the third phase, we will never know the relative contributions of each architect to the plans. Only the spiral staircases in the main stairwells of the first two sections of the building can be safely attributed to Hans and Oskar Gerson, who had already designed a similar staircase for the Messberghof.

The first section of the Sprinkenhof emerged relatively unscathed from World War II and is therefore entirely in its original condition, but the other two sections of the building were damaged. The damage to the original building fabric was, however, relatively minimal, particularly given that the reinforced concrete structure suffered no serious damage and the façades also remained intact. Even inside the buildings many historic details remain, including even historic paternoster lifts in the second and third sections.

The first and second sections of the Sprinkenhof were rehabilitated by the architects Kleffel, Köhnholdt and Partner, in consultation with the Hamburg Heritage Protection Agency and in line with heritage protection guidelines (2000-03). As part of the project, the entrance to the underground car park on Springeltwiete was closed, so that it could be used to accommodate the air conditioning units, and the car park in the interior courtyard of the second section of the building was covered with a glass roof. In addition, Springeltwiete was closed to motor vehicles, but retained its original appearance.

The Mohlenhof, which was constructed between 1927 and 1928, was designed by the architects Klopheus, Schoch and zu Putlitz. The developer was the Mohlenhof-Gesellschaft mbH, which was founded by Paul Hammer's building company. Our knowledge of the history of the planning of the Mohlenhof is also rather sketchy. The preliminary design dates from August 1927. The architects originally planned



Fig. 34: Sprinkenhof

a skeleton façade with the expressionist triangular motifs which were popular at the time, but this design also had to be revised at the instigation of the Building Commission. It wanted a façade that was as neutral as possible, due in part to the proximity of the Chilehaus.

Instead, the building was given a series of façades punctuated with narrow windows and was largely free of structural and decorative elements, with the exception of the ledge clad in artificial stone above the base of the building and the two friezes which decorated the main building on Burchardplatz and continued around the stepped-back upper storeys, where they formed parapets. The Mohlenhof suffered no serious damage in World War II and is to a very large extent in its original condition. Such changes as have been made mainly concern the façades on the lower floors. In the post-war period, the entrance hall was remodelled, with travertine stone-clad walls and a marble floor, and most of the staircases on the upper floors were modernised, although many of the original art deco features were retained.

The fact that these individual, heterogeneous buildings formed a harmonious and homogeneous whole is thanks to the Building Commission, which was es-



Fig. 35: Mohlenhof

established in 1912, and which had to be consulted on all plans for new buildings, but also on any alterations and extensions to existing buildings in those parts of the city which were deemed to be particularly worthy of protection. In the Kontorhaus district, the influence of the Building Commission is clear to see in the uniform facing of the buildings with clinker, the stepped-back upper storeys and the flat roofs. In addition, it wished the Sprinkenhof and Mohlenhof to be built in a more restrained style, so that they would not detract from the Chilehaus, which, even at the time, was highly prized. So much so that the city's then Director of Engineering and Construction, Fritz Schumacher, created the open area to the east of the Chilehaus precisely to ensure that the spectacular pointed tip of that building could be sufficiently appreciated. The fact that there was a body overseeing the design of an entire city centre district was something unique at the time, unparalleled even at international level.

Given their exceptional cultural, architectural and historical significance, all of the component buildings of the ensemble which is being nominated for the World Heritage List are legally protected under the Heritage Protection Act of the Free and Hanseatic



Fig. 36: Mohlenhof, entrance hall

City of Hamburg. The entire Speicherstadt with its buildings and all its attendant features, including the plots of land, streets and open spaces, together with the Customs Canal and the Binnenhafen, and including its canals and water basins, quay walls, bridges and other objects and parts which contribute to its image were listed under the Hamburg Heritage Protection Act in 1991. The buildings and open spaces in the Kontorhaus district which are being nominated for the World Heritage List were listed in 1983, with the exception of the Mohlenhof, which was listed in 2003. The two ensembles were included on Germany's Tentative List for nomination for the World Heritage List in 1998 and 2005 respectively.

3. World Heritage Characteristics

In order to be inscribed on the World Heritage List, sites are assessed on the basis of certain criteria: their “outstanding universal value,” their “integrity” and their “authenticity.” These criteria are also of key importance for defining the primary protection guidelines and for the sustainable future development of the future World Heritage site.

3.1 Proposed Statement on the Site’s Significance

In the southern part of Hamburg’s old town are two complementary, monofunctional districts, which are closely related, both physically and functionally: firstly, the complex of warehouses for goods imported through the port and, secondly, the Kontorhaus district with the offices of the companies engaged in port-related activities, including shipping.

The Speicherstadt was constructed in three phases between 1885 and 1927 under the direction of Franz Andreas Meyer. It was damaged in World War II, and reconstructed in the post-war period by Werner Kallmorgen, in keeping with the historic design; high-quality buildings were added in the 1950s. The Speicherstadt stands out for the exceptional homogeneity of both its architecture and its urban development. It consists of 15 five- to seven-storey warehouses and a series of individual buildings, the vast majority of which are constructed in brick with neo-Gothic and neo-Romanesque forms, and features a specific functional and physical structure, and a particular style of urban development, with cobbled streets, waterways, bridges and railway tracks.

The adjacent Kontorhaus district to the north of the Customs Canal, is comparably homogeneous. This district, which dates mainly from the 1920s and 1930s, consists predominantly of large-scale edifices, some of which fill entire blocks, with clinker façades in expressionist or sober designs, flat roofs and stepped-back upper storeys. The dominant feature of the prospective World Heritage area is the

Chilehaus, which was constructed between 1922 and 1924 by Fritz Höger. This 10-storey office building is constructed on a reinforced concrete frame and the outer walls are made of the typical dark-red to violet fired clinker bricks that are characteristic of the brick expressionist style. Other striking buildings in the nominated property are the Messberghof, built between 1923 and 1924 by the brothers Hans and Oskar Gerson; the Sprinkenhof, built in three sections between 1927 and 1943 by the architects Hans and Oskar Gerson and Fritz Höger, and the Mohlenhof, which was constructed in 1928 to plans by the architects Rudolf Klophaus, August Schoch and Erich zu Putlitz.

From a historical point of view, the architecture of the functionally complementary districts is a striking and unique microcosm, on a unique scale, of the development of European architecture in the late 19th century and the first third of the 20th century, and reflects the new ideas of the time about reorganising cities along functional lines, a key milestone in the emergence of modern urban development. The two districts were optimally located to meet the new logistics requirements for goods transshipment, and provide office space for organising trade. Moreover, the high quality of the districts’ design testifies to the internationally renowned status of Hamburg Port and the local export business at the time.

3.2 Outstanding Universal Value

The following criteria are proposed as a basis for inscribing the “Speicherstadt and Kontorhaus district with Chilehaus” on the World Heritage List. They are intended to define the unique universal value of the protected property:

- » (i) **represent a masterpiece of human creative genius:**

Fritz Höger’s Chilehaus, with its eastern tip recalling the prow of a ship and the characteristic detail of its façades, is regarded as an iconic work of expressionist architecture, which no standard work of reference on 20th century architecture fails to mention. By combining a reinforced concrete skeleton with traditional brickwork, executed with barely surpassable virtuoso design and craftsmanship, Höger created a modern style of office building architecture, the like of which the world had never seen.

- » (ii) **exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design:**

The cultural-historical significance of the Speicherstadt and the Kontorhaus district, particularly the core area consisting of the Chilehaus, Messberghof, Sprinkenhof and Mohlenhof, lies in the fact that they document the changes in urban development, architecture and technology, as well as the functional changes, which resulted from the rapid expansion of international trade in the second half of the 19th century. The two monofunctional, functionally complementary districts present a globally unique microcosm, on a unique scale, of the ideal of a modern, city with functional zones, and document the concept of city formation.

- » (iii) **bear a unique or at least exceptional testimony to a cultural tradition or to a civilisation which is living or which has disappeared:**

Thanks to their scale, the quality of their design, their materials and their architectural forms, both the Speicherstadt and the Kontorhaus district, in particular the core area consisting of the Chilehaus, Messberghof, Sprinkenhof and Mohlenhof, bear exceptional testimony to the building tradition in Hamburg, as a Hanseatic port city, and to the self-image of its business people, as well as to their own adaptability, which ensured their success.

- » (iv) **be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history:**

The two neighbouring, monofunctional, but functionally complementary districts, both contain outstanding examples of the types of buildings and ensembles which epitomise the consequences of the rapid growth in international trade in the late 19th and early 20th centuries respectively. Their uniform design and high-quality, functional construction, in the guise of Historicism and Modernism respectively, make them unique examples, the world over, of ensembles of maritime warehouses and modern office buildings of the 1920s.

Hamburg’s Speicherstadt, with its numerous warehouses and functional buildings, its specific functional and physical structure, its particular style of urban development, and with its cobbled streets, waterways, bridges and railway tracks, was constructed at the end of the 19th century, and today it is still the largest cohesive and integrated ensemble of warehouses anywhere in the world. Thanks to careful reconstruction following damage sustained in the last war, it has been possible to restore it to its original uniform appearance. It stands out not only for its

high degree of architectural homogeneity, resulting from the uniform red brick façades, predominantly in the neo-Gothic forms of the “Hanover School”, and its consistent urban planning, but also for its evocative setting, which underlines its prestigious style, unusual in such functional buildings.

The Kontorhaus district is characterised by both its considerable homogeneity and its remarkable scale, which can still be experienced today. As the first dedicated office district on the European continent, it showcases previous experience in office block design and illustrates the shift in focus of economic activities in continental Europe from the secondary to the tertiary sector. Its office buildings, particularly the Chilehaus, Messberghof, Sprinkenhof and Mohlenhof broke new ground in the development of office building architecture, and are amongst the most significant achievements of their kind post-World War I. The high quality of their design was unrivalled at the time, except in the United States. However, while international office block architecture of the time was still influenced by the Beaux-Arts style and other forms of Historicism, Hamburg’s buildings already displayed modern clinker façades in expressionist forms, which, in the Chilehaus and Sprinkenhof were barely surpassable in the virtuosity of their design and craftsmanship. The Messberghof, whose decorative and structural features are more restrained, was one of the first buildings anywhere in the world to pave the way for the New Objectivism movement. The Mohlenhof, with its relatively simple, smooth façades, can even be regarded as an early example of New Objectivism architecture. The buildings in the core area of the Kontorhaus district are therefore amongst the most significant office buildings of the 1920s. What is more, as works of important architects, they are also of high artistic merit.

Alongside their architectural forms, which were modern compared with other contemporary office buildings from around the world, Hamburg’s office buildings were also characterised by the high quality

of their design, which continues inside the buildings, in the hallways and staircases.

3.3 Statement of Integrity

The Hamburg ensemble comprises two mono-functional districts in direct neighbourhood to one another, which have been preserved intact in adequate size in almost unchanged historical form and design. On a unique scale and in unparalleled concentration, the ensemble documents the change from a mixed-use city to a modern city with mono-functional zones, which were established at the end of the 19th and the beginning of the 20th century.

The Speicherstadt has all the elements and structures necessary to underline its importance as the largest, uniform molded warehouse complex and most modern logistics centre of the world of the late 19th century. The Kontorhaus district, in particular the buildings of its core zone consisting of Chilehaus, Messberghof, Sprinkenhof and Mohlenhof comprises all the elements and structures that document its importance for the development of the modern office building architecture of the 1920s and 1930s.

3.4 Statement of Authenticity

The Hamburg ensemble Speicherstadt and Kontorhaus district with Chilehaus, two mutually complementary, directly neighbouring mono-functional districts in largely unchanged historic design with functionally shaped buildings of high quality in the style of historicism and of modernity, document the change of the mixed-use town to a modern city with mono-functional zones at the end of the 19th and in the early 20th century with a concentration and degree of preservation and on a scale, which are unique in the world.

Despite the damage suffered during the World War II and the successive changes of use during the course

of the last one-and-a-half decades, the Speicherstadt has largely retained its form and design in terms of building materials and substance, all of which are determined by their high degree of architectural and urban planning concentration, by the ambitious link between architectural design of the buildings and their technical facilities, by the effective composition of their prestigious red-brick construction in neo-Gothic architectural forms from the Hanover School and by their functional and aesthetic structure. These constants lend it the incomparable look as a “city of warehouses” (“Speicherstadt”) with an unusually prestigious character for that kind of building task. The original function of the Speicherstadt as a centre for storage and warehousing has largely been retained. In those cases where it has not, this function is still clearly traceable.

The Hamburg Kontorhaus district, whose buildings continue to serve their original purposes, is still largely unchanged characterised in terms of form and design as well as regards materials and substance. It consists of modern office buildings with reinforced steel constructions from the 1920s and 1930s. The carefully designed and in some cases very complex and detailed clinker brick facades feature expressionist and functional architectural forms. Also, the artistic decorative elements and the prestigious decoration of building entrances and staircases are largely unchanged in terms of material and substance. This also applies to the Chilehaus, its characteristic detailing of the brick facades and its significant form including the overbuilding of the Fischertwiete, the S-shaped facade on Messberg, and applies above all to its eastern tip which is reminiscent of a ship's prow.

3.5 Protection and Administration Plan

Given their outstanding significance, both the Speicherstadt and the Kontorhaus district are listed under the Hamburg Heritage Protection Act. Any repairs or alterations to the buildings, and building work of any

consequence, have to be discussed with the Heritage Protection Agency of the Free and Hanseatic City of Hamburg, and are subject to its approval. The Speicherstadt also has its own Design Ordinance and a Development Concept for the Speicherstadt has been drawn up, too.

It is intended to draft a Design Ordinance for the Kontorhaus district as well. In addition, a local development plan is currently being produced for the Speicherstadt (local development plan HafenCity no. 12/Hamburg- Altstadt district no. 48).

A management plan has been formulated to safeguard the preservation and proper management of the ensemble „Speicherstadt and Kontorhaus district with Chilehaus.

The Heritage Protection Agency will be responsible for coordinating the management of the prospective World Heritage site and will be affiliated a department from the Ministry of Culture.

4. The Protected Property, Protection Objectives and Legal Instruments for the Preservation and Sustainable Development of the Nominated Property

The main requirements for safeguarding the “Speicherstadt and Kontorhaus district with Chilehaus”, which is being nominated for the World Heritage List, derive from the World Heritage Convention, which underpins the application of the World Heritage Programme, the “Operational Guidelines for the Implementation of the Convention concerning the Protection of the World Cultural and Natural Heritage” (hereinafter: Operational Guidelines) and the various charters, recommendations and declarations, which have been drafted by UNESCO and ICOMOS in recent years.

At national level and at the regional level of the federal State of Hamburg, three key pieces of legislation guarantee protection and sustainable development: the Federal Construction Code (Baugesetzbuch), the Hamburg Building Code and the Heritage Protection Act of the Free and Hanseatic City of Hamburg. Further planning guidelines for the future World Heritage area are also available in the form of the Hamburg City Centre Concept (Innenstadtkonzept), the Development Concept for the Speicherstadt of April 2012 and the Design Manual for the Speicherstadt (Gestaltungshandbuch Speicherstadt) of July 2002.

The Operational Guidelines stipulate that when management plans are drawn up, it is vital to ensure that the national and federal planning systems of the Federal Republic of Germany and the Free and Hanseatic City of Hamburg are compatible with the Guidelines in the World Heritage Convention. The same applies to the legal status of the designated buffer zone for the World Heritage area, since its purpose is to guarantee the protection of the surrounding area. It is therefore not only about preserving the built heritage itself; in fact, safeguarding the overall setting and the visual experience which it has to offer also plays a crucial role. The following section therefore provides an explanation of the key objectives set out in the UNESCO World Heritage Convention and how they relate to Germany’s planning systems and objectives at both national and regional (Land) level.

In the interests of maximum transparency and in accordance with the Operational Guidelines, the intention is to enable international players, agencies, building developers, residents, property owners and other interested parties quickly to find comprehensive information about the requirements in the nominated property and the buffer zone under international, national and regional (Land) law. To achieve this, efforts are underway to make all of the relevant texts, objectives and statements in the instruments introduced below accessible on the Internet, because they provide the basis for ensuring the protection and sustainable development of the future World Heritage site of the “Speicherstadt and Kontorhaus district with Chilehaus”.

4.1 The Protected Property

Pursuant to Article 1 of the World Heritage Convention, the “Speicherstadt and Kontorhaus district with Chilehaus” ensemble falls into the “cultural heritage” category. Within that category it falls into the sub-category of “groups of buildings”, which the World Heritage Convention describes as: “groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science”.

4.2 Protection Objectives and other Primary Objectives

The World Heritage Convention regards both the conservation and presentation of World Heritage sites as important and therefore requires both to be respected. Particular attention has to be paid to ensuring continued compliance with the criteria which justified the inscription on the World Heritage List in the first place: the “outstanding universal value”, authenticity and integrity of the World Heritage site. Since, in this case, the ensemble is in the centre of the city of Hamburg, where people live and work, and since the area will continue to be managed under

market economy conditions, even after its inscription on the World Heritage List, it is necessary to reconcile these needs with the sustainable development of the World Heritage site. With this in mind, the essential protection objectives and measures to be taken are formulated within the following three pillars:

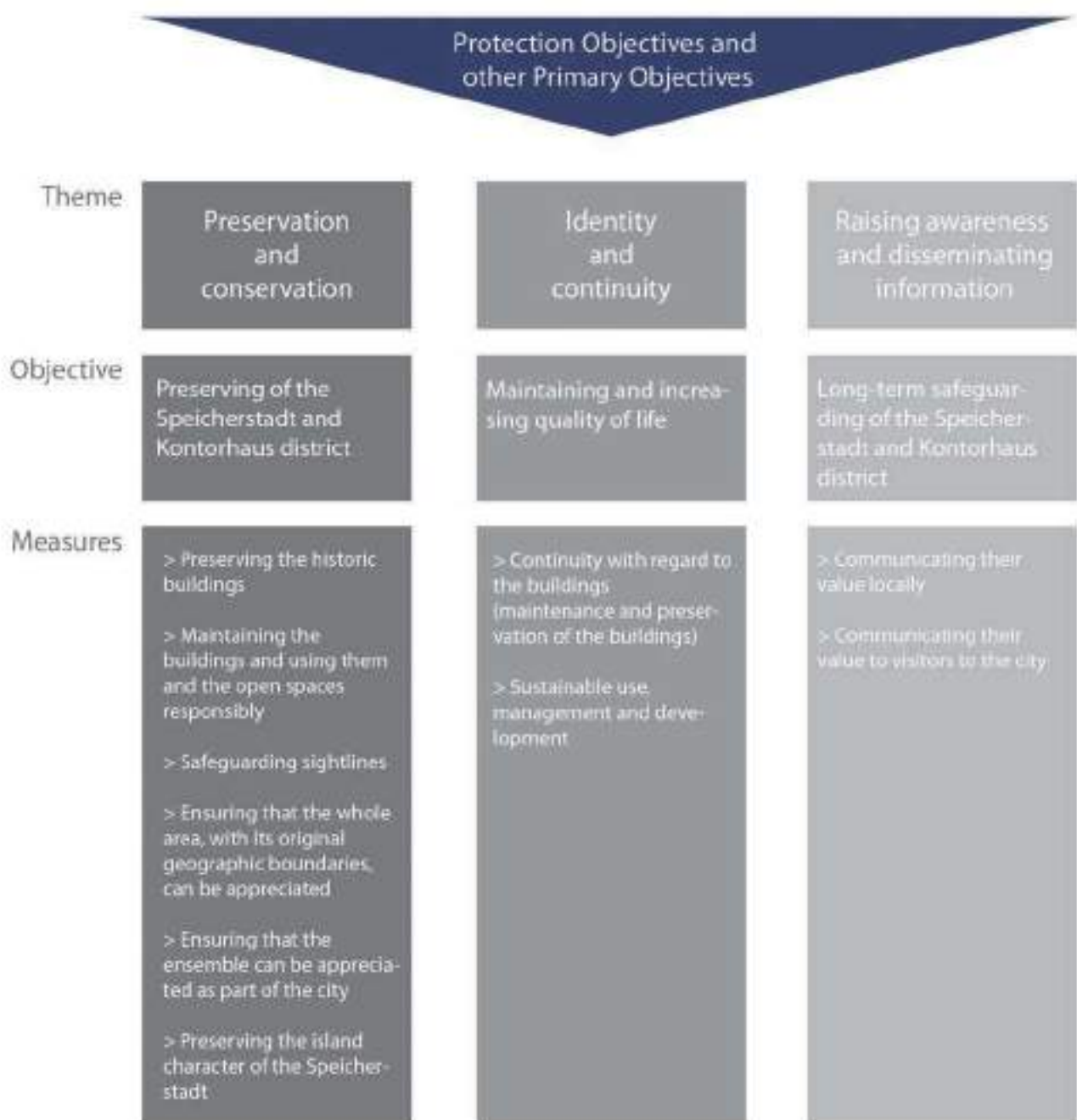


Fig. 37: Three-pillar model of the protection objectives of the “Speicherstadt and Kontorhaus district with Chilehaus”, which is being proposed for nomination

1. Preservation and conservation: Preserving the historic buildings, the characteristic overall impact of the Speicherstadt and Kontorhaus ensembles and their typical appearance within the cityscape by:

- Maintaining the buildings and using them and the adjoining open spaces responsibly;
- Safeguarding the visual integrity of the ensembles in the cityscape by preserving existing sight lines so that they can be enjoyed as part of Hamburg's cityscape;
- Ensuring that the area from the Kehrwiederspitz to Poggenmühle can continue to be appreciated as an original part of the Speicherstadt;
- Ensuring that the specific structure of the Speicherstadt, which is a "town" with streets, waterways and bridges, and the fact that it is an island, can continue to be appreciated;
- Preserving the specific character of the Speicherstadt and Kontorhaus district and ensuring that the different purposes for which they were designed can continue to be appreciated.

2. Identity and continuity: Maintaining or even increasing the quality of life of the residents of Hamburg by safeguarding a unique testimony to Hamburg's cultural and historical development, which played a key role in establishing its identity, by:

- Pursuing a policy of continuity, as hitherto, with regard to the historic buildings (maintenance and preservation of the buildings);
- Ensuring the sustainable use, management, preservation and development of the future World Heritage site.

3. Raising awareness and disseminating information: Providing for the long-term and sustainable

safeguarding of the Speicherstadt and Kontorhaus district by:

- Communicating to representatives of business and politics and to the people of Hamburg the value which the nominated property represents;
- Communicating to visitors to the city the value which the nominated property represents.

4.3 World Heritage Convention and International Agreements

Key to achieving these objectives are the vision and primary objectives of the World Heritage Convention, the Operational Guidelines for their implementation, the internationally valid charters and other guidelines.

4.3.1 The World Heritage Convention

The World Heritage Convention is based on the idea that "parts of the cultural or natural heritage are of outstanding interest and therefore need to be preserved as part of the world heritage of mankind as a whole" (preamble to the World Heritage Convention). The World Heritage Convention does not therefore regard cultural or natural heritage sites as belonging solely to the State on whose territory they are located. Rather, they are, conceptually, the property of mankind as a whole. By signing the World Heritage Convention, the States Parties recognise their international obligation to protect the World Heritage sites situated on their territory and to preserve them for future generations.

By signing the World Heritage Convention, the States Parties have undertaken, in particular:

- to adopt a general policy which aims to give the cultural and natural heritage a function in the life of the community and to integrate the protection of that heritage into comprehensive planning programmes;

- to develop scientific and technical studies and research and to work out such operating methods as will make the State capable of counteracting the dangers that threaten its cultural or natural heritage; and
- to take the appropriate legal, scientific, technical, administrative and financial measures necessary for the identification, protection, conservation, presentation and rehabilitation of this heritage.

The World Heritage Convention was ratified by the Federal Republic of Germany in 1976, but it has not yet been incorporated into national law. It is therefore crucial for the preservation, sustainable development and management of the future World Heritage area to ensure that the planning systems at national and regional (Land) level are compatible with the aims of the World Heritage Convention.

An important step towards achieving this was made when the new Heritage Protection Act (of 5 April 2013) of the Free and Hanseatic City of Hamburg came into force on 1 May 2013. Section 7, Paragraph 8 of this piece of legislation explicitly mentions the World Heritage requirements, stating that: „All measures and plans must take into account the obligation to protect the cultural heritage in accordance with the Convention Concerning the Protection of the World Cultural and Natural Heritage of 16 November 1972 (German Federal Law Gazette (BGBl), 1977 II, p. 215)“ (Heritage Protection Act of 5 April 2013 of the Free and Hanseatic City of Hamburg, Official Hamburg Gazette, p. 142).

4.3.2 Operational Guidelines

The “Operational Guidelines for the Implementation of the World Heritage Convention” (hereinafter referred to as the Operational Guidelines) provide an essential basis for achieving these objectives. They aim to facilitate the implementation of the World Heritage Convention.

In particular, they set forth the procedures for:

- the inscription of properties on the World Heritage List and the List of World Heritage in Danger;
- the protection and conservation of World Heritage properties;
- the granting of International Assistance under the World Heritage Fund; and
- the mobilisation of national and international support in favour of the Convention.

The Operational Guidelines are periodically revised to reflect the decisions of the World Heritage Committee. They define the principal approaches towards managing World Heritage sites. References to the Operational Guidelines in this Management Plan are to the 2011 version.

4.3.3 Charters and Declarations

Contrary to the planning legislation at both national and regional levels, which is listed below, the charters, declarations and recommendations issued by UNESCO and ICOMOS are purely advisory in nature. However, they provide a detailed explanation of the tasks involved in protecting monuments, cultural properties and world heritage. The practical objectives which they set with regard to implementing the World Heritage Convention are therefore of key importance, as are the objectives for the preservation, use and sustainable development of World Heritage sites. The following charters and documents are of particular relevance to the “Speicherstadt and Kontorhaus district with Chilehaus”: the Venice Charter, the Washington Charter, the Nara Document on Authenticity, the Burra Charter and the more recent Recommendation on the Historic Urban Landscape. It is intended to make these international guidelines available on the Internet, so that all of those involved

in safeguarding the future World Heritage site and all other interested parties can gain easy access to them.

Since this nomination for the World Heritage List concerns a group of buildings within an urban setting, which is closely intertwined with its urban surroundings both physically and in terms of present city development objectives, the Recommendation on the Historic Urban Landscape, which was adopted by the World Heritage Committee in 2011, is of particular significance. The approach adopted by the Recommendation on the Historic Urban Landscape is based on existing declarations and charters, and takes account of the fact that World Heritage sites in urban areas are subject to continuous change. It also recognises that the social communities living in and around urban World Heritage sites play a key role in their preservation and sustainable development. They must therefore be fully involved in implementing the preservation and sustainable development strategies.

Against this background, the Recommendation on the Historic Urban Landscape recommends that efforts to preserve cultural heritage in urban areas should no longer be made in isolation, but should rather be considered in a broader context, which also takes account of dynamic processes within society. Historic areas should therefore be identified and protected as an integral part of their urban context. Management thereof should also take full account of the overall urban context and should therefore be in tune with overarching urban development objectives. All of those involved in urban planning processes should, as far as possible, participate in the management of the site. Close cooperation with private stakeholders and interest groups is also recommended.

4.4 Legislation and Planning Systems at National and Regional Level

Alongside these international guidelines, the general development and construction frameworks provided for at both national and regional level include the following pieces of legislation and planning instruments, which are relevant to the future World Heritage area:

4.4.1 Federal Construction Code

The provisions of the Construction Code of the Federal Republic of Germany play a decisive role in regulating building development in both the World Heritage area and the buffer zone. At the same time, they provide the means to protect the future World Heritage site, through instruments such as the general development and construction framework, and ordinances on conservation and design, and by stipulating other levels at which it is possible to intervene.

4.4.2 Hamburg Building Code

The Hamburg Building Code of 14 December 2005 (as last amended on 15 December 2009) contains general building regulations, establishes the legal rules governing plots of land and their development, and contains provisions on design and construction as well as building products and methods, walls, ceilings, roofs, escape routes and technical building equipment. It also stipulates the purposes for which buildings may be used.

In addition, the Hamburg Building Code defines the tasks and competences of those involved in construction projects, including building monitoring authorities, and contains provisions on preventive monitoring, inspection measures, administrative offences and statutory instruments.

4.4.3 Zoning and Land-Use Plan

In accordance with Section 1, Paragraph III, and Section 5, Paragraph ff, of the Federal Construction Code, the Free and Hanseatic City of Hamburg has produced a zoning and land-use plan for the entire city, including, obviously, the nominated property and the buffer zone, as part of a general development and construction framework. The most recent version of the zoning and land-use plan for the Free and Hanseatic City of Hamburg, which was published on 22 October 1997 (Official Hamburg Gazette, p. 485), still classifies the planning area as part of the “port,” and that description is included for information purposes. The zoning and land-use plan is being amended in parallel with the relevant local development plan, and in future the area concerned will be classified as “mixed-use development.” This plan establishes the essential guidelines for land use and building developments for the entire city centre.

4.4.4 Local Development Plan

On the basis of the 1938 Ordinance on the Building Inspectorate, an old-style district development plan was initially drawn up, covering the entire Hamburg city centre, including the Kontorhaus district. The most recent version of this dates from 14 January 1955 (Official Hamburg Gazette, p. 61). In large parts of the city centre, this planning document has now been superseded by numerous local development plans under the former and present versions of the Federal Construction Code.

In terms of planning legislation, the area of the Kontorhaus district nominated for UNESCO World Heritage List has been classified as an urban core area where residential use can be approved by way of exceptional permission (Ordinance on the Use of Buildings, Section 7, Paragraph 3). The relevant local development plans are Hamburg-Altstadt 30 of 14 June 1994 and Hamburg-Altstadt 47/ Neustadt 49 of 5 July 2011.

The Speicherstadt was removed from the scope of the Port Area Development Act (Hafenentwicklungsgesetz) on 10 October 2012, paving the way for a local development plan to be drawn up. The official decision to do this was made on 17 October 2012 (see 4.4.5 and 7.1.5).

4.4.5 The Speicherstadt’s removal from the Scope of the Port Area Development Act (Hafenentwicklungsgesetz) and the Drafting of a Speicherstadt local development plan

Until 2012, the Speicherstadt fell within the scope of the Port Area Development Act (Hafenentwicklungsgesetz) of 25 January 1982, as last amended on 19 April 2011 (Official Hamburg Gazette, p. 123). Changes to logistics operations in the port (including a shift from groupage to container transport) and the development of the HafenCity had a significant impact on the Speicherstadt. It saw a decline in port-related activities, and a subsequent increase in demand from city users, and underwent radical structural change. As a result, the Speicherstadt was removed from the Port Area Development Act on 10 October 2012.

In administrative terms, the Speicherstadt, complete with its waterways, the Customs Canal and the Binnenhafen from Kehr wiedersteg as far as Oberbaumbrücke, is now part of the HafenCity district. Its removal from the port area is intended to pave the way for its development as an attractive link between the city centre and the HafenCity, and for it to be used for city-related purposes.

Since plans could not be established under the Federal Construction Code in the areas covered by the Port Area Development Act, no local development plan has yet been drawn up for the Speicherstadt. However, now that it has been removed from the scope of the Port Area Development Act, the legisla-

tive picture has changed, such that it is now possible for a local development plan to be drawn up. This process will also have to take due account of the requirements of World Heritage sites. At present, under the Order on Competences relating to the Building Code of 8 August 2006 (Official Hamburg Gazette, p. 2085), the Regional Ministry of Urban Development and the Environment (BSU) is responsible for implementing the Hamburg Building Code in the Speicherstadt (cf. 7.1.5).

Within the Regional Ministry of Urban Development and the Environment, the Office for the Building Code and Construction is competent to grant planning permission in the Speicherstadt. The Hamburg Port Authority will continue to be responsible for maintaining the bodies of water and quay walls. The bridges and streets fall within the remit of the district of Hamburg-Centre. Other tasks, such as improvements of the access infrastructure to the Speicherstadt, on the request of the financial authorities, are carried out by the Regional Ministry of Economic Affairs, Transport and Innovation (BWVI), which is aided in the performance of these tasks by the Land's Agency for Roads, Bridges and Open Waters (LSBG).

4.4.6 The Hamburg Heritage Protection Act

The Heritage Protection Act of the Free and Hanseatic City of Hamburg (as last amended on 05.04.2013) directly protects architectural monuments, ensembles, garden monuments and archaeological monuments, as well as movable heritage assets whose protected classification has become final (Section 4). Under Section 9, open spaces, streets, bodies of water, quay walls and bridges in the World Heritage area and its immediate surroundings may not be partially or completely destroyed, restored, significantly improved, removed from their location or changed in any other way, without a permit from the competent authority.

The Speicherstadt: In both urban planning and architectural terms, the Speicherstadt constitutes the most significant ensemble of listed buildings in Hamburg. The "Speicherstadt ensemble, with its buildings and all its attendant features, including the plots of land, streets and open spaces, together with the Customs Canal and the Binnenhafen, and including its canals and water basins, quay walls, bridges and other objects and parts which contribute to its image" have been listed under the Hamburg Heritage Protection Act since 1991.

The Kontorhaus district: The buildings in the Kontorhaus district which are relevant to the World Heritage nomination are listed under the Hamburg Heritage Protection Act as part of the Kontorhaus district. The Mohlenhof was added in 2003; all of the other buildings nominated for World Heritage status had already been listed as monuments under the Hamburg Heritage Protection Act since 1983. The adjoining streets and open spaces are also protected under the Act as part of the Kontorhaus district ensemble.

Protection of the surrounding area: The areas immediately surrounding the listed entities of the Speicherstadt and the Kontorhaus district are protected under Section 8 of the Hamburg Heritage Protection Act. "To the extent that the immediate surroundings of a heritage asset are of formative significance for its appearance or continued existence, a permit is required from the competent authority before such surroundings may be changed by the erection, alteration or elimination of structural elements, by the development of unbuilt public or private spaces, or by any other means, if such change significantly detracts from the character and appearance of the heritage asset."

Heritage Council: The competent Regional Ministry of Culture is assisted by a Heritage Council, consisting of 12 members, which acts as an independent advisory board on matters relating to heritage protection and preservation. It is comprised of expert representatives from the fields of heritage preservation, history

and architecture, together with citizens and institutions of the Free and Hanseatic City of Hamburg that are active in the area. It advises the competent authority and takes positions on issues of principle and topical questions relating to heritage protection and preservation.

In the future, the Heritage Council will devote particular attention to the requirements of the prospective

World Heritage site. Its expertise will be drawn on to address issues relating to the inclusion of the future World Heritage site in the development of the city as a whole, the forthcoming regeneration projects in the World Heritage area and the new construction projects in its buffer zone, as well as other matters connected with heritage preservation. The objective is to achieve consistently high quality when making decisions about the fabric of the buildings and the public spaces.

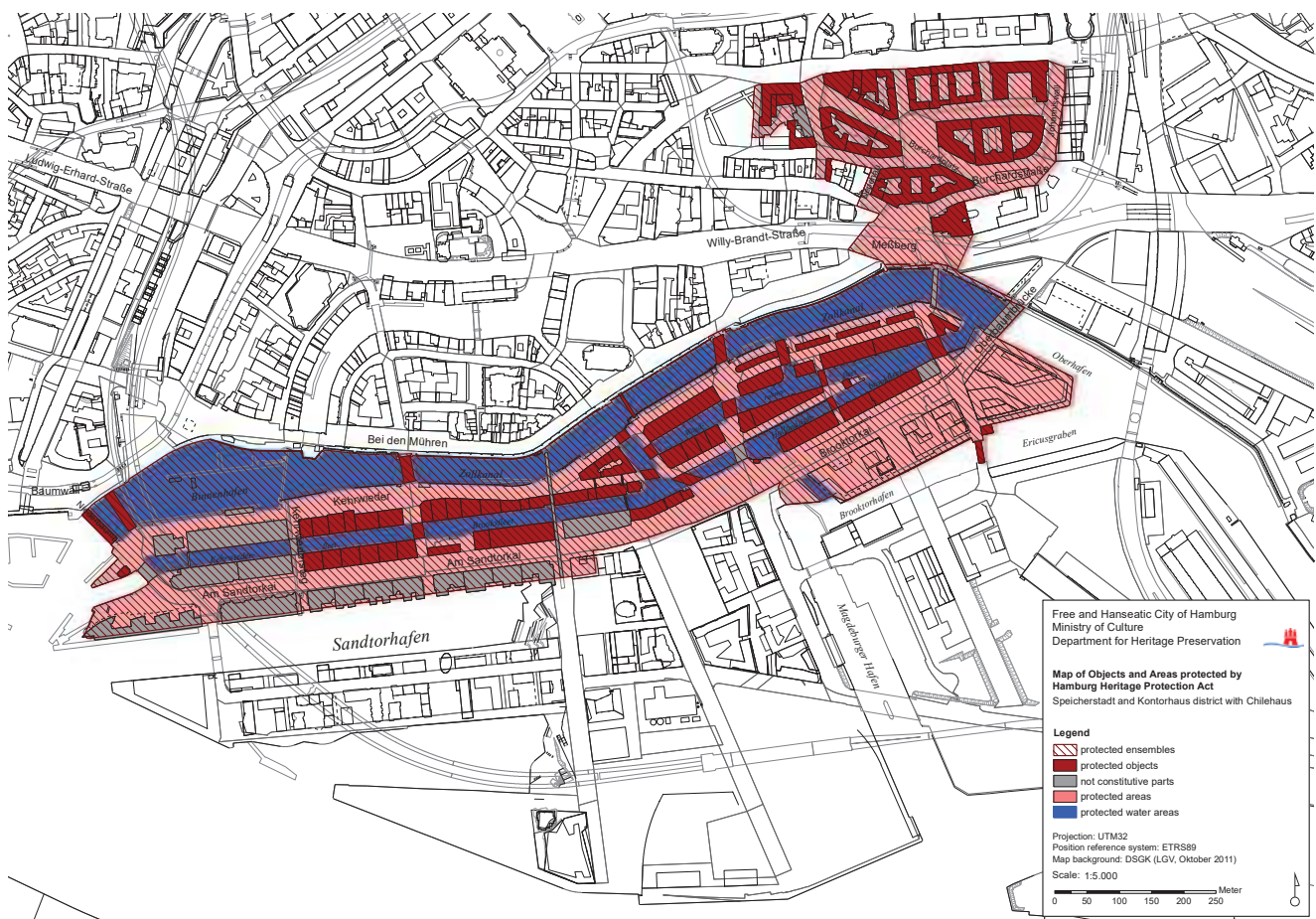


Fig. 38: Heritage protection map of the Speicherstadt and Kontorhaus district

5. Protected Property

The proposed World Heritage area of the “Speicherstadt and Kontorhaus district with Chilehaus” comprises two neighbouring, functionally complementary districts. The precise boundaries of both the nominated property and the buffer zone, which serves to protect the integrity of the nominated property, are described below. The boundaries encircle all of the features which make an essential contribution to the property’s “outstanding universal value”.

The boundaries of the nominated property are drawn in such a way as to guarantee, in particular,

- that the nominated ensemble, thus defined, together with all of its valuable features, can be preserved for future generations, without its “outstanding universal value”, “authenticity” or “integrity” being damaged in any way,
- that the visual experience offered at present by the nominated ensemble, including important sight lines, is also preserved for the future,
- that it is possible to manage the nominated property efficiently.

The boundaries of the nominated property lie within the protected area which already enjoys legal protection under the Hamburg Heritage Protection Act. This ensures that there is maximum consistency between existing regional (Land) legislation and the abovementioned objectives.

In order to safeguard the nominated property, it is vital that its boundaries (World Heritage area and buffer zone) can easily be identified by all user groups and all those involved in planning processes in and around the proposed World Heritage site. In the interests of ensuring maximum transparency for all stakeholders, and in accordance with Section 5, Paragraph 4, of the Federal Construction Code (Baugesetzbuch), it is intended to include the proposed World Heritage area and its protected zones

(“buffer zone”) in the zoning and land-use plan “for information purposes”. The proposed World Heritage area and its buffer zone will therefore be marked as such in the zoning and land-use plan. With the exception of a few sections of the buffer zone, all of the areas in question are listed under the Heritage Protection Act of the Free and Hanseatic City of Hamburg.

The precise boundaries of the proposed World Heritage area (red outline), its buffer zone (grey) and the areas protected under the Hamburg Heritage Protection Act (yellow outline) are shown in figure 39.

5.1 Protected Property

The protected property comprises the relevant parts of the adjoining, functionally complementary districts of the Kontorhaus district and the Speicherstadt. Starting from its most north-easterly point, and proceeding anti-clockwise, its boundary runs along the following points and plots of land:

District 1: Kontorhaus district: In the Kontorhaus district, the boundary runs along the central reservation of Altstädter Strasse from Johanniswall street to Burchardplatz, along the north side of Burchardplatz, and diagonally across Burchardstrasse to the western boundary of the Mohlenhof (plot 224). It then runs diagonally across Niedernstrasse to the intersection of Niedernstrasse and Depenau street, along the western side of Depenau street as far as the southern side of Klingberg street, and along that southern side as far as the eastern boundary of plot 1650. Moving further to the south, the boundary runs along the western edge of plot 1914 (Messberg) as far as the northern side of the Customs Canal. It then runs in a north-easterly direction across Willy-Brandt-Strasse as far as the south-east corner of the Messberghof, before heading northwards along the eastern boundary of the Messberghof as far as the southern edge of

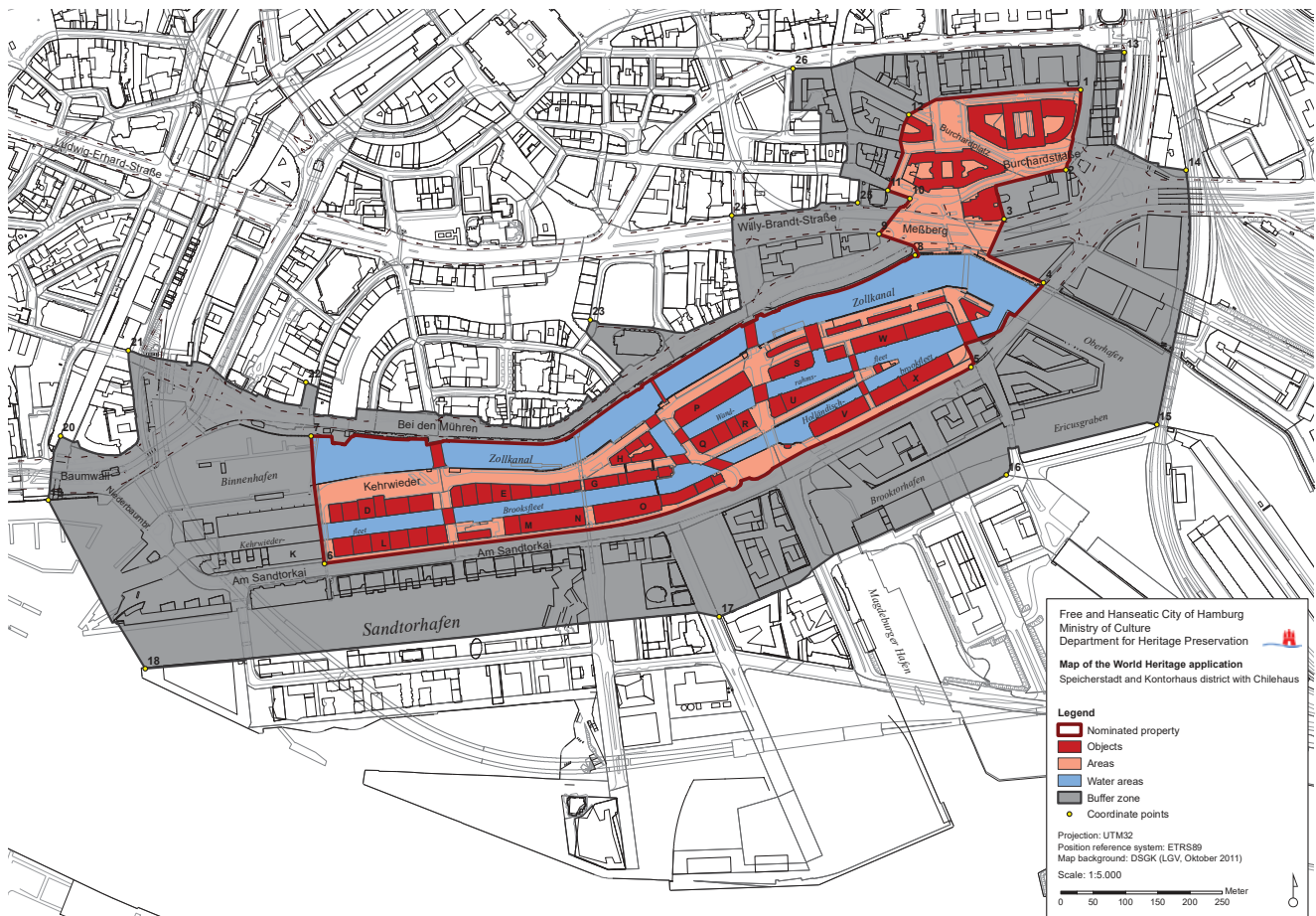


Fig. 39: Protected property (red outline), buffer zone (coloured grey),

Pumpen street. It then runs eastwards along the southern edge of Pumpen street and Burchardstrasse to the north-eastern corner of the building at 1, Burchardstrasse, and diagonally across Burchardstrasse in a northerly direction as far as the western side of Johanniswall street. Finally, it continues northwards until it reaches the central reservation of Altstädter Strasse.

District 2: Speicherstadt: The boundary around the Speicherstadt runs westwards along the north side of the Customs Canal as far as the Kehrwiedersteg bridge across the Binnenhafen. The western boundary of the proposed World Heritage area is marked by the Kehrwiedersteg bridge over the Binnenhafen and Kehrwiedersteg itself, and runs as far as the intersection of Kehrwiedersteg and Am Sandtorkai. It then heads eastwards along the northern side of

the streets Am Sandtorkai and Brooktorkai as far as the corner of Poggenmühle street, northwards along the eastern side of warehouse block X as far as Holländischbrookfleet waterway, and eastwards across Poggenmühle street along the southern side of Holländischbrookfleet waterway as far as Oberbaumbrücke. It then runs westward along the western side of Oberbaumbrücke to the north of the Oberhafen and westwards along the northern side of the Oberhafen to the south-east corner of plot 1914 (Messberg).

5.2 Buffer Zone

As stipulated in Paragraphs 103 and 104 of the "Operational Guidelines," a buffer zone has been identified for the proposed World Heritage area. The buffer zone makes an essential contribution to

safeguarding the proposed World Heritage site, by ensuring that the visual experience that it offers remains intact. The buffer zone is the area surrounding the World Heritage area and extends as far as physical or carefully selected boundaries. It is thus in line with the Hamburg Heritage Protection Act, which provides that if the area in the immediate vicinity of a listed property makes a significant contribution to its appearance, it too should be protected. The buffer zone also takes account of open spaces and bodies of water, which play an important role in enhancing the setting of the nominated ensemble and the surrounding cityscape. Even lines of sight and areas further afield, which are key to ensuring the (visual) integrity of the proposed World Heritage site, have been taken into account when designating the buffer zone. The buffer zone also seeks to integrate areas which have a historical connection with the proposed World Heritage area. These include, in particular, the western tip of the Speicherstadt and the areas to the south of the streets Am Sandtorkai and Brooktorkai, which sustained severe damage in World War II and now feature a number of new buildings. They have therefore not been included in the nominated property, but are important for understanding the original design of the Speicherstadt. In the first district, to the north of the Speicherstadt, the buffer zone includes not only key buildings such as the Chilehaus, Messberghof, Sprinkenhof and Mohlenhof, but all the buildings in the entire Kontorhaus district, including the Cityhof high-rise buildings of the post-war period.

Within the buffer zone, construction projects have to be assessed for their compatibility with the proposed World Heritage site, particular attention being paid to height and size considerations. When implemented, they have to take account of sensitive views and sight lines of the proposed World Heritage ensemble. As a general rule, planning projects have to be agreed with the World Heritage Coordinator.

5.3 Protection of Visual Connections, Silhouettes and Panoramas

The various visual connections with the proposed World Heritage site are of crucial importance: From these vantage points, the proposed World Heritage site can be fully appreciated and experienced, and it is possible to gain a better understanding of how it fits in with its surroundings, and vice versa. The existing sight lines are particularly important, given that the area surrounding the proposed World Heritage ensemble has seen major changes in recent years as a result of the construction of the HafenCity. This has significantly detracted from the views of the west and south of the Speicherstadt from the Elbe and from the Sandtorhafen. The purpose of defining the sight lines is therefore to preserve the remaining visual connections between the city and the proposed World Heritage area.

The sight lines can be divided into the following categories:

1. Visual connections from the city centre to the nominated property,
2. Visual connections within the nominated property,
3. Visual connections from the HafenCity to the nominated property.

5.3.1 Visual Connections from the City Centre to the Nominated Property

A mark of the quality of the visual connections from the centre of Hamburg and the HafenCity to the proposed World Heritage area is that they are also an integral part of existing or planned transport routes, linking the city centre with the HafenCity. As a result, these visual connections not only enhance the visual experience

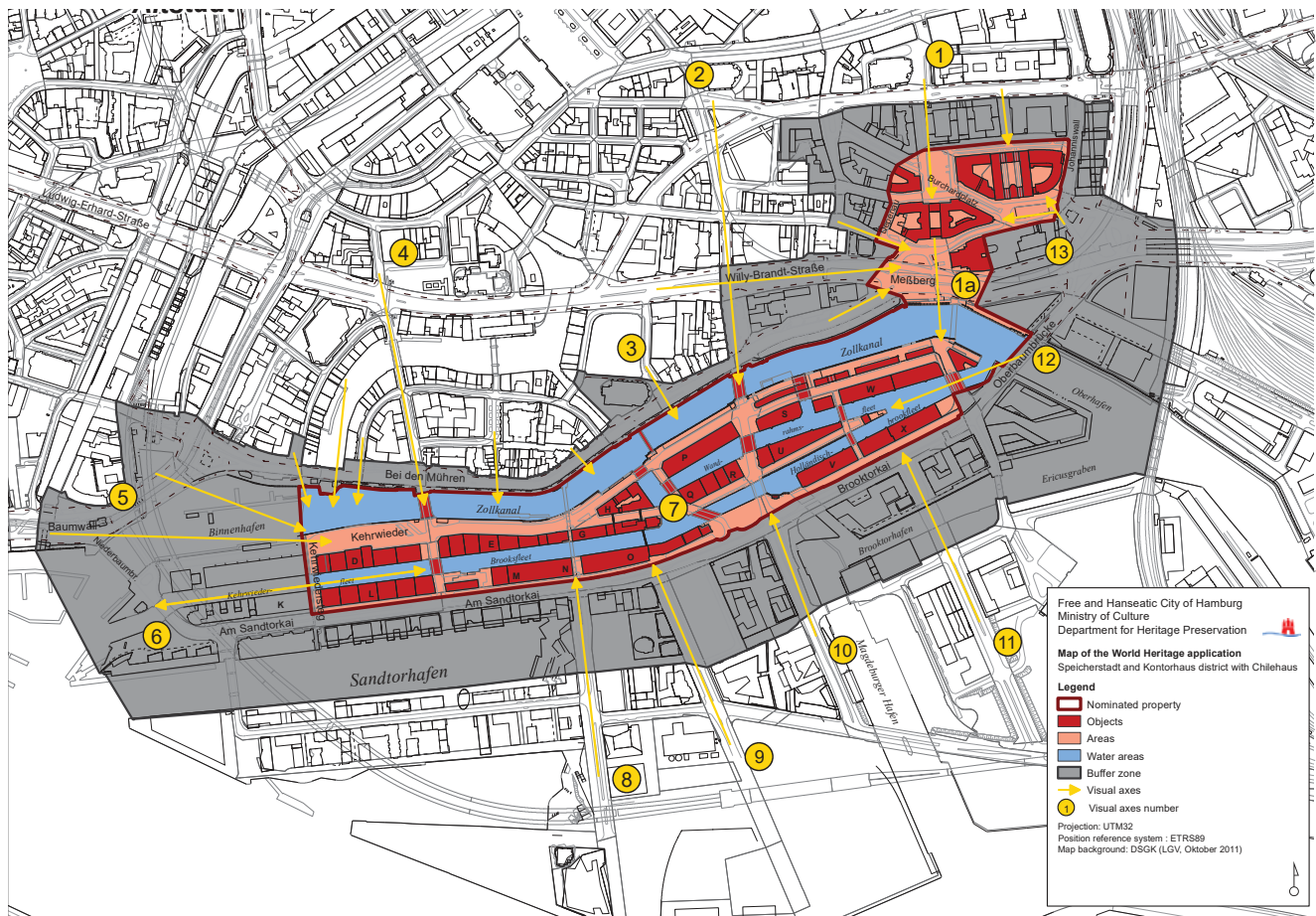


Fig. 41: Visual connections between the nominated property and the surrounding district

offered by the proposed World Heritage area when viewed from the city centre, but are also very important for the physical connection of the two districts.

» 1 and 1a St Jacobi – Burchardplatz – Fischertwiete – Wandrahmsteg – Speicherstadt

The St Jacobi - Burchardplatz - Speicherstadt sight line is important for two reasons: Firstly, it provides a visual experience of the Kontorhaus district from the city centre and, secondly, it is crucial for understanding the functional and physical connection between the Kontorhaus district and the Speicherstadt. It is also an integral part of the Ballindamm – Baakenhöft transport route, which will become important for linking the city centre with the eastern part of the HafenCity.

The sight line from Fischertwiete, which runs through the Chilehaus, towards Wandrahmsteg and the Speicherstadt, is also of great historical importance, since it demonstrates how the Kontorhaus district and the Speicherstadt were linked both functionally and visually.

» 2 Domplatz – Speicherstadt

The Domplatz - Speicherstadt sight line is of considerable importance for appreciating the Speicherstadt, since it constitutes one of the three visual connections between the centre of Hamburg and the proposed World Heritage area. Moreover, the view encompasses the “centre” of the Speicherstadt with its many important historic buildings. Foremost among them is the HHLA’s administration building, also known as the “town hall of the Speicherstadt”;



Fig. 42: Current view through the Fischertwiete towards the Customs Canal and the Speicherstadt



Fig. 43: View from the „Town Hall“ of the Speicherstadt on the Domplatz to the St. Petri Church

a building which has always been a striking landmark in the Speicherstadt, because of its particularly sumptuous design and because it continues to be the head office of the HHLA. This visual connection is also an integral component of the future transport link from the Binnenalster to the Magdeburger Hafen, envisaged in the Hamburg 2010 City Centre Concept (Innenstadtkonzept).

» 3 Willy-Brandt-Strasse – Messberg

The sight line from Willy-Brandt-Strasse to the Messberg is of central importance for experiencing the Kontorhaus district. Willy-Brandt-Strasse runs right up to the stepped façade of the Messberghof. This view is particularly important because it is experienced by thousands of car drivers every day.

» 4 Hopfenmarkt - Cremoninsel - Speicherstadt

The Hopfenmarkt - Cremoninsel - Speicherstadt sight line is of particular importance for experiencing the western part of the Speicherstadt. Here, the HHLA



Fig. 44: View down Willy-Brandt-Strasse to the Messberg

plans, as far as possible, to continue to use the existing warehouses for storing carpets, which means that the historic view of the Speicherstadt also conveys an image of how it was originally used for storing groupage. It also derives particular importance from the fact that this part of the Speicherstadt, south of Brooksbrücke, is home to the Speicherstadt's most popular museums and cultural attractions, which means that for many visitors it constitutes a "main entrance" to the area. In addition, this visual connection is also an integral component of the future transport link from Hopfenmarkt to Sandtorkai, as envisaged in the Hamburg 2010 City Centre Concept (Innenstadt-konzept). The historic, functional links between the Speicherstadt and Sandtorkai are still clearly visible. This sight line concludes with the harbour for traditional ships in the HafenCity.

» 5 Baumwall - Kajen - Speicherstadt / Overhead railway - Speicherstadt

The western part of the Speicherstadt can be experienced thanks to the visual connection from Baumwall or Kajen, across the Binnenhafen and the Customs Canal, to the Speicherstadt. There is also pedestrian access to the Speicherstadt across the Niederbaum bridges, a route which will become increasingly important once the Elbphilharmonie Hamburg is complete. In addition, the visual connection forms an integral component of the future transport link from the Binnenalster to the new Elbphilharmonie. Already, the stretch of the existing overhead railway at the Baumwall stop offers a panoramic view of the northern face of the Speicherstadt, which is enjoyed every day by the many passengers using this form of public transport.

5.3.2 Visual Connections within the Speicherstadt

The visual connections within the Speicherstadt are, in general, extremely significant. The various



Fig. 45: Visual connection from Baumwall to the Speicherstadt

different bridges, in particular, offer unique vantage points from which to experience the homogeneous nature of the ensemble, and the combination of warehouses, streets and waterways, quay walls and stairs, which form an organic whole. It is these existing views of the Speicherstadt that become etched on visitors' memories.

» 6 From the Speicherstadt to the old police building

The visual connection from the Speicherstadt to the old police building offers a particularly striking insight



Fig. 46: Visual connection from the Speicherstadt to the old police building

into the internal configuration of the Speicherstadt, with its warehouses, bridges and waterways. It is also of great historical significance, since from there it is still possible to see how the Speicherstadt originally extended further towards the west.

» 7 Views within the Speicherstadt

There are two sharply contrasting groups of views in the Speicherstadt, the first from north to south and the second from east to west. The east-west views extend over long distances, whereas the north-south views establish visual connections between the old town and the port areas or offer views through the Speicherstadt itself, cutting right through the entire district. The north-south views are regularly punctuated by buildings, bridges or vegetation, whereas most of the views from east to west stretch uninterrupted far into the distance.

The Speicherstadt owes much of its distinctive appeal to the uniformity of its waterways, which are

characterised by vertical quay walls, with staircases set into them, and warehouses built directly on top of the quay walls. Another typical feature of the waterways is that they are uncluttered by jetties or pontoons, which would have obstructed the delivery and transhipment of goods. Once again, it is the bridges in the Speicherstadt which provide particularly good vantage points from which to experience the district.

5.3.3 Visual Connections from the HafenCity to the Nominated Property

» 8 Magellan-Terrassen – Speicherstadt

The area around the Magellan-Terrassen is one of the most lively and bustling parts of the HafenCity. The view of the Speicherstadt from this point is particularly important, as it links the two parts of the city and affords a good view of the southern side of the Speicherstadt.



Fig. 47: Views from south to north and from west to east within the Speicherstadt



Fig. 48: Historic view of the waterways and view down Brooksfleet as it is today

» 9 Sandtorpark – Speicherstadt

A further view of the southern aspect of the Speicherstadt can be enjoyed from Überseeallee. This constitutes one of the most important vantage points in the HafenCity from which to experience the Speicherstadt, and it is therefore important for the sight line to be safeguarded for the future.

» 10 Osakaallee – Speicherstadt

The view from Osakaallee to the Speicherstadt is another highly significant visual connection between the south of the city and the Speicherstadt. It will become even more important in the future, because it links the centre of the HafenCity around the Magdeburger Hafen with the Speicherstadt both visually and functionally.

» 11 Shanghaiallee – Brooktorkai

The Shanghaiallee - Speicherstadt sight line now also constitutes a significant visual link to the Speicherstadt from the south.

» 12 Oberbaumbrücke – Brooktorkai –



Fig. 49: View from Osakaallee to the Speicherstadt

Speicherstadt

The Oberbaumbrücke - Brooktorkai - Speicherstadt sight line plays a significant role in enhancing people's everyday experience of the Speicherstadt, since Brooktorkai is not only a very busy road, but also elevated, which makes it possible for drivers to see the eastern side of the Speicherstadt in context. It also offers a view of the „Wasserschlosschen“ (Little Water Castle), one of the most well-known images of the Speicherstadt. The view has suffered somewhat as the result of the recent construction of a hydrogen filling station directly between Oberbaumbrücke and the Speicherstadt, but is still of note. There are plans to demolish the filling station in the not too distant future.

13 Burchardstrasse – Kontorhaus district

The continuation of Burchardstrasse offers one of the most important vantage points for views of the Kontorhaus district. This view is characterised by the tapered eastern side of the Chilehaus, making it one of the most well-known images of the Kontorhaus district. As a result, it is of outstanding significance for the visual experience of the proposed World Heritage site.



Fig. 50: The view of the so-called „Wasserschlosschen“ (Little Water Castle) is one of the most well-known images of the Speicherstadt

5.3.4 Other Visual Connections

There are a whole series of other visual connections with the proposed World Heritage area, which enable it to be experienced from afar. Of particular note are the adjoining districts immediately to the north of the Customs Canal, which offer numerous glimpses of the proposed World Heritage area along waterways or down smaller streets across the Customs Canal. These visual connections have also been marked on the map. They form an integral part of the designated buffer zone and therefore also need to be safeguarded.

In addition, the streets surrounding the Kontorhaus district also offer many glimpses of the future World Heritage area, allowing that ensemble to be experienced on a day-to-day basis. Those important sight lines also need to be preserved.



Fig. 51: View from the continuation of Burchardstrasse towards the eastern tip of the Chilehaus and the Kontorhaus district



Fig. 52: Visual connections from Springeltwiete to the Sprinkenhof from Niedernstrasse to the Chilehaus and across the Customs Canal towards the Speicherstadt

PART II ADMINISTRATION AND MANAGEMENT

6. Administration of the Proposed World Heritage Site – Coordination and Organisation

The ensemble which is being nominated for World Heritage List, the “Speicherstadt and Kontorhaus district with Chilehaus”, straddles two of Hamburg’s urban districts: the Kontorhaus district is part of Hamburg’s Altstadt district, while the Speicherstadt lies in the new urban district of the HafenCity. It is thus an integral component of the physical structure of one of the liveliest parts of Hamburg. An efficient and well-integrated management system is therefore crucial to ensuring that the proposed UNESCO World Heritage site is effectively preserved in the long term.

This chapter contains a detailed description of how the World Heritage management system will work and the tasks that it will perform. It also lists the key players who will be involved in the management of the site.

6.1 Coordination

The Heritage Protection Agency will be responsible for coordinating the management of the proposed World Heritage site. Should the nomination of the “Speicherstadt and Kontorhaus district with Chilehaus” for inscription on the World Heritage List be successful, then the Regional Ministry of Culture intends to appoint a World Heritage Coordinator, who will be responsible within the Heritage Protection Agency for coordinating the management of the proposed World Heritage site. The required funding has already been secured.

The World Heritage Coordinator’s role is to facilitate communication with the regional ministries, property owners and other stakeholders listed below, and to liaise with national and international institutions, so as to safeguard the quality of the future World Heritage site. In the event of overlapping interests, the World Heritage Coordinator will also play an important role in conflict management.

The scope of the World Heritage management ex-

plicitly covers not only the World Heritage area itself, but also its buffer zone and any areas impacting on the sight lines described in Chapter 5 which lie outside the buffer zone. This is important in the interests of facilitating communication and enabling any potential conflicts to be identified at an early stage, so that the quality of the World Heritage site can be effectively safeguarded. To protect the visual integrity of the proposed World Heritage site, it is particularly important for all the relevant projects in this area to be assessed for their impact on the World Heritage site and agreed with the World Heritage Coordinator.

6.1.1 World Heritage Coordination and the Inter-Ministerial Steering Group

The World Heritage Coordinator will work closely with those responsible in other ministries, as well as with the property owners and other relevant stakeholders. For this purpose, it is proposed to set up an inter-ministerial steering group, which will meet at regular intervals. Given the range of functional responsibilities, it is planned to include representatives of the Heritage Protection Agency, the Regional Ministry of Urban Development and the Environment (BSU), the district authority for Hamburg-Centre and the Regional Ministry of Economic Affairs, Transport and Innovation (BWVI) in the inner circle of the steering group. The idea is for the competent authorities each to appoint an individual, who will be responsible for dealing with all matters relating to World Heritage management, and for communicating relevant issues within their own institution.

To enable communication to be as direct and easy as possible, the intention is also to include a representative from the HHLA and a representative of the owners of the Kontorhaus district in the inter-ministerial steering group. Representatives of other authorities and interest groups will be invited if required.

The World Heritage Coordinator will also facilitate



Fig. 53: The area covered by the proposed World Heritage site, the “Speicherstadt and Kontorhaus district with Chilehaus”, its buffer zone and the surrounding area

close communication with the World Heritage Committee, through its secretariat, the World Heritage Centre. Similarly, he/she will also liaise closely with the Advisory Bodies of the World Heritage Committee, in particular ICOMOS. If necessary, the World Heritage Coordinator will also brief bodies at national level, such as the Federal Foreign Office or the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany (abbr.: Standing Conference).

A further task of the World Heritage Coordinator will be to liaise with representatives of various local and regional interest groups, as well as the general public, about



Fig. 54: World Heritage management principles

the management of the World Heritage site. This will involve, in particular, coordinating and implementing educational projects and tourist offerings in and around the proposed World Heritage site (cf. Section 9.3).

6.1.2 Stakeholders, Ministries, Authorities and Interest Groups

The tasks of protecting and managing the proposed World Heritage site overlap with the competences of the following ministries, property owners, institutions and interest groups:



Fig. 55: Those involved in World Heritage management, and their competences

6.1.3 Ownership Structure

The following table lists all the owners of properties within the nominated property. The ownership of the Speicherstadt is not expected to change in the future.

Property	Owner
Speicherstadt	
Plots of land on which the buildings stand, streets, squares, bridges, parking areas, bodies of water	Free and Hanseatic City of Hamburg
Customs buildings 2, 3, 4, "Little Water Castle" (Wasserschlosschen)	Free and Hanseatic City of Hamburg (LIG-Real Estate Management)
Customs Museum and former customs administration building on Poggenmühle street	Federal Republic of Germany, Institute for Federal Real Estate (Bundesanstalt für Immobilienaufgaben (BIMA))
All other properties	Hamburger Hafen und Logistik AG (HHLA)
Kontorhaus district	
Streets, squares, parking areas	Free and Hanseatic City of Hamburg
Chilehaus	Union Invest Real Estate GmbH, Hamburg
Messberghof (former Ballinhaus)	Heinrich Bauer Verlag KG, HH
Sprinkenhof 1	Objekt Burchardplatz GmbH & Co. KG
Sprinkenhof 2	alstria office REIT-AG
Mohlenhof	Grundstücksgesellschaft Theodor Wille GmbH&Co

6.2 Monitoring and Quality Assurance

The World Heritage Coordinator will also be responsible for carrying out regular monitoring and quality assurance activities in the proposed World Heritage site. These will include, in particular:

6.2.1 Regular Reporting

In accordance with Article 29 of the World Heritage Convention and Paragraphs 169 to 176 of the Operational Guidelines (2011 version), in which the States Parties to the World Heritage Convention undertake to submit regular reports, the World Heritage Coordinator will prepare a report on the state of conservation of the proposed World Heritage site.

6.2.2 Reactive Monitoring

In the event of exceptional circumstances, in particular if there are specific threats to the proposed World Heritage site's outstanding universal value, authenticity and integrity – for example, due to new constructions affecting the cityscape – the World Heritage Coordinator will ensure that special reports are submitted to the World Heritage Committee, as required under Paragraph 172 of the Operational Guidelines. These have to be submitted to the World Heritage Centre at the latest by the 1 February following the occurrence of the exceptional circumstances concerned.

Should reports be submitted to the World Heritage Centre from sources other than the State Party, pursuant to Paragraph 174 of the Operational Guidelines, raising questions about the state of conservation, then the World Heritage Coordinator will support the World Heritage Committee in its investigations. If the World Heritage Committee so requests then ICOMOS, as the competent Advisory Body, will also

be involved in that procedure.

6.2.3 Preventive Monitoring

The German national ICOMOS committee has set up a monitoring group, which has oversight of World Heritage sites in Germany. The members of the monitoring group observe current developments in the World Heritage sites, carry out on-site visits and draft annual reports, which may, if appropriate, trigger the “reactive monitoring” procedure, as outlined in Section 6.2.4.

The monitoring group's primary objective is to contribute to avoiding conflict in World Heritage sites. The World Heritage Coordinator is therefore encouraged to cooperate closely with the German national ICOMOS committee and in particular the competent members of the monitoring group.

6.2.4 Conflict Management

The World Heritage Coordinator takes the lead on conflict management and is responsible for facilitating coordination between the various different players, and, if necessary, seeking advice from the World Heritage Centre and the Advisory Bodies. Nevertheless, the overriding objective should still be to resolve any conflicts of interest at local level.

Over and above these mechanisms and institutions, it is also possible to draw on the experience and expertise of the Heritage Council if required, in order to avoid conflicts in and around the future World Heritage site.

PART III THE FUTURE OF THE NOMINATED PROPERTY

7. Planning Systems and Policy Frameworks

The objective of PART III of the Management Plan is to list the main guidelines for the preservation and sustainable development of the proposed World Heritage site. In this regard, particular account must be taken of the outstanding universal value, authenticity and integrity of the “Speicherstadt and Kontorhaus district with Chilehaus”, which are the criteria used to assess the significance of the site (cf. Chapter 3) and on the basis of which it may be included on the World Heritage List. It is important to ensure that Hamburg’s current urban development objectives are brought into line with those criteria. Similarly, it is essential to ensure that this set of guidelines for managing the buildings are in tune with the World heritage criteria.

This chapter first lists the relevant planning systems and policy frameworks. It then goes on to define the key objectives for the preservation and sustainable development of the proposed World Heritage site, in line with the World Heritage Convention, under which there is an obligation to, “adopt general policies to give the heritage a function in the life of the community” and “integrate heritage protection into comprehensive planning programmes” (Operational Guidelines, Paragraphs 15 b and c).

7.1 Planning Systems and Policy Frameworks

The following planning systems play an essential role in this context.

7.1.1 Hamburg 2010 City Centre Concept (Innenstadtkonzept)

The Hamburg 2010 City Centre Concept (Innenstadtkonzept) is based on the City of Hamburg Programme Plan of 1981, which sought to open up Hamburg’s city centre to the Elbe, improve the quality of the urban environment and mitigate the segregation and depopulation of the city centre. In addition, it sought to promote the city centre as a place to live.

The Hamburg 2010 City Centre Concept seeks primarily to integrate the HafenCity, which lies to the south of the city centre, in the city centre district. The HafenCity covers 157 hectares and, once completed, will increase the size of the city centre by almost 40%. This leads to structural shifts of emphasis in the city centre, changing its functionality, and impacting on the status of different areas and the importance of the connections between them. A new balance therefore needs to be sought for the entire city centre, both now and in the years to come.

As an integrated policy framework, the Hamburg 2010 City Centre Concept focuses on various different areas and links them together to form a whole. Particular emphasis is placed on cultivating public spaces, promoting the city centre for residential use and boosting retail trade. Other thematic areas covered in the Hamburg 2010 City Centre Concept are: establishing a central business/ district with a focus service; developing the area as a cultural centre; giving even more prominence to the Gestalt qualities of the area, focusing in particular on converting post-war sites in urban areas, and managing traffic in a way that is compatible with urban living. By establishing a dialogue between the new attractive water-side areas and the established centre of Hamburg, the objective was to define the urban boundaries more sharply and to create a dense network of connections within the city. The goal is to make Hamburg’s city centre the city’s prime retail destination.

In general, the Hamburg 2010 City Centre Concept is a tool to enable Hamburg’s historic core and its new maritime district to grow together. Given the location of the Kontorhaus district and the Speicherstadt, with the city centre immediately to the north, and the HafenCity immediately to the south, it is clear that they play an important role in the Hamburg 2010 City Centre Concept. This is particularly true of the Speicherstadt, which is an island, characterised by its east-west orientation and separated from the mainland by the Customs Canal and the Binnen-

hafen. Now, however, it is an integral component of the cross-city routes highlighted in the City Centre Concept, routes along which pedestrian and traffic flows will be redirected, and thanks to which the area bordered by Mönckebergstrasse, Jungfernstieg and the Magdeburger Hafen is set to be radically revitalised as a new shopping triangle. The benefits and drawbacks of the various different routes have been identified.

Since 2012, intensive public consultations have been underway on the statements made in the 2010 City Centre Concept. This wide-ranging process is an opportunity for the public to discuss, ask questions about and contribute their own ideas to the proposals and objectives documented in the City Centre Concept. At the heart of the consultation exercise have been several rounds of moderated thematic workshops, guided tours of the city and public information events.

The workshops were on four different thematic areas:

- Architecture / Urban culture / Heritage protection
- Residential use
- Public spaces
- Retail / Office market

Participants included both the general public and individuals with specific expertise.

Two rounds of workshops were held, which were attended by a wide range of experts and a large number of private individuals. A report has been produced summarising the outcome of the workshops and the recommendations made by the workshop participants and speakers. These will be taken into account in a revised version of the City Centre Concept, which will be presented at a public event.

7.1.2 The Development Concept for Hamburg's Speicherstadt

The Development Concept (Entwicklungskonzept) for Hamburg's Speicherstadt, hereinafter referred to as the Development Concept for the Speicherstadt, was drafted by the Regional Ministry of Urban Development and the Environment (BSU) in cooperation with the HHLA, other ministries in Hamburg and the district authorities. In April 2012, it was given legal effect by the Senate and was noted by the Hamburg Parliament. The Development Concept for the Speicherstadt is an informal planning programme and serves as a framework for managing the future development of the Speicherstadt. One of the main reasons for drafting it was the Speicherstadt's nomination for inscription on the World Heritage List. In addition, the Development Concept for the Speicherstadt is intended to serve as a basis for a local development plan for the Speicherstadt, work on which has begun now that the Speicherstadt has been removed from the scope of the Port Area Development Act (Hafenentwicklungsgesetz). The Development Concept for the Speicherstadt is therefore of central importance, both for the preservation and sustainable development of the Speicherstadt, which is being nominated for World Heritage List, and for this Management Plan, because it summarises the facts, general conditions and guidelines, which are essential for fulfilling this task.

When completed, the HafenCity, the Speicherstadt will constitute a link between it and the city centre. One of the challenges presented by this new status is that the Speicherstadt has hitherto been separated from the rest of the city and was built on an east-west axis. Historically, north-south through-routes played a subordinate role, but they are now becoming increasingly important. Change is therefore necessary, but at the same time it is important to retain the Speicherstadt's historic buildings, appearance and characteristic infrastructure.

Additional challenges which are identified in the Development Concept for the Speicherstadt include the current changes in how the warehouses are used. Specifically, there has been a decline in transshipment and logistics, while an increasing number of service companies, trade operations and cultural attractions are establishing themselves there. There is also increased interest in living in the Speicherstadt. Large-scale residential use is, however, only possible if there is comprehensive flood protection. As part of the process of drafting the Development Concept for the Speicherstadt, a flood protection concept was also produced. However, it has not yet been assessed for its impact on heritage protection (Internal Memorandum 20/4388, p. 4). Another key challenge for the future is maintaining the quality of public spaces. Ensuring that the heads of the wooden piles on which the Speicherstadt is built remain structurally stable is a further important task.

While taking appropriate account of the Speicherstadt's historic heritage and its proposed nomination for World Heritage List, the Development Concept for the Speicherstadt also seeks to highlight any opportunities for change and further development, without threatening the area's existing character. It sets out relevant criteria for this, while at the same time describing the existing technical and legal constraints. A concept has been drafted for the transport infrastructure and the design of public spaces within the Speicherstadt.

The Development Concept for the Speicherstadt contains detailed information on the following aspects, bearing in mind that all changes require the permission of the heritage protection authorities:

- Uses and changes of use (storage and trade, services, residential use, cultural institutions)
- Flood protection
- Safeguarding the wooden piles supporting the

quay walls and warehouses

- Transport (access, parked vehicles, design of parking areas, bridges)
- Open spaces and their design
- Lighting
- Existing flora and fauna

7.1.3 Ordinance on the Design of the Speicherstadt

In order to facilitate compliance with heritage protection requirements, particularly as far as the external appearance of the Speicherstadt is concerned, the Senate adopted an ordinance on 5 August 2008 containing specific rules for the Speicherstadt. The Ordinance on the Design of the Speicherstadt (Official Hamburg Gazette, p. 285) stipulates that any alterations to the warehouse buildings must be compatible with heritage protection and contains provisions on

- façades
- roofs
- building technology
- advertising and vending machines
- the design of the surrounding external space

These provisions are based on the existing historic buildings and are therefore an important instrument for preserving the appearance of this part of the proposed World Heritage site. Since it is listed under the Heritage Protection Act, any changes to the external appearance of the Speicherstadt are subject to approval by the competent authorities.

7.1.4 Design Manual for the Speicherstadt (Gestaltungshandbuch Speicherstadt)

In 2002, the Hamburger Hafen- und Lagerhaus-Aktiengesellschaft (HHLA), which owns all the property in the Speicherstadt, commissioned a Design Manual for the Speicherstadt. The manual has not been adopted by the Hamburg Parliament and is therefore not legally binding. Nevertheless, the HHLA has used it as a design guideline for years, and it is therefore very important for safeguarding the quality of the Speicherstadt.

The Design Manual for the Speicherstadt defines essential model components and explains the design principles which apply to buildings and advertising. It also contains design principles for the transitional areas between the Speicherstadt and the HafenCity, and recommendations on aspects of urban architecture, and on the design of open spaces, buildings, façades, roofs and entrance areas. In addition, it sets out the rules and restrictions with which its tenants must comply, in accordance with their rental contracts under private law.

7.1.5 The Local Development Plan for the Speicherstadt

A local development plan is currently being prepared for the Speicherstadt, which was removed from the scope of the Port Area Development Act (Hafenentwicklungsgesetz) on 10 October 2012. Since the Original use of the Speicherstadt more and more disappears the local development plan refers mainly on the determination of the type of use. Further the local development plan envisages moving Wandrahmsteg back to its original position (although no date has yet been set for this to happen).

Under the decision to draft a local development plan, there are two ways in which any undesired developments can be prevented pending its approval: by

postponing them and by imposing a development freeze (§§ 15 and 16-18 BauGB).

7.1.6 International References and Policy Documents

Under this heading it is important to mention once again the policy documents and recommendations described in Section 4.3, which are also a crucial reference point for the development of the proposed World Heritage site.

8. Possible Threats to the Conservation of the Nominated Property

The planning systems described above and, in particular, the Development Concept for the Speicherstadt, adopted by the Senate, provide an extensive foundation on which to base all future plans and decisions affecting the proposed World Heritage site. Nevertheless, questions remain, questions which, while not necessarily directly related to the nomination of the Speicherstadt and Kontorhaus district for UNESCO's World Heritage List, will in any case need to be resolved in the future. In identifying appropriate solutions, due consideration will need to be taken of the interests of all stakeholders, so as to avoid conflicts of interest.

This chapter describes some of the questions which have arisen in connection with the key objectives identified above, and which will require further clarification in the future.

8.1 Pace of Development and Changes of Use

Whereas at present changes of use are uncommon in the Kontorhaus district – apart from the possibility of converting the stepped-back upper storeys into apartments – it is a different matter entirely in the Speicherstadt. Here, a conversion process has been underway for some considerable time, prompted by the fact that many of the warehouses are no longer needed for port-related purposes. The nature of the goods, which are still stored and transhipped in the Speicherstadt, has also changed radically in recent decades. Whereas previously coffee, tea, cocoa, dried fruits, nuts and spices were stored, processed and transhipped in the Speicherstadt, in the last few decades the storage of oriental carpets has dominated the warehouses. However, in the last few years, this segment has also declined, and it is therefore safe to assume that in future only about a third of all the warehouses will continue to be used for their original purpose.

There is at present a consensus that the activities

of storage and distribution should not disappear from the Speicherstadt entirely, because they are part and parcel of its typical character. At present, of the around 300,000 square metres of usable floor space in the Speicherstadt, around 96,000 square metres are still used for storage, and it is predicted that around a third of the total space available will continue to be required for storage purposes. About a third of the remaining buildings have already been converted to new uses, and the Speicherstadt now hosts several companies from the fashion and textiles industries, who use the space for both storage and to showcase their collections, thus building on traditional warehouse activities. In addition, around 81,000 square metres of the available space is occupied by offices. Another recent addition to the mix are cultural institutions, leisure facilities and restaurants, which have moved into the Speicherstadt in greater numbers since the removal of its Free Port status. Cafés, restaurants and venues for cultural and leisure activities now occupy some 25,000 square metres in the Speicherstadt. They make a significant contribution to the liveliness and attractiveness of the district and will therefore continue to be encouraged in the future. The atmospheric historic buildings and the generous open spaces in the warehouses also make the Speicherstadt attractive to artists and others from the creative industries. It is therefore proposed to earmark around 10,000 square metres of space in the Speicherstadt for artists' studios, around 5,000 square metres of which will be offered at very reasonable prices so that they are within the reach of younger artists.

Since the ensemble is listed under Hamburg's Heritage Protection Act, all of these changes of use, and any related alterations to warehouse buildings, have been carried out in close cooperation with the Hamburg Heritage Protection Agency, and have been subject to the granting of a permit. The objective is to minimise intervention in the fabric of the buildings. As a result of this approach, which is set to continue in the future, a great deal of valuable experience has



Fig. 56: Historical and current use of the buildings in the warehouse district

been accumulated in converting buildings in the Speicherstadt. At the same time, it is important to bear in mind that changes of use not only have an impact on the design and the fabric of the buildings, but also require public footpaths to be adapted.

8.2 Living in the Speicherstadt

In the context of present and future changes of use, particular attention needs to be paid to one point in particular: the possible conversion of warehouse buildings for residential purposes. Since one of Hamburg's top urban development priorities is to promote inner city living and to prevent a one-sided development to a city office, the possibility, in the future, of integrating more apartments into the Speicherstadt has been mooted. However, converting existing warehouse buildings into apartments requires relatively major alterations to be made to the original buildings, at least in comparison with other conversion projects. The buildings are relatively deep, and to fulfil the requirements for natural light, access and domestic installations, significant structural alterations need to be made, for example to create atria, add more windows and to comply with fire safety requirements.

In 2012, to sound out how best to go about enabling

people to live in the Speicherstadt, the Regional Ministry of Urban Development and the Environment (BSU), together with the HHLA, launched a competition and invited people to submit their ideas on the subject. In the interests of ensuring an appropriate housing mix, apartments ranging in size from 50 to 180 square metres had to be considered. The organisers drew the following conclusions: If apartments are to be created in the Speicherstadt, then both the exterior and interior of the buildings must be preserved so that they reflect the spirit of the place. With this in mind, they recommended that the desire for a mix of larger and smaller apartments should be regarded as secondary, and that the priority should be to create typical loft apartments with minimal modifications and new installations, although this could mean restrictions on apartments facing just one way, and difficulties complying with the rules on lighting. Excluding the typical storage floors of the warehouses, the jury recommended creating maisonette-style apartments and studios on the upper and attic floors, retaining the historic supporting structures and roof timbers. Particular care would have to be taken with the roofscape, and in particular the impact on views from the waterways and from Sandtorkai.

A further prerequisite for living in the Speicherstadt is flood protection. Either there needs to be a com-

prehensive system of flood protection (cf. Section 8.3) or direct access from the warehouses to elevated escape routes. So far this is only the case in the warehouses with direct access to Kibbelstegbrücke, for example block N, a small part of which already houses a combination of offices and apartments.

8.3 Flood Protection

Since the Speicherstadt lies outside the public main dyke system, between the city centre, which is protected by a system of flood defences, and the Hafen-City, which is built on plinths that raise it above the

reference water level, there is currently no comprehensive system of flood defences, such as a closed network of dykes, to prevent the Speicherstadt from flooding. The Speicherstadt lies between 4.50 m and 5.50 m above sea level (NN = tidal reference level), i.e. considerably lower than the present reference mean water level of 7.30 m above sea level, which is set to rise still further in future to 8.10 m above sea level (Internal Memorandum 20/5561). As a result, the Speicherstadt has suffered frequent flooding in the past. The floods do not pose a risk to the fabric of the Speicherstadt buildings, however, and no substantial flood damage has been found so far.

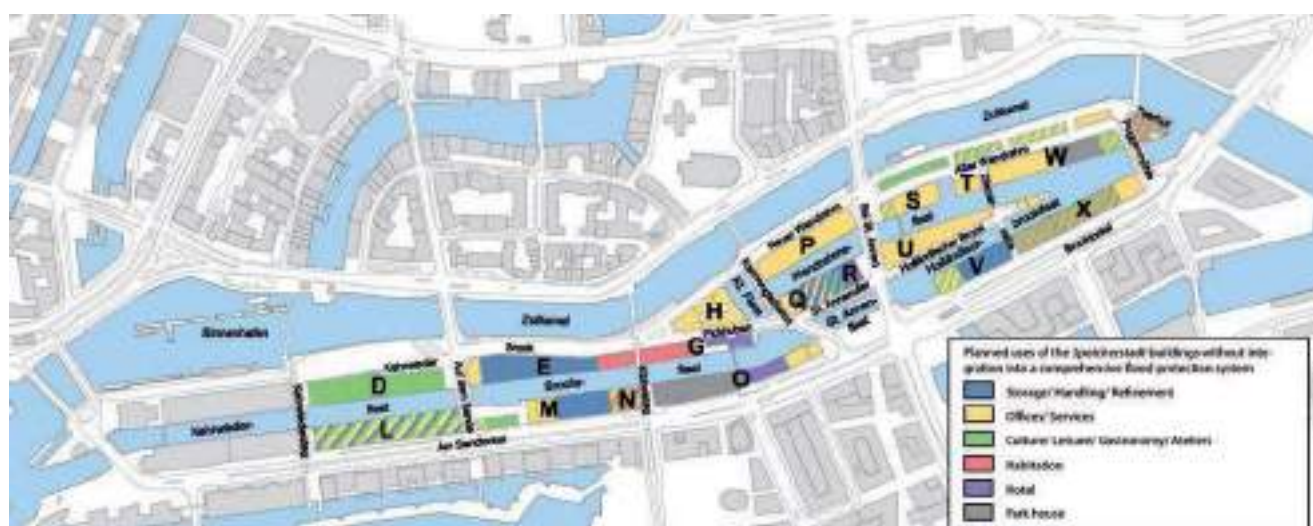


Fig. 57: Planned uses if the Speicherstadt is not integrated into the comprehensive flood protection system

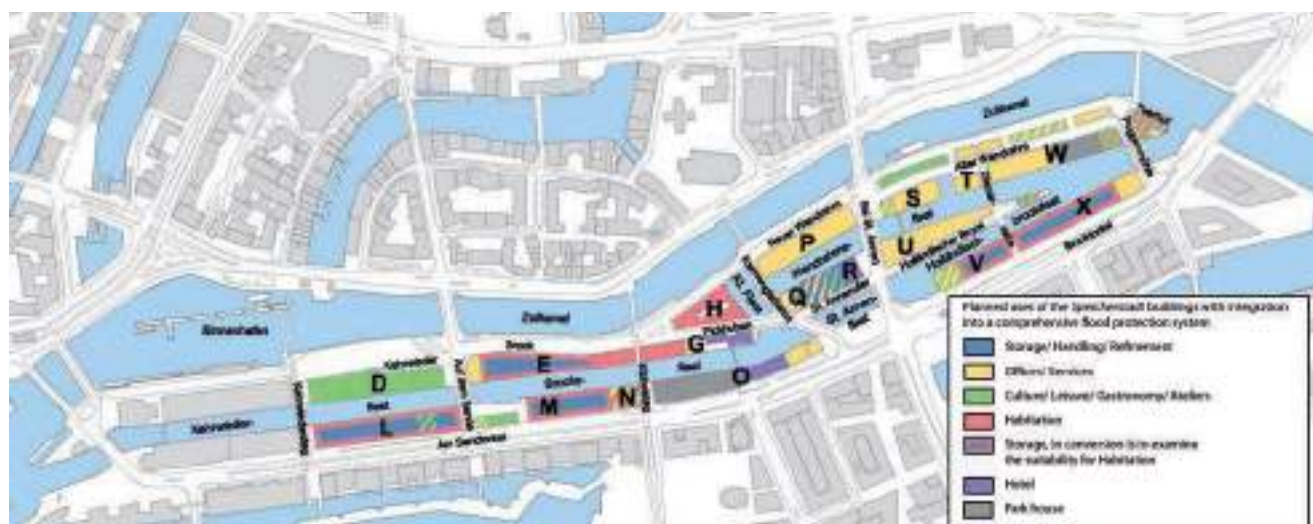


Fig. 58: Planned uses if the Speicherstadt is integrated into the comprehensive flood protection system

Some of the warehouse buildings, which are being used for storage or as commercial or office space, have taken steps to prevent flooding. Some have individual flood defences, which can prevent the basements and ground floors of individual buildings from being flooded.

However, if warehouses were to be converted into apartments or hotels, it would be absolutely vital for there to be a comprehensive flood protection system and appropriate escape routes, which would be safe in the event of flooding. For this reason, as part of the process of drawing up the Development Concept for the Speicherstadt, a study was carried out on constructing a flood protection system, and two main variants were looked at. The study concluded that it is technically feasible to construct a comprehensive flood protection system, but that given the substantial cost of such a system, it would be a very long-term project and that further, more in-depth investigations are necessary.

Of course, if a comprehensive flood protection system is implemented in the Speicherstadt, it will be necessary to ensure that any new flood defences do not detract from the historic buildings or the historic appearance of the Speicherstadt. In particular, the marked contrast between older and more recent buildings in the Speicherstadt should not be exacerbated. The proposed World Heritage management, but also ICOMOS, as an Advisory Body of the World Herit-

age Committee, should therefore be closely involved in future plans to implement such a flood protection scheme.

8.4 Existing Flood Defences and the Quality of the Speicherstadt Experience

Regardless of whether or not comprehensive flood defences are constructed for the Speicherstadt, it is also important to consider the impact of existing flood defences on its historic appearance. This is of particular relevance to the area to the north of the Customs Canal, which on the one hand affects the view of the Speicherstadt from the city centre, but on the other also serves as part of the flood defence line. As far as possible, the quality of the experience offered by the Speicherstadt should be preserved in the future.

There are already some good examples of how the requirements of flood protection can be reconciled with ensuring that the Speicherstadt can continue to be experienced as part of the Hamburg cityscape and complying with heritage protection imperatives, for example by using existing flood defences as viewpoints. In order to identify consensus-based solutions to changing flood protection requirements, any future measures should also be agreed in close consultation with the Heritage Protection Agency and/or the future World Heritage management.



Fig. 59: Existing flood defences on the Customs Canal and the use of flood defences on the Customs Canal as a vantage point from which to view the Speicherstadt

8.5 The Structural Safety of the Quay Walls under the Warehouses and Streets

In recent years, the Speicherstadt's 120-year-old quay walls have begun to show signs of wear and tear, both at the water's edge and in the warehouse buildings themselves, particularly in the basements. As a result, the HHLA commissioned a report assessing the structural safety of the quay walls, which concluded that repairs definitely needed to be carried out to the quay walls and that the heads of the foundation piles also needed to be rehabilitated.

A second report, this time commissioned by the Free and Hanseatic City of Hamburg, came to a different conclusion: that the damage was localised and that only certain sections of the quay walls were at risk. No immediate action was necessary, and the repairs could be done in the medium (3 to 5 years) to long term (10 to 15 years).

Ensuring the long-term structural safety of the quay walls is vital for the conservation of the Speicherstadt. Since the two reports are not unanimous, in the future it will be necessary to produce an appropriate rehabilitation concept for the quay walls, which has the full support of all those involved.

8.6 Traffic

Before the special rules applying to the Free Port were relaxed and eventually abolished, nearly all of the traffic in the Speicherstadt either originated or terminated there. The only exceptions were the roads Bei St. Annen and Am Sandtorkai/ Brooktorkai, which served as through-routes, carrying traffic across Freihafenbrücke to the southern parts of the port and to Harburg. Since then, the Speicherstadt has seen a sharp increase in traffic as well as greater numbers of cyclists and pedestrians. Further changes of use in the Speicherstadt and the continued development of HafenCity in the future will

also impact on the streets and footpaths. Hitherto, the Speicherstadt's infrastructure has remained virtually unchanged, and is therefore one of its characteristic features, which needs to be preserved (see Chapter 2). As the Speicherstadt develops, it will therefore be necessary to be aware, on the one hand, that new demands are being placed on the streets and footpaths but, on the other, that it is important to preserve the historic infrastructure in accordance with the principles of heritage protection.

8.7 Barrier-free Access

Barrier-free access is particularly important for the proposed World Heritage area, which must remain inclusive and accessible to all. In this context, the provisions of the UN Convention on the Rights of Persons with Disabilities and the associated action plan of the Free and Hanseatic City of Hamburg must be respected. In the future, it will also be necessary to identify solutions which enable elderly and disabled people to use the footpaths safely, while preserving the historic materials in the streets. This requirement needs to be reconciled with protecting the heritage of the streets and footpaths in the Speicherstadt and the Kontorhaus district.

8.8 Effects from visitors / tourists

The Speicherstadt, the Kontorhaus district and the Chilehaus are integral parts of the tourism marketing of the Free and Hanseatic City of Hamburg. Together with other tourist attractions, they form an integral part of existing tourism products. This applies particularly to the Speicherstadt itself as well as memory for specific tourist attractions lying there like the „Miniaturland Wunderland“ or the „Hamburg Dungeon“, which attract many tourists every year and are among the main attraction points of Hamburg. At present, not visible, that from the impact of tourism arise specific threats or attacks for the nominated World Heritage Ensemble „Speicherstadt, Kontorhausviertel and Chile House.“ Yet it is vital to ensure through constant

monitoring, that a balance of tourist use is assured with the requirements of conservation practice and use of the buildings and of the public spaces.

8.9 Careful rearrangements of areas and buildings in the buffer zone

In the coming years, additional areas in the buffer zone will be reorganized. This will also be accompanied by some new buildings. This is especially true in the area of Cityhof skyscrapers on the eastern edge of the Kontorhaus district, in the area between Willy-Brandt-Strasse and customs channel west of the Messberg and for a single as yet undeveloped field in the neighboring port city. The new buildings, which are here in planning, also need to be very carefully considered and tailored to their compatibility with the nominated property.

8.10 Key Indicators for Assessing the State of Conservation

The issues outlined above were used to define the following key indicators, which will be assessed at regular intervals, so as to avoid conflicts of interest:

Factor / Indicator	Periodicity	Who is responsible / Location of Recors
Cityscape / City silhouette	Ongoing	Heritage Protection Agency / BSU
Public spaces	Ongoing	Heritage Protection Agency / BSU / District Hamburg-Centre
Preservation of the building structure	Ongoing	HHLA / Owners of the Kontorhaus district / Heritage Protection Agency
Structural safety Quay walls and buildings of the Speicherstadt	Ongoing	Hamburg Port Authority / BSU / Heritage Protection Agency
Uses and changes of use	Ongoing	HHLA / Owners of the Kontorhaus district / Heritage Protection Agency
Traffic and changes in traffic	Annually	BWVI / Heritage Protection Agency
Development of tourism	Annually	Hamburg Tourismus GmbH / Heritage Protection Agency/ HHLA/ Owners Kontorhaus district/ BSU
Developments in the buffer zone	Annually	Heritage Protection Agency / BSU/ District Hamburg-Centre

9. Strategic Measures and Priority Projects

In order to ensure the conservation of the proposed World Heritage site, with reference to the criteria for inclusion on the World Heritage List, which are listed in Chapter 3, and the protection and other primary objectives for its preservation and sustainable development, which are defined in Chapter 4, it is necessary to translate the existing planning systems and policy frameworks into tangible project steps. The three thematic strands used in Chapter 4 to define the protection objectives and other primary objectives can serve as a basis here:

- Preservation and conservation
- Identity and continuity
- Raising awareness and disseminating information

9.1 Preservation and Conservation

The World Heritage Convention regards both the conservation and presentation of World Heritage sites as important and therefore requires both to be respected. Preserving the fabric of the buildings in the World Heritage area together with the surrounding open spaces is therefore a top priority. In support of this objective, the following measures are envisaged:

9.1.1 Design Concept for the Kontorhaus District

At present, the public spaces around the Kontorhaus district are not of optimal quality, and this detracts from the experience offered by the future World Heritage ensemble. One such example is Burchardplatz, which was admittedly designed as a parking area already in the original plans for the construction of the Kontorhaus district, but whose quality is at present diminished by the parked vehicles there. The extension of Burchardstrasse, to the south-west of the Kontorhaus district, presents a similar problem. This street is dominated by the characteristic and impres-

sive shape of the south-western tip of the Chilehaus. Here too, however, parked cars prevent this unique space from being experienced to the full. Efforts are therefore being made to enhance the quality of public spaces in the Kontorhaus district by introducing new parking arrangements.



Fig. 60: Burchardplatz and Burchardstrasse are at present used for parking

Fischertwiete also needs to be upgraded, since it has lost its original character as a through road and is now more akin to a courtyard or square. In the medium term, it should once again be restored to its original condition, so that the functional and physical connections between the Speicherstadt and the Kontorhaus district are again made more explicit.

Another issue to be addressed in the Kontorhaus district concerns the design of the bases of buildings and external spaces, which should be made more uniform. While the façades of the buildings' bases are generally impressive, the advertising boards affixed to them need to be of a uniform design that complies with the principles of heritage protection, and of a standard that befits a World Heritage site. The same applies to the street furniture used in the Kontorhaus district.

In order to coordinate and implement these measures in accordance with heritage protection and world heritage principles, it is envisaged that a design concept be developed for the Kontorhaus district. This should make it possible to safeguard and improve the quality of the external spaces in the Kontorhaus district, as is already the case today in the Speicherstadt.



Fig. 61: Fischertwiete today

9.1.2 Strengthening the Connection between the Kontorhaus District and the Speicherstadt

The physical and visual connections between St. Jacobi, Burchardplatz and the Speicherstadt are important because they provide a visual experience of the Kontorhaus district from the city centre. However, they also bear eloquent testimony to the functional and physical link between the Kontorhaus district and the Speicherstadt, and thus play a key role in fostering public understanding of how the two areas are related. The quality of the area between the Kontorhaus district, Willy-Brandt-Strasse, the Customs Canal and the Speicherstadt therefore needs to be enhanced.

Plans for Willy-Brandt-Strasse, an east-west link road, date back as far as 1910, although it was not actually constructed until after the war. It now forms a physical barrier between the two districts, which is visually accentuated by the road signs positioned there. Wandrahmsteg was shifted from its historical position which adds to the impression of a hiatus between the Kontorhaus district and the Speicherstadt. Since the "Speicherstadt and Kontorhaus district with Chilehaus" have been nominated for World Heritage status on the basis that the two ensembles are interdependent, both functionally and physically, and given that evidence needs to be provided of the proposed World Heritage site's outstanding universal value, it is desirable to strengthen this (visual) connection. Since this area also contributes to consolidating the route from Ballindamm to Baakenhöft, which will be important for connecting Hamburg city centre to the eastern part of the HafenCity, reference was already made to these shortcomings in the Hamburg 2010 City Centre Concept (Innenstadt-konzept Hamburg 2010, 105-107).

It is a particular challenge to identify a solution which, on the one hand, takes account of city centre traffic flows – the Ost-West-Strasse - Willy-Brandt-Strasse



Fig. 62: Chilehaus and Fischertwiete from the south, as it is today; advertising boards and signs on the base of the Sprinkenhof building and next to it

Fig. 63: Past and present connections between the Speicherstadt and the Kontorhaus district: Historic Wandrahmsbrücke across the Customs Canal, view through Fischertwiete towards the Speicherstadt and view from the Speicherstadt or rather the exit of the Messberg underpass towards the Chilehaus

- Deichtorplatz route is an important access route into the city centre and plays a significant role in the road network in general – while, on the other hand, improving the existing situation, so that the historical connection between the Kontorhaus district and the Speicherstadt is made more explicit than it is at present.

9.1.3 Strengthening and Maintaining Other Visual Connections

Over the last few years, the construction of the HafenCity has radically altered the area around the Speicherstadt. This makes it all the more important to preserve the existing visual connections and – where necessary – to improve their quality.

The Oberbaumbrücke - Brooktorkai - Speicherstadt sight line plays a significant role in enhancing people's everyday experience of the Speicherstadt, since Brooktorkai is not only a very busy road, but also elevated, which makes it possible for drivers to see the eastern side of the Speicherstadt in context. It also offers a view of the "Wasserschlosschen" (Little Water Castle), one of the most well-known images of the Speicherstadt. The view has suffered somewhat as a result of the recent construction of a



Fig. 64: View of the "Wasserschlosschen" (Little Water Castle)

hydrogen filling station directly between Oberbaumbrücke and the Speicherstadt. The hydrogen filling station only has a 10-year permit, and will then be moved to another site, thus restoring the uninterrupted visual connection between Oberbaumbrücke and the Speicherstadt.

9.1.4 Preserving the Wooden Pile Foundations of the Warehouses and Quay Walls

The Speicherstadt's wooden pile foundations were originally driven to a depth such that the heads were approximately 0.50 m below sea level (tidal reference level), which at the time was the mean low-water level. This ensured that the piles were nearly always submerged and thereby protected from rot. Over the last two centuries, the tidal range in Hamburg's port has continually increased, and as a result the mean low-water level has now fallen to 1.60 m below sea level (tidal reference level), which means that the pile heads are dry twice daily for several hours at a time, with consequent risks of damage to their load-bearing capacity.

So far, the wooden pile foundations in the Speicherstadt have suffered minimal damage as a result of the fall in the low-water level. However, since the tid-



Fig. 65: View from Oberbaumbrücke to the Speicherstadt as it is at present, blocked by the construction of a new hydrogen filling station

al range is continuing to increase, the pile heads are becoming more and more exposed. Further clarification is now needed about the risk of the foundations becoming unstable as a result of damage to the pile heads caused by their becoming dry. Although the pile heads do not dry out entirely, they could be exposed to harmful bacteria because of the influx of oxygen.

Regardless of the Speicherstadt's nomination for World Heritage status, when it comes to preserving the structural safety of the buildings, no risks should be taken. In the future, therefore, it will be necessary to carry out a thorough examination of the wooden pile foundations and to develop a concept for safeguarding the structural stability of the warehouses and quay walls in the long term. The city of Hamburg, which is responsible for the structural stability of the quay walls, has undertaken to provide the necessary funding (Internal Memorandum 20/4388).

9.1.5 Sensitive Reordering of Traffic and Access to the Speicherstadt

As explained in Section 8.6, the changes in and around the Speicherstadt have already had a significant impact on traffic, a trend which is set to continue in the future.

Hitherto, the Speicherstadt's infrastructure has remained virtually unchanged, and is therefore one of its characteristic features which needs to be preserved (see Chapter 2). As the Speicherstadt develops, it will be necessary to be aware, on the one hand, that new demands are being placed on the streets and footpaths but, on the other, that it is important to preserve the historic infrastructure in accordance with the principles of heritage protection.

With this in mind, the Development Concept for the Speicherstadt contains a summary of the consequences of these developments and the measures

to be taken in response, based on the "Scenario 2025" traffic study of the Speicherstadt and the HafenCity. The Development Concept also describes in detail the measures proposed for the public spaces in the Speicherstadt and contains information about the present and future design of the streets, and the materials to be used.

On the basis of the requirements set out in the Development Concept for the Speicherstadt, the BWVI and the BSU are now drafting an access plan.

9.2 Identity and Continuity

The Operational Guidelines for the Implementation of the World Heritage Convention state that World Heritage properties can be used for a wide range of purposes, provided that such purposes are ecologically and culturally sustainable. Agenda 21, which was adopted in 1992 at the Earth Summit in Rio de Janeiro, and under which 180 countries undertook to implement a programme of action for the 21st century, is decisive here. The programme of action – known as the Local Agenda 21 or LA 21 – seeks to strike a balance on development issues between economic, social and ecological demands.

States Parties to the World Heritage Convention and all partners in the protection of World Heritage have to ensure that the sustainable use of the property does not have an adverse impact on its outstanding universal value, integrity or authenticity. To achieve this objective in the "Speicherstadt and Kontorhaus district with Chilehaus," the ensemble being nominated for World Heritage List, the following strategic guidelines are proposed:

9.2.1 Sustainable Use of the Buildings

Ever since they were built, the buildings in the Kontorhaus district have been used for the purpose for which they were intended. The condition of the build-

ings in the nominated property can at present be described as outstanding. No major changes of use are currently expected. The conditions for preserving the fabric of the Kontorhaus buildings are therefore ideal.

The majority of the Speicherstadt's buildings have been owned by Hamburger Hafen und Logistik GmbH since they were constructed. This situation will not change in the future. HHLA has accumulated a great deal of valuable experience in preserving and maintaining the historic Speicherstadt buildings, and this will ensure a high degree of continuity when it comes to the preservation and sustainable development of the Speicherstadt. In the course of the part-privatisation of HHLA, its Speicherstadt assets were separated from its other business activities. The Speicherstadt buildings were assigned non-listed tracking stocks, which are wholly owned by the Hamburg Capital and Holdings Management Company (Hamburger Gesellschaft für Vermögens- und Beteiligungsmanagement mbH; HGV), which in turn is wholly owned by the City of Hamburg.

In 2007, the Hamburg Parliament adopted a decision entitled Internal Memorandum on the Part-Privatisation of HHLA (Bürgerschaftsdrucksache zum Teilbörsengang), which confirmed a gentle development approach towards new uses for the Speicherstadt. This was a crucial step towards introducing a system of sustainable management and development in the Speicherstadt, enabling it to be preserved in the long term.

9.2.2 Continuity, Identity and Quality of Life through Sustainable Changes of Use in the Speicherstadt

In response to the ongoing process of change in the Speicherstadt, several conversion projects have already been carried out in recent years, in close consultation with the Heritage Protection Agency. There are plans to convert more warehouses in the future, which again will be done in cooperation with the Her-

itage Protection Agency. This close cooperation is intended to ensure that the architectural homogeneity of the Speicherstadt, its historic buildings, construction techniques and characteristic warehouse interiors are preserved for the future.

Without jeopardising the typical characteristics and historic fabric of its buildings, these measures are intended to make the Speicherstadt a lively and vibrant part of the city, which owes its strong attractiveness and identity not only to its cultural and historical significance and atmosphere, but also to its important role in Hamburg's present and future cultural life. The new user groups within the Speicherstadt make an essential contribution to this, but so do visitors from in and around Hamburg and from further afield, who are attracted by new services and cultural activities. To ensure that these measures are sustainable, a balanced mix of uses is being sought.

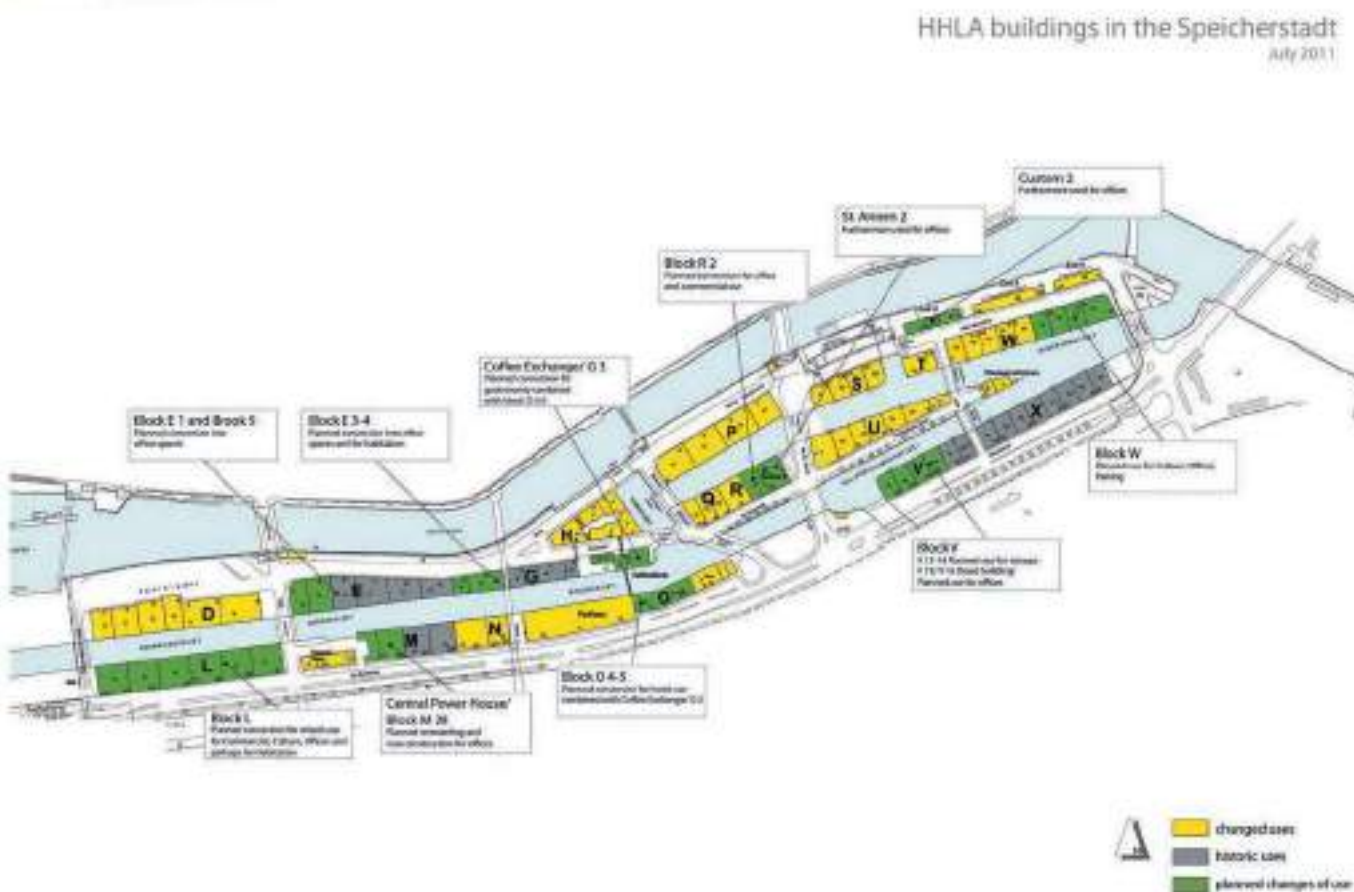
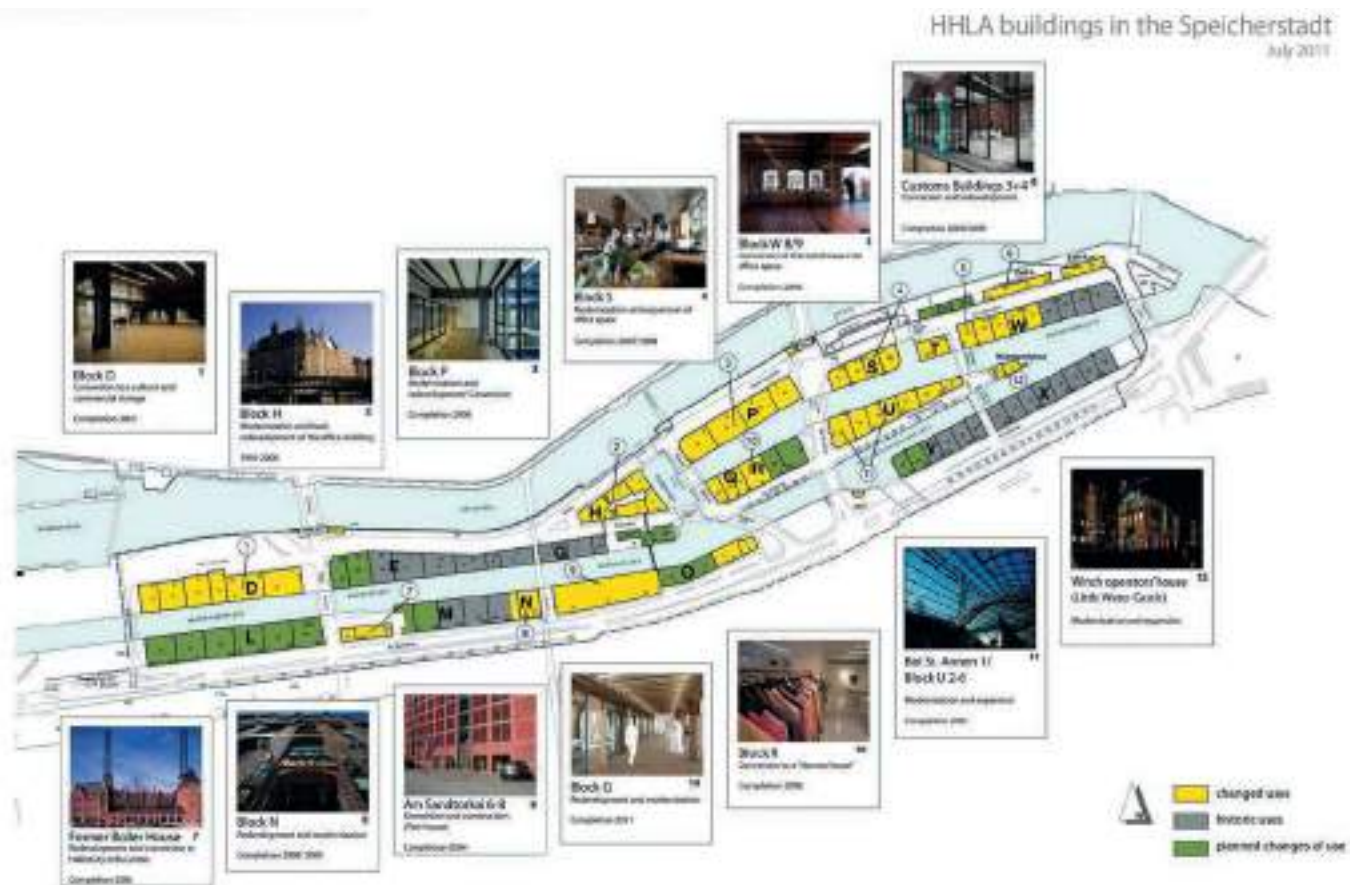


Fig. 66: Completed and planned conversion projects in the Speicherstadt

9.3 Raising Awareness and Disseminating Information

Inscription on the World Heritage List goes hand in hand with an undertaking to communicate the idea of World Heritage and promote the World Heritage site to a wide public audience. This is also essential to raise public awareness of the needs of World Heritage in general, and the need to take proper care of our cultural and historical heritage in particular. The third group of proposed projects therefore concerns education and communication.

9.3.1 Setting up a World Heritage Information Centre

At the heart of the proposed education and communication concept is the World Heritage Information Centre, which will be responsible for public relations, education, tourism and visitor management.

One potential location has been identified for the World Heritage Information Centre: the Speicher-

stadt's former power house, the Boiler House (Kesselhaus). In recent years it has already housed the Information Centre for the HafenCity. In addition, it is proposed to create a "satellite" World Information Centre in the Kontorhaus district, to ensure that information is readily available across the site.

There are several different entry points to the proposed World Heritage area, at each of which it will be necessary to create "information points", so that visitors can orientate themselves and find out information about the area. This can be achieved by adding digital information to the existing signs.

To ensure that the information provided is as comprehensive as possible, it makes sense to create synergies with existing cultural attractions in the nominated property. This will also contribute to the longevity of the communication concept, while enabling it to be delivered at a reasonable cost. The World Heritage Information Centre should therefore be established in partnership with existing cultural activities, whose thematic work is connected to the history of the Speicherstadt and Kontorhaus district.



Fig. 67: Key components of the World Heritage Information Centre concept



Fig. 68: The Boiler House

The Speicherstadt Museum is a particularly important example, since it already tells the story of the building of the Speicherstadt and how it has been used over the decades for storing goods, as well as organising regular guided tours focusing on various different themes. There are also numerous cultural attractions in close proximity to the Speicherstadt, which can be included in this concept.

Essential components of the communications structure are therefore:

- the central World Heritage Information Centre in the old Boiler House and a satellite centre in the Kontorhaus district, containing in particular:
- Exhibitions and information about Hamburg's cultural World Heritage
- Information about Germany's World Heritage sites
- Information about the UNESCO World Heritage List and UNESCO activities
- including existing cultural institutions in and around the proposed World Heritage area in the education and communication services provided

- harnessing the existing signage system and complementing it with a digital information system, and perhaps a virtual information system (for example, a "World Heritage app")

9.3.2 Embedding and Integrating the Education and Communication Strategy at Local and International Level

To ensure that the education and communication work is both broad-based and firmly established, it is vital for it to be closely integrated with Hamburg's other tourist offers. This is particularly true in the light of the fact that the Free and Hanseatic City of Hamburg is already heavily geared towards tourism. In 2010, Hamburg had 8.95 million overnight stays and 111 million day visitors. Revenue from tourism was EUR 7.4 billion. An established organisational structure already exists in the city in the shape of Hamburg Tourism (Hamburg Tourismus GmbH), which is responsible for coordinating tourism marketing in Hamburg.

The Speicherstadt, the Kontorhaus district and the Chilehaus already feature heavily in tourism publicity for the Free and Hanseatic City of Hamburg. Together with other tourist attractions, they are already established tourist destinations. Many of Hamburg's attractions, such as Hamburg Port, the Elbe river beach, and the waterfront with its Fish Market and landing stages, have thematic links to the future World Heritage site. There is already a tightly integrated tourist infrastructure, with tours of the port, thematic walking tours of the city and bus tours. There is therefore a readymade, clearly defined backdrop against which to experience the future World Heritage site, which should make it possible to promote the education and communication concept effectively. In addition, the following measures are proposed to inject momentum into this process:

The use of the UNESCO logo should make the World Heritage site more distinctive and raise awareness of

its significance, as well as of the opportunities and responsibilities associated with its preservation. It is intended to use the UNESCO logo both in relevant (Internet) presentations and at appropriate locations in the World Heritage area itself, in particular at entry points to the proposed World Heritage area and in other locations where World Heritage information is provided.

Since it is crucial that the education and communication strategy reaches young people, it is proposed to work in close cooperation with UNESCO Associated Schools. Through the “World Heritage in Young Hands” programme, which seeks, through pedagogical activities, to raise awareness among young people of the risks to World Heritage and to show them how they can help to preserve it, the existing UNESCO Associated Schools in Hamburg (Helene-Lange-Gymnasium, Schule Altonaer Strasse, Gymnasium Allee, Altona, Gymnasium Allermöher, Gymnasium Grootmoor and Technische Fachschule HEINZE) will be closely involved in the education work.

Working with academic institutions should also help to embed the education and communication work. The Free and Hanseatic City of Hamburg hosts three renowned universities: the University of Hamburg, the HafenCity University Hamburg and the Hamburg University of Technology. The Academy for Architectural Culture (aac), a highly regarded private academic institute, is also based in the city, offering additional qualifications for talented students of architecture, graduates and architects. Experts from the HafenCity University Hamburg have already been involved in drafting the nomination documents for the future World Heritage ensemble. It is hoped that this relationship can be consolidated in the future.

To bring the “Speicherstadt and Kontorhaus district with Chilehaus” to life, as a place of communication and new encounters, it is proposed to hold events as part of the World Heritage Day, which is celebrated at a different World Heritage site in Germany each year on the first Sunday in June.

Hamburg’s regular Heritage Open Day (on the second Sunday in September) provides a further opportunity to raise public awareness of heritage protection issues. If nomination is successful, the future World Heritage area will therefore play a prominent role in these activities.

If nomination is successful, another opportunity for disseminating information about the World Heritage site is the International Day for Monuments and Sites, which is on 18 April each year.

Membership of the association of German UNESCO World Heritage sites (UNESCO-Welterbestätten Deutschland e. V.) will provide opportunities to work closely with the existing network of tourism organisations representing German World Heritage sites.

The Lübeck Declaration, which was adopted at the international conference organised under the auspices of the German Presidency of the EU on 13 and 14 June 2007 in Lübeck, calls for thematic exchanges of information and enhanced inter-regional and international cooperation between individual World Heritage sites. To this end, it is proposed to form a network including: Hanseatic cities in the Baltic Sea region, many of which – both within and outside Germany – are already inscribed on the World Heritage List; cities with historical trading links to Hamburg; port cities within and outside Europe, and cities which have witnessed significant historical and typological developments in office architecture.

9.4 Key Project Lines

The key project lines for the preservation and sustainable development of the “Speicherstadt and Kontorhaus district with Chilehaus” can therefore be summarised as follows:

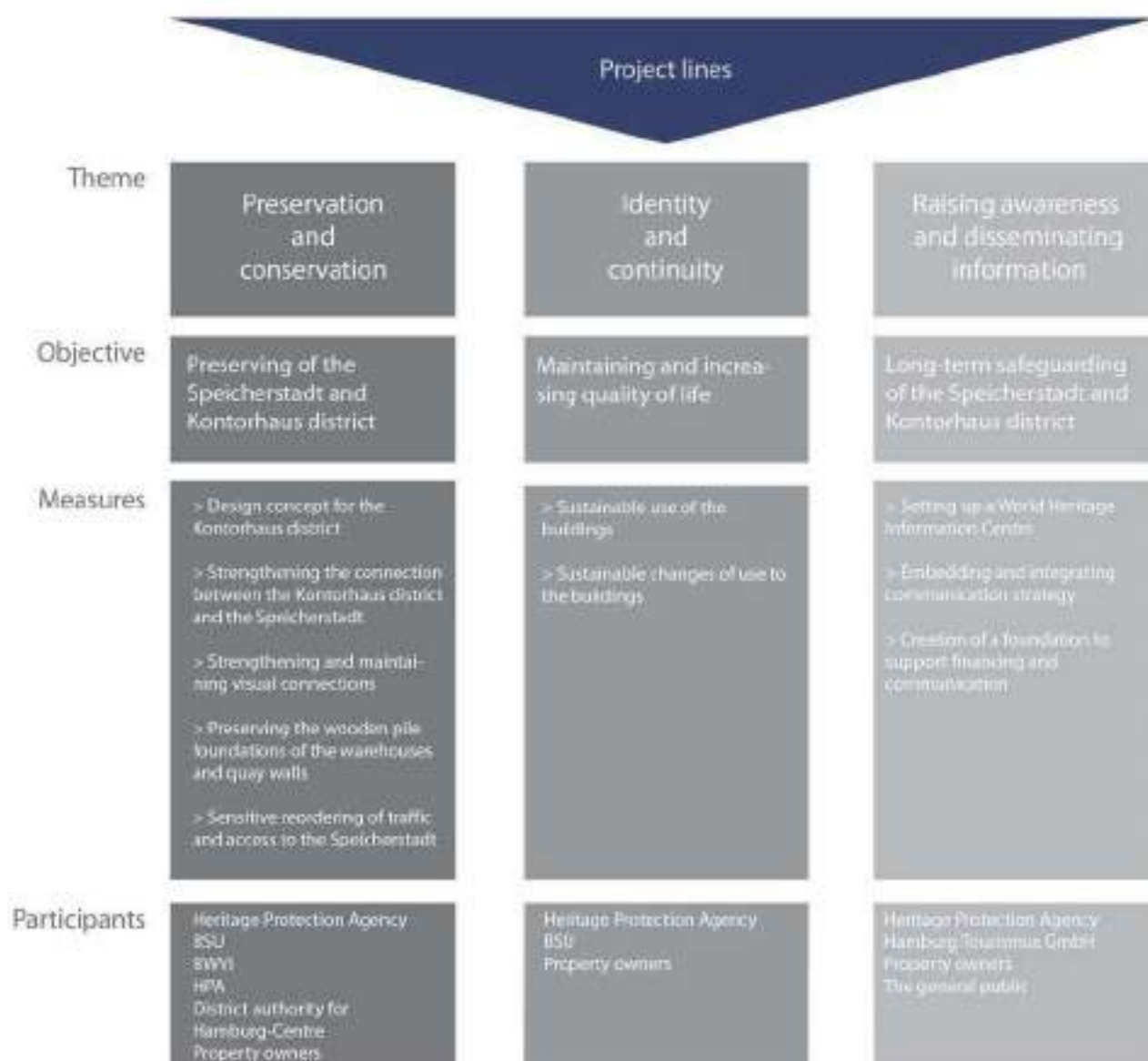


Fig. 69: Action plan and thematic project lines for combining the preservation and sustainable development of the “Speicherstadt and Kontorhaus district with Chilehaus”

10. Resources

There are two essential prerequisites for conserving the proposed World Heritage site, and assuring the necessary coordination and communication: the availability of the appropriate financial resources and properly qualified personnel.

10.1 Staff

Specialist staff in the Hamburg Heritage Protection authorities will be responsible for supervising the protected property, and will thus ensure that the “Speicherstadt and Kontorhaus district with Chilehaus” is properly preserved and maintained. The staff include qualified art historians, architects, landscape architects and conservators.

A new post of World Heritage Coordinator will be created in the Heritage Protection Agency, and the necessary funding has been earmarked.

The members of the Heritage Council, who, under Section 3 of the Hamburg Heritage Protection Act, provide independent expert advice to the competent authority, support the preservation and sustainable development of the World Heritage site.

In the future, the Heritage Council will devote particular attention to the requirements of the proposed World Heritage site. Its expertise will be drawn on to address issues relating to the inclusion of the proposed World Heritage site in the development of the city as a whole, the forthcoming regeneration projects in the World Heritage area and the new construction projects in its buffer zone, as well as other matters connected with heritage preservation. The objective is to achieve consistently high quality when making decisions about the fabric of the buildings and the public spaces.

In addition, both the other ministries and institutions involved and the individual and corporate owners have experienced staff and experts to deal with ongoing repairs and maintenance work.

Firms of architects with experience of working on listed buildings will be commissioned to draw up plans for major renovations and, in some cases, to supervise that work. Hamburg has a good supply of architects, conservators and specialist engineers with experience of working on listed buildings. Several university institutions and technical universities teach and research in that field. There is also a good supply of suitable specialised construction companies and craftsmen in and around Hamburg.

10.2 Funding

10.2.1 Preservation and Maintenance

All of the components of the proposed World Heritage area are legally protected heritage assets under Hamburg heritage law. Pursuant to the Hamburg Heritage Protection Act from 5 April 2013 (HmbGVBl. S. 142), the owners are required, “to make reasonable efforts to preserve the heritage asset, protect it from danger and maintain it in good repair” (Section 7, Paragraph 1). The owners are therefore responsible for maintaining the buildings, and generally provide the necessary financing. Funds are made available each year in the budget of the Free and Hanseatic City of Hamburg to maintain public streets, paths, quay walls and open spaces.

10.2.2 Creation of a Foundation to Support the Preservation of the Nominated Property and Communication Activities

If the nomination of the “Speicherstadt and Kontorhaus district with Chilehaus” as a UNESCO World Heritage site is successful, a foundation will be set up to support communication activities. The intention is to build up the foundation by requesting support from interested and engaged Hamburg citizens, the owners of property in the nominated property and other private-sector companies and institutions. In this way the foundation will also serve to anchor the idea of World Heritage more firmly in the city.

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