D6.1 ARCH Resilience Measures Inventory

User guide
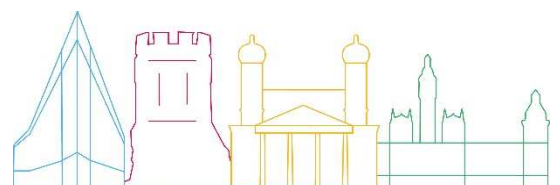
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List of Abbreviations

Abbreviation	Meaning
ARCH	Advancing Resilience of historic areas against Climate-related and other Hazards
EU	European Union
IPCC	Intergovernmental Panel on Climate Change
RAD	Resilience Assessment Dashboard
RMI	Resilience Measure Inventory
SECAP	Sustainable Energy and Climate Action Plan

1. Introduction

The ARCH project (Advancing Resilience of historic areas against Climate-related and other Hazards) aims to enhance the resilience of areas of historic and cultural value to climate change-related and other hazards. One its objectives is to identify which measures are suitable to build/improve the resilience of historic areas. In line with this objective, the Resilience Measure Inventory (RMI) has been developed.

2. What is the Resilience Measure Inventory?

It is a detailed list of measures to build local heritage resilience presented in a web-based format tool, Microsoft Power BI, to increase the user-friendliness.

3. What is the RMI for?

The aim of the RMI is to assist city administrators, heritage managers and related stakeholders to identify measures to strengthen the resilience of their heritage and consequently the whole city/municipality. The focus of the inventory is on (i) heritage building & structures as well as (2) cultural heritage landscapes with focus on agricultural heritage, to cover the scope of all Foundation cities. However, the RMI also provides resilience measures at urban scale. Urban resilience measures while not necessarily suitable for heritage areas, can nonetheless be considered for implementation in their vicinity *e.g.* to minimize impacts of extreme heat & heatwaves and flooding.

The inventory allows practitioners:

- To browse and compare measures for inclusion in a climate adaptation plan, a heritage management plan, or other action plan or strategy,

- To develop a preliminary portfolio of feasible measures[1]. The RMI may be helpful in conjunction with vulnerability and risk analyses as well as resilience assessments.

These measures may be used:

- To identify previously unknown measures
- To gather more information about known measures
- To support SECAP development in the framework of the EU Covenant of Mayors (aiding the selection of appropriate measures for inclusion in the SECAP)

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[1] To fine-tune the portfolio and develop a corresponding action plan, the preliminary portfolio should be complemented with additional context-specific knowledge and information *e.g.* feasibility, acceptability, alignment with other policy etc. This information may be available in the ARCH Hub or tools, come from local stakeholder knowledge and/or other sources (*e.g.* other relevant EU Projects). This finetuning may be done by other means such as prioritization exercises (*e.g.* multicriteria analysis , benefit-cost analysis) *e.g.* supported by tools as the CLIMACT-Prio tool and the FEMA Benefit-Cost Analysis (BCA) Toolkit 6.0 for multicriteria decision analysis and benefit-cost analysis, respectively.

4. How to navigate and use the Inventory

This section contains a short manual of the ARCH RMI tool. It describes the structure of the tool, the functionalities present within the tool and the logical steps for using the RMI with the intention of helping end-users to navigate through the inventory and achieve its objectives.

4.1. Description of the tool format and technical requirements of use

The RMI tool is a web-based application built on Microsoft Power BI. Thus, there exist some technical requirements for the optimal performance of the tool that must be fulfilled by the users.

At the time of writing this document, according to Microsoft's information[2]:

"*Power BI is designed to work with any of the supported browsers listed below. However, performance varies depending on the browser you choose. If you use Internet Explorer in particular, you may experience poorer performance, therefore it is strongly recommended to use a more modern browser than Internet Explorer, such as Microsoft Edge. If performance is still not acceptable, try other supported modern browsers to see if they provide better results for the Power BI solution.*

Power BI supports these browsers on all platforms on which they are available:

- *"Microsoft Edge Chromium*

- *Internet Explorer 11. Some advanced features, such as lineage view, are not supported in Internet Explorer. See Data Lineage (preview release) for more information.*

- *As of August 17, 2021, Microsoft 365 applications and services, including Power BI, will no longer be supported in Internet Explorer 11 (IE 11). For more information, see this Microsoft 365 blog post.*

- *Latest version of Chrome for desktop*

- *Latest version of Safari Mac*

- *Latest version of Firefox for desktop. Firefox may change the fonts used in Power BI"*

4.2. The inventory structure & sequence

The welcome page to the RMI is the landing page and presents the essence of the inventory in one sentence (Figure 1).

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[2] https://docs.microsoft.com/es-es/power-bi/fundamentals/power-bi-browsers
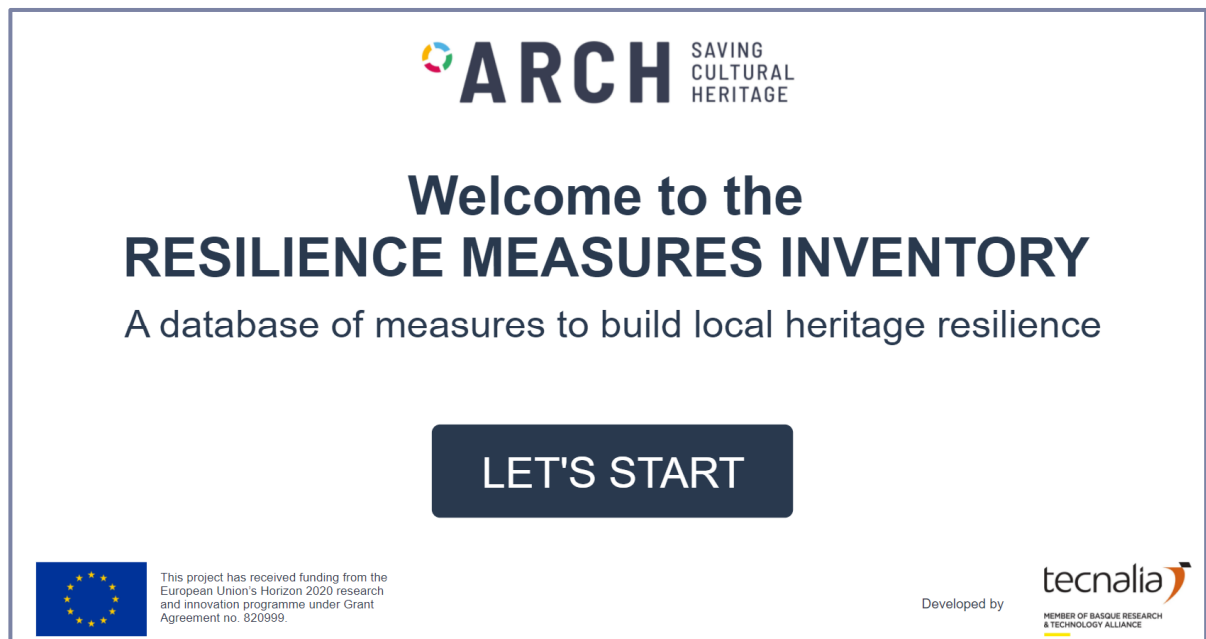
Figure 1. Landing page to the RMI

Click on the "Let's start" button to arrive to the main page (Figure 2).
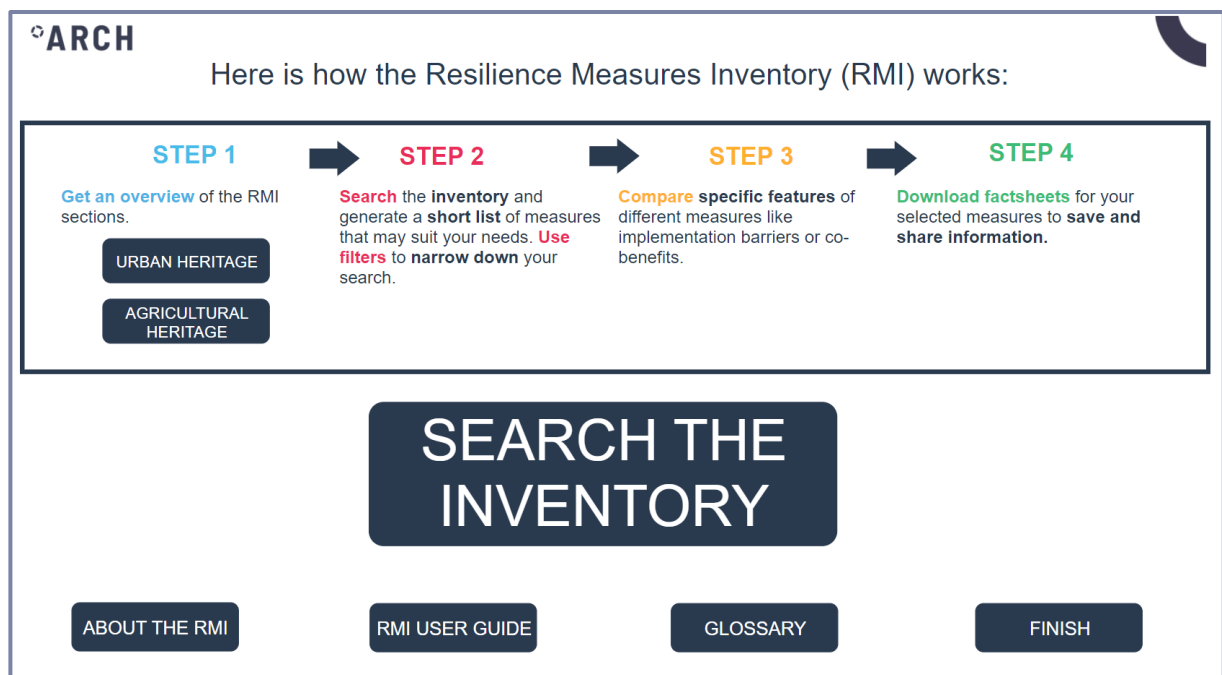
Figure 2. RMI main page

The overall RMI structure is described in Figure 3.
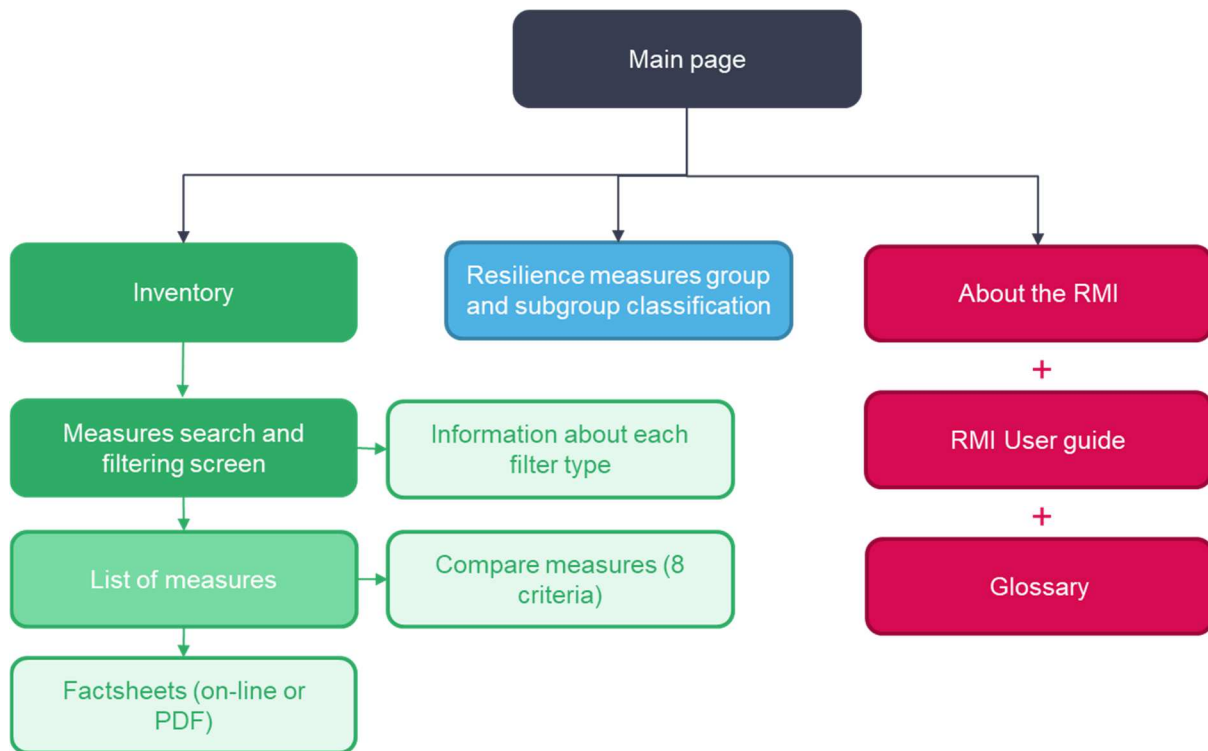
Figure 3. RMI content map of the main page

Use the different buttons to further explore the RMI as shown in Figure 4 to Figure 6.

Being a web-based tool the introductory information to the RMI is summarised under the "**About the RMI**" button (Figure 4). However, more information about the purpose and scope of the RMI can be found in Sections 2 and 3 of this report, respectively.
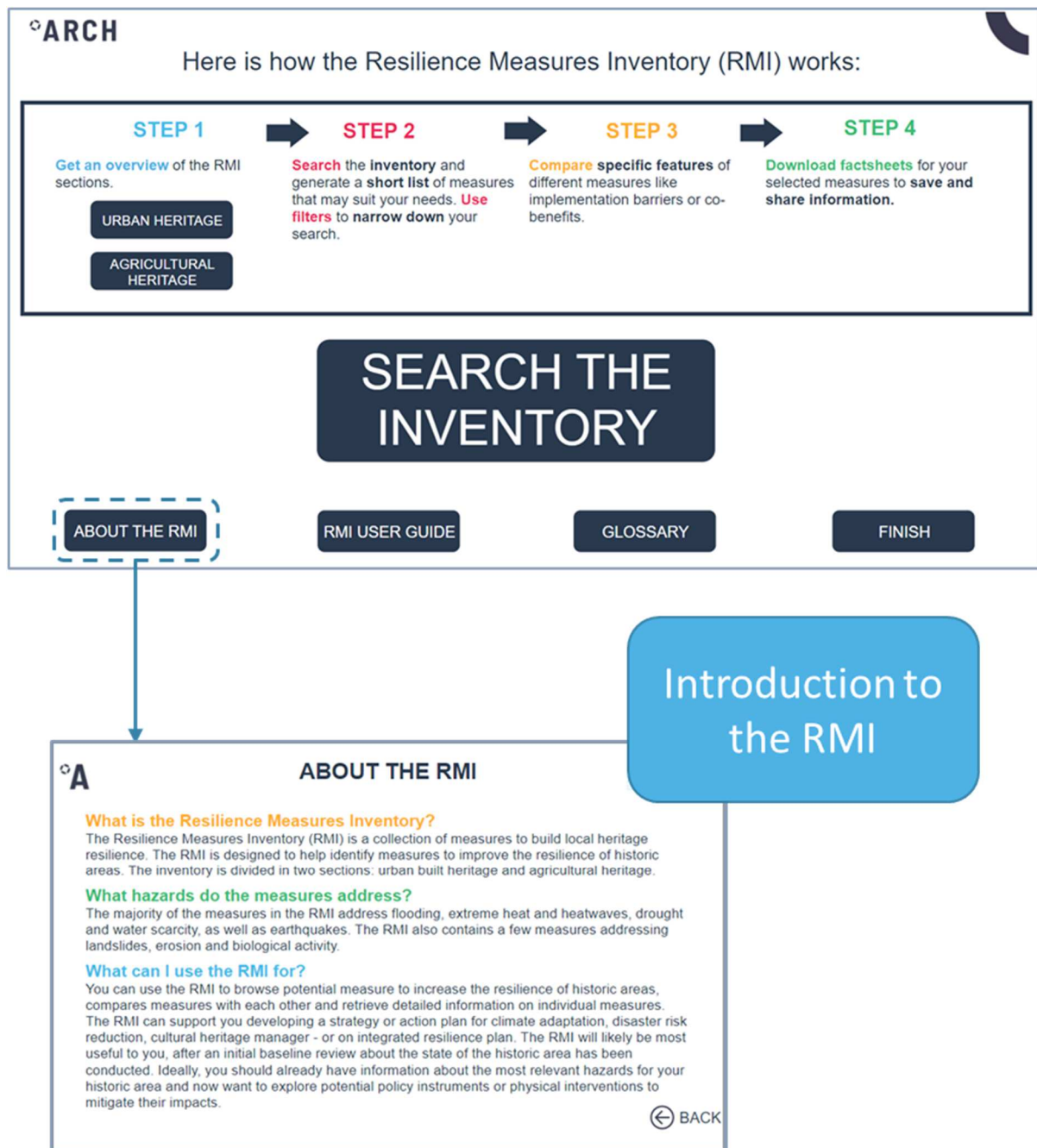
Figure 4. Short RMI introduction window with its aim, envisioned use, and scope

The RMI provides direct access to this report by clicking on "**RMI User Guide**" (Figure 5). This is a shorter version of the deliverable D6.1 "ARCH Resilience Measrues Inventory. Concept and user guide"[3] is intended to provide practical information on how to navigate through the RMI and use cases.

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[3] The extended version of this deliverable can be found in the ARCH project's website: https://savingculturalheritage.eu/resources/deliverables
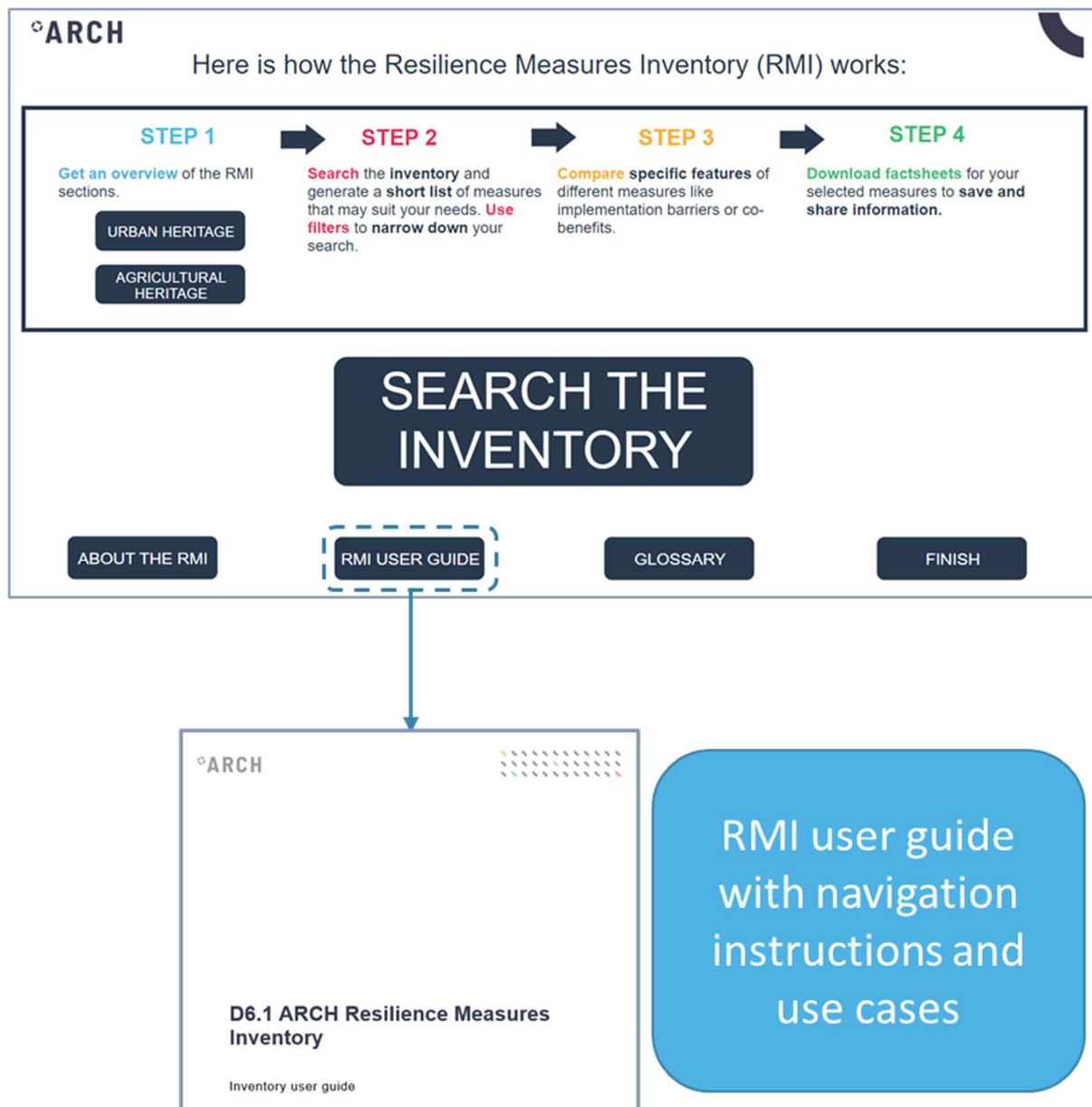
Figure 5. Access to the RMI user guide

As the RMI is intended for users with different backgrounds, mainly in the fields of cultural heritage management, adaptation to climate change and disaster risk management or reduction, a glossary is provided. The glossary based on the ARCH Glossary can be consulted as seen in Figure 6 and includes the terms that are specific for these three themes.

Figure 6. A brief ARCH glossary with terms regarding disaster risk management, adaptation to climate change and cultural heritage management

The main page also describes the recommended steps to create a portfolio of resilience measures, especially for first-time users. This sequence is envisioned to be applied when a search from general to more concrete information is desired. However, all steps are optional and once the user is proficient with the tool the navigation is meant to be free between the different windows of information. See subsections 4.2.1 to 4.2.4 for further information about the steps and the RMI's functionalities.

4.2.1. Step 1: Overview of the two sections of inventory

As explained before, the RMI is divided into two sections: one focused on urban, heritage buildings & structures and the other one focused on agricultural heritage.

The 261 measures present in the RMI are categorized by similarities in the intended outcomes[4] and nature[5] according to hierarchical classes (group & subgroups). Thus, Step 1, aims at a general **exploration of the hierarchical classification of the measures** (group & subgroups) by type of inventory. This classification may help for a quicker identification of resilience measures according to needs and/or function, especially for new users.

To access this categorization click on the section of the inventory of interest (Dark blue boxes: "**Urban Heritage**" or "**Agricultural Heritage**") as seen in Figure 7. However, the descriptions of each group and subgroup are found after clicking "**Search the inventory**" under the "**Definition of your search**" window (see subsection 4.2.2 for further information).
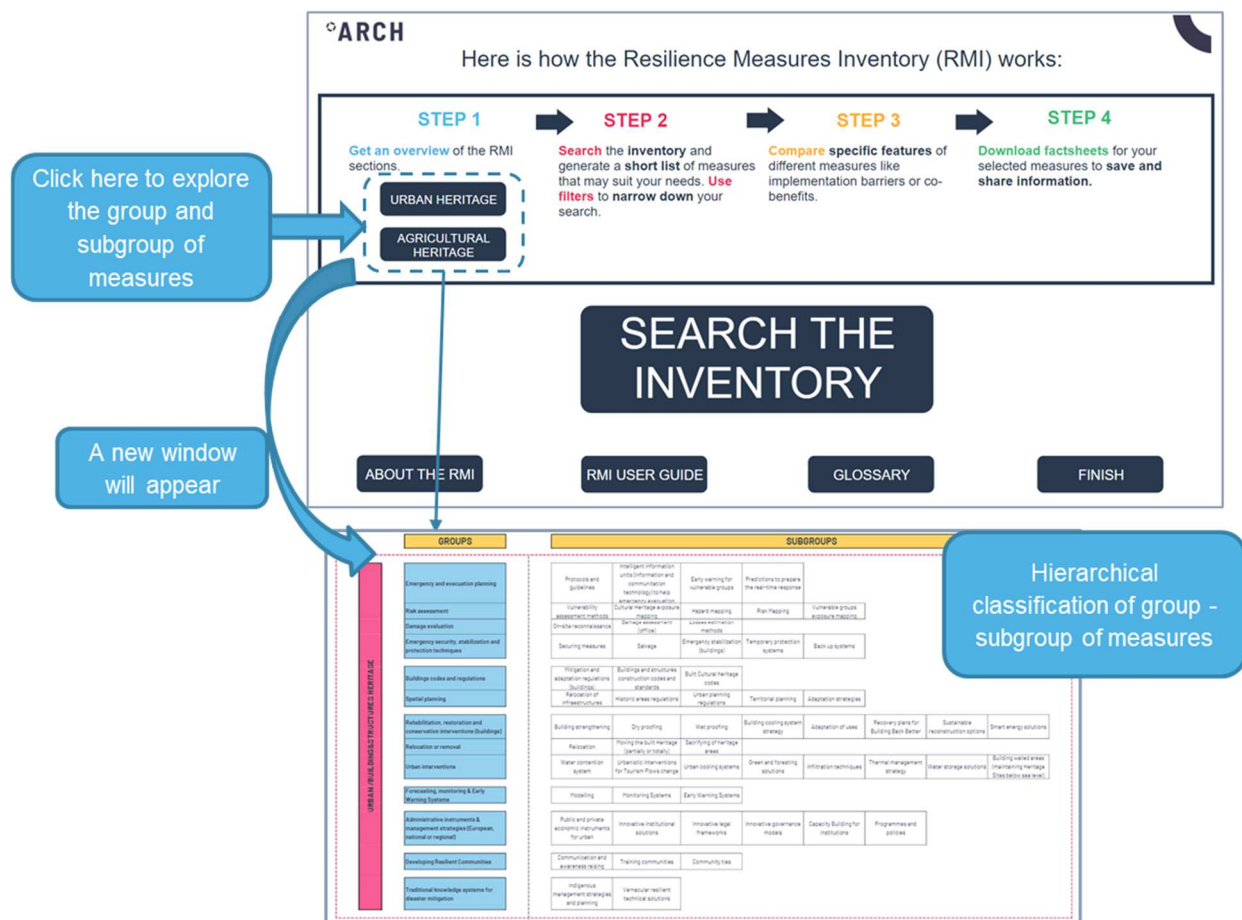
Figure 7. How to explore the higher hierarchical classification of resilience measures

There are different buttons to open the overview of the group and subgroup classification in the web browser (*e.g.* Google Chrome, Microsoft Edge *etc.*), download it as a PDF file or print it (Figure 8a). This allows to enlarge the font size and/or to aid in the measures search without the need to go back to the main page. This new window has also a zoom and search function in the bottom of the window (Figure 8b).

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[4] Outcomes are can be defined as the results or impacts that the group or subgroup of measures achieve by their implementation
[5] Nature is referred to the type of measures according to the IPCC's classification.
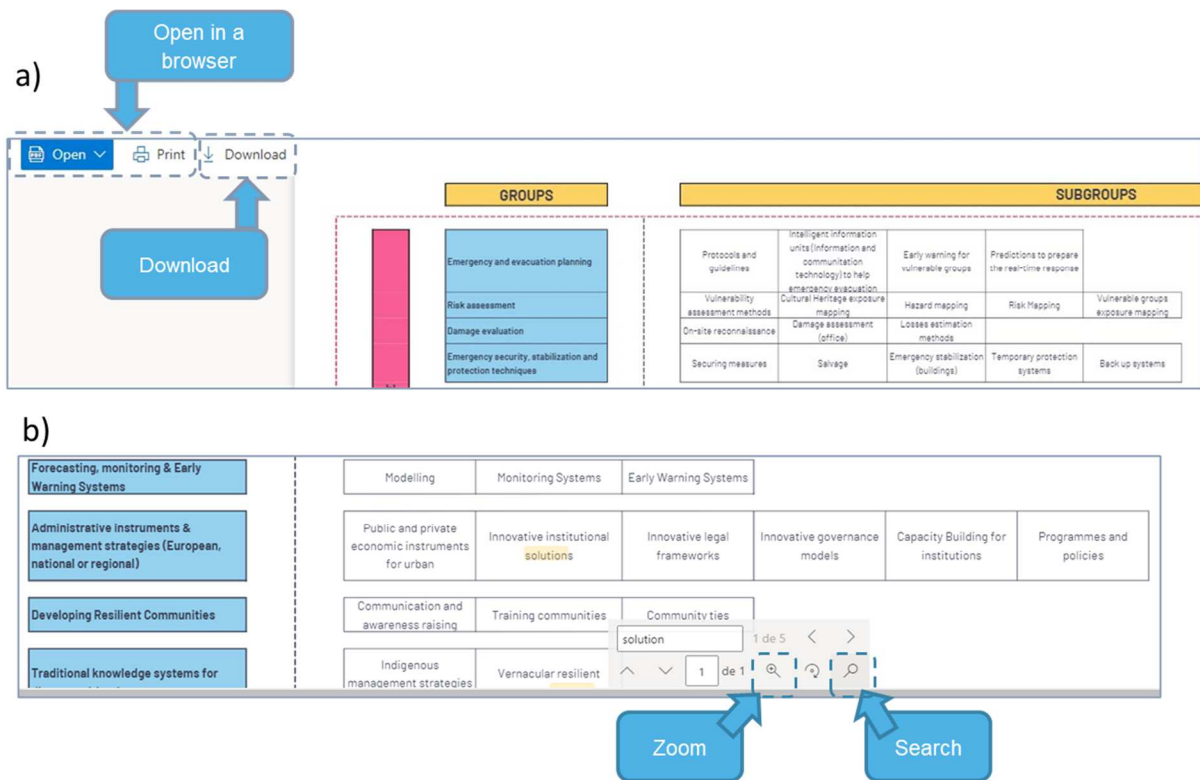
Figure 8.Available functions within the group and subgroup classification window. a) Download or open in in an explorer window functions, b) zoom and search functions

4.2.2. Step 2: Search the inventory and arrive at a short list of measures

From the main page, the big dark blue button ('**Search the inventory**) brings the user to the inventory itself as seen in Figure 9.

Figure 9. How to access to the RMI and the resilience measures search window with multiple filters

This new window offers several filters to identify suitable resilience measures. It also provides info boxes ⓘ where descriptions of the filters and supporting information is available.

To make searching the over 250 measures included in the inventory less time-consuming, three categories of filter have been created to narrow down your search for suitable resilience measures as follows:

"**Basic Information**" filters allow to limit the search to those measures of interest, according to the measure categorization found in Step 1. These filters also allow to search for measures

suitable to address gaps in the resilience assessments done via ARCH Resilience Assessment Dashboard (RAD), after its completion.

"**Specific Information**" filters provide parameters to fine-tune the search.

"**Search measures**" field allows to filter measures using a specific term.

To select the appropriate choice for each filter, click on the arrow icon "∨" as seen in Figure 10. Note that the order in which filters are selected is important, because selecting one filter field automatically restricts the choices available for the next filter. For example, if only one category is selected under "Group of measure" (*e.g.* "Developing Resilient Communities") then only the subgroups related to this category will appear under "Subgroup of measure". In the same manner, if "soil erosion" is first selected under "Type of hazard" and then the user revisits "Type of inventory" the only option that will appear within this filter is "Agricultural Heritage". The "Search Measures" feature also works as a filter and it will only show those measures that include the search words in their title. If no filters are used, all the measures will appear in the following window when clicking on "Check compatible measures". It has to be highlighted that the more filters are used the more restrictive the search will be. However, an iterative search can be made until the final selection of measures is achieved.

Figure 10. Instructions on how to select the desired filters

To select more than one choice at once, simply hold down Ctrl[6] while selecting the choices with the mouse (left button) as explained in Figure 11.

Figure 11. How to select multiple choices

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[6] Note: German keyboards may label "Ctrl" key as "Strg".

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To help in understanding the filters and their use, click on the available info boxes as seen in Figure 11. By clicking on each of them a new window will appear with extra information about the different choices.

Figure 12. Two examples of information given in the info-boxes.: i) description of each resilience group of measures to clarify any doubts and ii) definition of a filter and its filter options

To select the filter options per measure follow instructions as shown in Figure 10 or within the info boxes windows as explained in Figure 13. After selecting the desired options within one filter, click the back button and the selection will be registered in the "Definition of your search" window. The selection of choices are not meant to take place on the table, but on the boxes in the bottom of the window as seen in Figure 13.

Figure 13. How to select filter options within the info boxes: when clicking on the back button the selection will be registered in the filter field from the "Definition of your search" window

In case there is a need to amend the selection of the filters, there are two ways to erase the filter selection (**Table 1. Erase function buttons and information**

):

Table 1. Erase function buttons and information

Button type	Button image	What is its function?
Delete filter button	DELETE FILTERS ▼×	Erase all the filter selections
Eraser	Search a Measure / Search 🔍 ✎	Erase this specific filter field information (Image of "Search a measure" as example)

Once the filters have been selected click on the "**Check compatible measures**" button from Figure 9 to study which resilience measures meet the search needs or requirements.

A new window will appear with the full list of compatible measures. The table also includes information about the subgroup and group of measures they belong to. In the top right-hand corner, a counter is available where it shows how many results the search returned (Figure 14).

Figure 14. List of resilience measures results

While the RMI is not designed to export or download the table with measures, there is a "quick fix" to print the selection in PDF. Instructions can be found in the info box.

4.2.3. Step 3: Compare specific features

Once the preliminary list of resilience measures has been identified (Figure 14), there are two different options on how to proceed:

1. If further refinement is needed, click on "**Compare measures**" button to compare the resilience measures with each other. This will lead to a new window (Figure 15) where all filtered measures are listed on the left, the benchmarking parameters are presented at the bottom on the window and the table with the comparing information is presented in the centre of the window. Select the parameters of interest for benchmarking the measures. There is no need to do anything if all parameters are of interest. However, the table may be a bit overwhelming if many measures and all parameters are selected.

2. If the comparing parameters are not clear click on the info boxes ⓘ (to the right of the parameter buttons). A new window will appear (Figure 16) with the description of the parameter and the alternatives of choice for each parameter.

Figure 15. Benchmarking window of resilience measures

Figure 16. Parameter definition and characterization information

3. To have comprehensive information about each specific measure without comparing them, click on "**Factsheets**" (Figure 14). A new window will appear (Figure 17). Click on the measure (on the left side of the window) of interest to visualize the information.
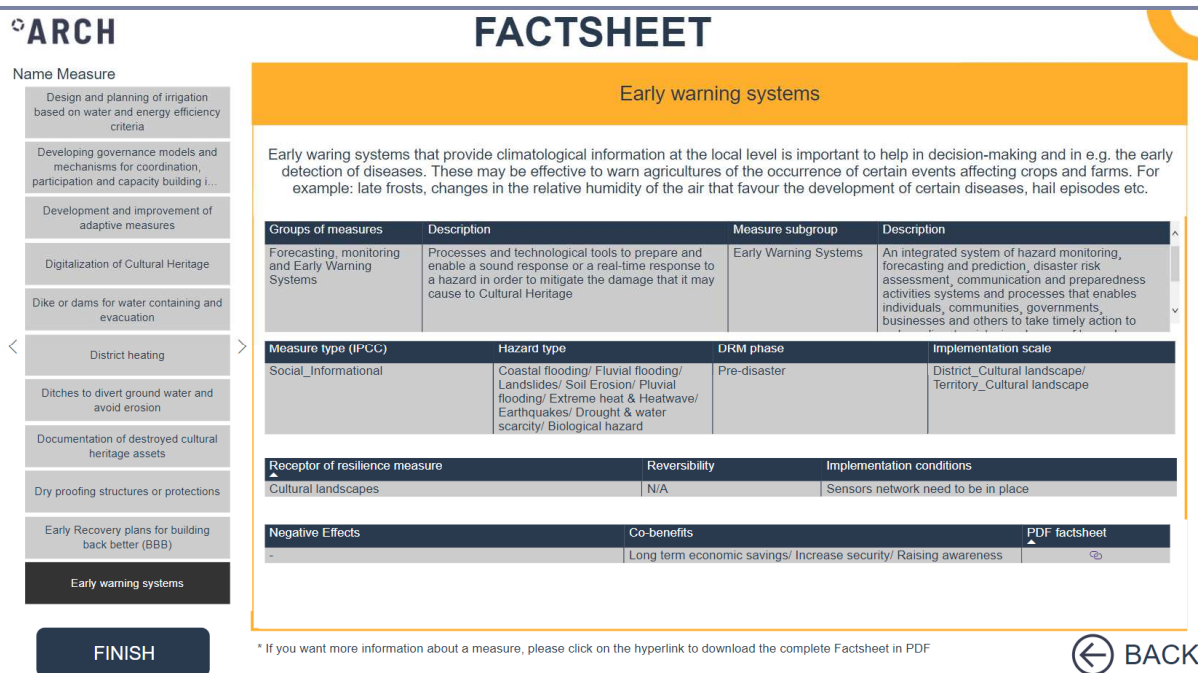
Figure 17. Factsheet window

4.2.4. Step 4: Download factsheets

If the selection of the resilience measures is finished, to save the factsheet for each resilience measure of interest as PDF files (Figure 18), click on each of the hyperlinks to download them (Figure 19).
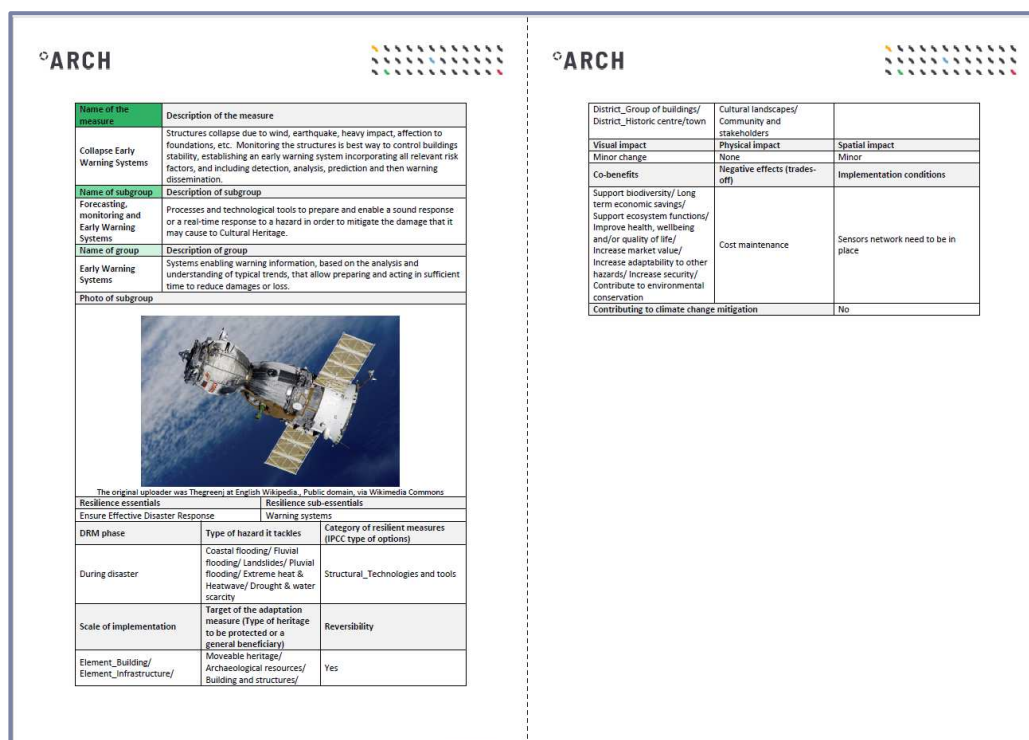
Figure 18. Example of a downloaded PDF factsheet

Figure 19. How to download the PDF factsheet. a) From the "List of measures" window and b) from the " factsheet" window

4.3. Other functions

Apart from all the functions that have been described in subsection 4.2 to describe the sequence of search, three extra functions are presented such as how to expand the table for better visualization, see which filters apply (Figure 20) and how to re-arrange the list in a table by alphabetical order (Figure 21).

Figure 20. Buttons to expand the table for better visualization and to check which filters apply to the shown search

Figure 21. Button to order the content of the field alphabetically

5. Use cases of the resilience measure inventory

5.1. Use Case 1: Social resilience in an agricultural community

I would like to increase social resilience in an agricultural community. Which subgroup of measures would be appropriate for this purpose?

We present three different strategies to search for this information.

The quickest (Option A), but the one that would give less comprehensive information would be to follow the instructions under subsection Step 1: Overview of the two sections of inventory (Figure 7). That is, from the **main window** click on the blue button **Agricultural Heritage.** A new window will appear with the classification of group and subgroup. By exploring the groups, the user can see that there is one group entitled "**Developing resilient communities** ". The subgroups included in this group of measures are: i) communication and awareness raising, ii) training communities and iii) communities ties. However, the user will not be able to know what each subgroup implies.

A second option (option B) will provide not only the name of the subgroup of resilience measures that increase social resilience, but the resilience measures itself. After clinking on "**Click on the inventory to get started**" from the **main window** a new window will appear. The steps to follow are described below (Figure 22):

1. Select Agricultural heritage choice from **Type of inventory** filter.

2. Click on **Group of measure** filter and after revising the list of options, select **Developing resilient communities.**

3. Click on the dark blue button "**Check compatible measures**". A new window will appear with the list of measures that are compatible with this search. In the table the different subgroups of measures under the "**Developing resilient communities**" group will be visible as well as the resilience measures under each of the subgroups.

Figure 22. Steps 1 to 3 from use case, option B, and the result window from the search

In case the names of the groups are not self-explanatory enough, a third option (C) is available (Figure 23).

1. First, select Agricultural heritage choice from **Type of inventory** filter.
2. Click on the info-box linked to **group of measures** filter.
3. A new window will appear where the list of the groups of measures (bottom as grey squares) and their definition (top) can be explored. By clicking on the appropriate group of measures, in this case **Developing Resilient Communities,** the box turns black

which means this alternative has been selected. This is the same as selecting on the previous window the desired choices on a filter

4. Click on the **back button**
5. Check on the info box linked to **Subgroup of measures** where all the subgroups associated to **Developing Resilient Communities** and their definitions will appear. Considering the subgroup definition, the user is in a better position of selecting those ones of real interest.

Figure 23. Steps 1 to 5 from option C from use case 1

5.2. Use Case 2: Flood management

I would like to know which measures can be applied during a flood to understand if I could incorporate new measures in my flood management plan. I would also like to explore what type of implementation conditions and negative effects those measures have.

First from the **Main window**, click the Inventory button "**Search the Inventory**". You will arrive to the "**Definition of your search**" window (Figure 9). Then, follow the described steps (Figure 24):

1. Select in **Type of Inventory** filter: Urban /building & Structures heritage

2. Select in **Disaster Risk Management Phase** filter: 2. During disaster.

3. Select in **Type of hazard** filter: Coastal flooding, fluvial flooding, and pluvial flooding. Press "Ctrl" from the computer keyboard when selecting more than one option.

4. Click on the dark blue button **Check compatible measures**

Figure 24. Steps 1 to 4 from use case 3

5. The list of measures compatible with the search will appear in the next window. To explore what type of implementation conditions and negative effects those measures have, please, click on the dark blue button **Compare measures (**Figure 25**).**

Figure 25. Step 5 from use case 3

6. Again, a new window will appear with the information table in the centre (Figure 26). The compatible measures to the left and the parameters to benchmark the measures at the bottom. Click on the parameters entitled **Implementation conditions** and **Negative effects** to limit the visualization to this information.

7. To know what type of information the parameters contain or its definition, please click on the info boxes (Figure 16).

8. There is a scroll function to the right to be able to see the information for all the measures.

9. When the evaluation of these parameters is finalized, click on the dark button **Finish** or start a new search. If the **Finish** button is clicked the back-cover window will pop up (Figure 27). From here the user can re-start[7] a search or visit the ARCH project's website by clicking on the ARCH button.

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[7] If the re-start button is clicked the user can see on the "**Definition of your search**" that the previous choices are saved. At this point there are two choices, (i) to click on the "**Delete filters**" button to start a new search or (ii) apply extra filters to continue narrowing down the search.
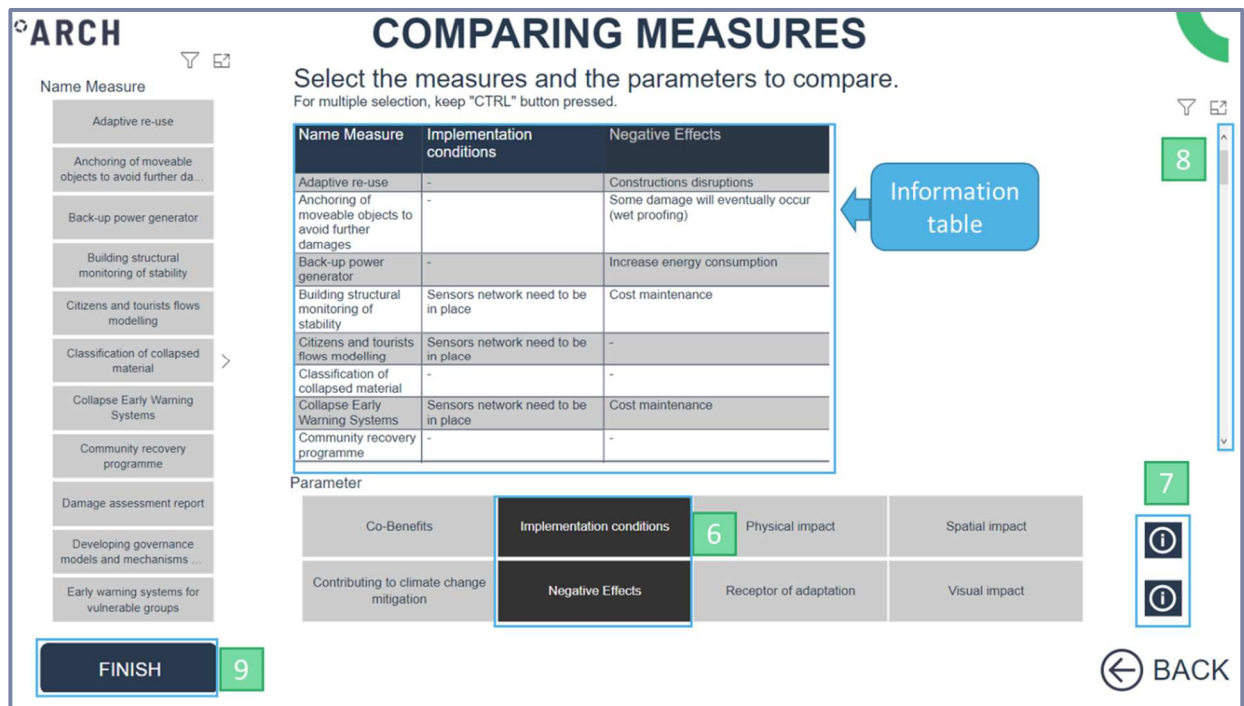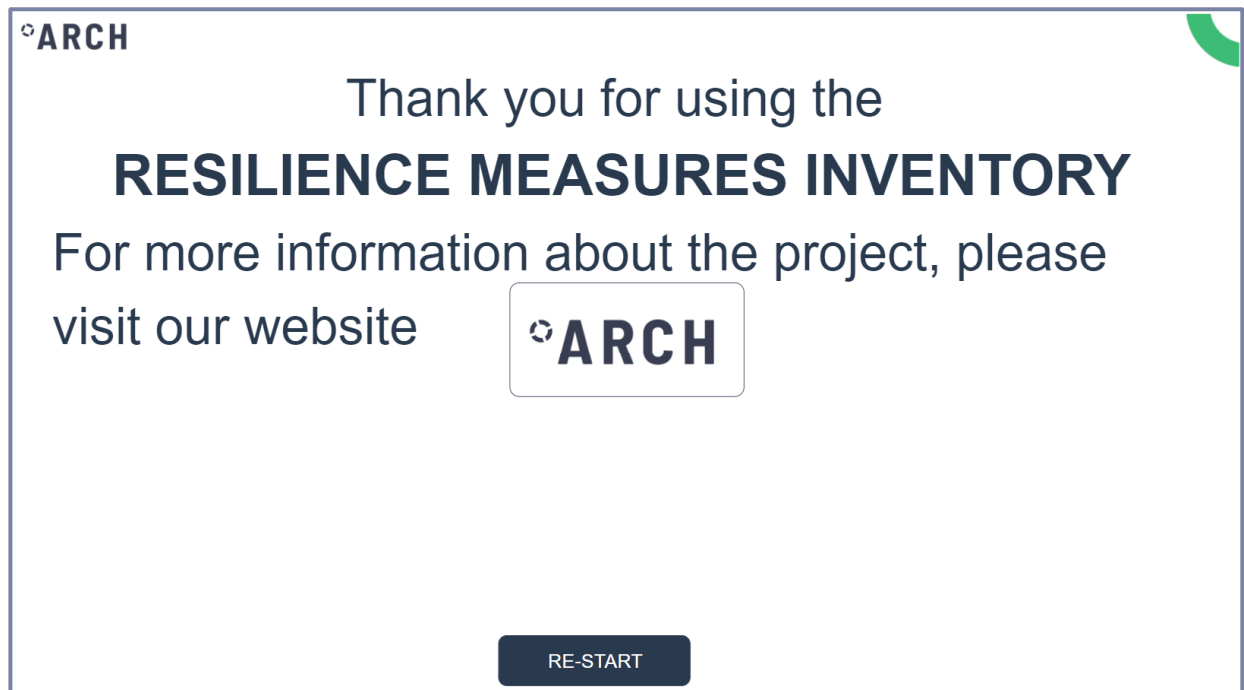
Figure 26. Steps 6 to 9 from use case 3

Figure 27. Back cover of the RMI

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5.3. Use case 3: Early warning systems

I am interested in early warning systems; thus, I would like to explore this type of measures within the RMI and the information that is provided (factsheets)

This use case aims at answering the following questions: Are early warning systems present as a resilience measure? At group/subgroup or measure level?

1. To know exactly what type of measures to search for, click the **"Search the Inventory"** button on the **main window**. The window **Definition of your search** window will appear. The quickest way to proceed would be to type "early warning system" under the **Search Measures** filter (Figure 28).

2. Click on the magnifying glass icon to apply the filter. A list with resilience measures containing "early warning system" will appear under **Search Result List**.

3. Select under the **Search Result List** all the measures that are relevant. In this case all of them. Press "Ctrl" from the computer keyboard when selecting more than one option.

4. Click on the dark blue button **Check compatible measures** to proceed. A new window (Figure 29) will show with the **List of measures** containing the search term. The result shows 5 out of 261 measures within the RMI contain the "early warning system" term on it, which belong to two subgroups and 2 group of measures.

Figure 28. Steps 1 to 4 from use case 3

5. Click on the factsheets if extra characterisation information is desired about the selected measures. Click either in the PDF factsheets, which can be downloaded by clicking on the symbol ⬡ (5), or on the online factsheet by clicking the button **factsheets** (5B). Factsheets allow a quicker switch from one measure to another while

the hyperlink to the PDF files allows to download the information and save the measures on the computer. Note that similar measures come from the two type of inventories, thus if a clear receptor has been identified, it may be pertinent to complement this search with **Type of inventory** filter.

Figure 29. Step 5 in use case 3