RESIN

SUPPORTING DECISION – MAKING FOR RESILIENT CITIES

e-Guide development – e-Guide (final)

Overview of results achieved in Task 6.3

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1 Table of figures

Executive Summary

Deliverable D6.6 is the final version of the e-Guide. This document has been prepared to mark the delivery of this electronic product and outlines the contents, process and decisions underlying the development of the e-Guide, which can found at http://e-Guide.resin.itti.com.pl/.

This report presents the design aims of the e-Guide that were set out at the start of the development process in D6.2 (Nieuwenhuijs, 2016), the approach followed for developing the e-Guide in a co-creation process, and finally draws conclusions on the extent to which the end result has fulfilled the goals.

We conclude the development of the e-Guide fulfilled almost all the goals it set out to fulfil completely and furthermore identified a total of 13 innovative elements that can be considered for any national or international platform in support of the urban climate adaptation process, of which were nine were found to be very useful or essential. This results in recommendations for incorporation of features in existing or future climate adaptation support platforms.

2 Reading guide

This report is meant as a description of the content, development process and level of success of the e-Guide, not as a guide how to use the e-Guide. The e-Guide was developed to be self-explanatory.

This report starts (in chapter 4) with a general introduction on the goals the e-Guide was set out to fulfil. In this chapter we identify two types of goals for the success of the e-Guide:

- Fixed goals set out in the DoW (Description of Work) and the ensuing study of requirements for a supporting platform for the urban climate adaptation process;
- The goal to minimize duplication of existing functionality in this respect and add new functionalities that support the end users in their process.

In chapter 4 we will analyse the extent to which the e-Guide was successful in developing new functionality for supporting the end users in their climate adaptation process and the extent to which this functionality is recognized by the end user as useful.

In chapter 5 we will present the new functionality (tools and methods) incorporated in the e-Guide to support the user in executing certain steps of his or her adaptation process.

In chapter 6, the way the e-Guide integrates the use of tools and methods developed in the RESIN project is presented.

In chapter 7 we will assess the extent to which the e-Guide was successful in achieving the fixed goals and by extension, in supporting the end user in his or her adaptation process.

Finally, in chapter 8 we will evaluate the level of success of the e-Guide in terms of the goals set out and draw conclusions.

3 Terms and abbreviations

In this section the terms and abbreviations used in the document are introduced.

3.1 Terms

Term	Definition
Decision Framework	An element of the e-Guide. Structured guide which provides support for creating an (update for an) urban climate adaptation plan in a digitized, interactive form.
Decision Support System (DSS)	An information system that supports business or organizational decision-making activities.
DoW	Description of Work
e-Guide	A DSS to support city administrators (including managing and supportive staff) in developing an effective climate adaptation plan.
Guide	Advisory texts showing the most favourable pathways towards a goal.
Method	Systematic procedure to achieve a particular result.
Phase	Highest level of the structure of the Decision Framework.
Step	Lowest level of the structure of the Decision Framework. Steps are grouped into activities of similar nature.
Tool	Method supported by functional (often software based) aids.

Table 1: Terms

3.2 Abbreviations

Term	Meaning
EEA	European Environment Agency
ICE(+)	Impact Chain Editor (part of IVAVIA)
IVAVIA	Impact and Vulnerability Analysis of Vital Infrastructures and built-up Areas
JSON	JavaScript Object Notation
NUTS	Nomenclature des Unités Territoriales Statistiques; Classification of Territorial Units for Statistics
RESIN	Climate Resilient Cities and Infrastructures (project name)
RIVAS	Risk and Vulnerability Assessment System
UAST	Urban Adaptation Support Tool; associated with Climate Adapt and Mayors Adapt.

Table 2: Abbreviations

4 Design aim of the e-Guide

Below, a summary is given of the specific goals described at the start of the project in Deliverable 6.2 (Nieuwenhuijs, 2016). We will later compare this with the results at the end of the process.

4.1 Specific goals of the e-Guide

- provide the user with standardised tools, information, checklists and practical examples, to advance through all phases of the adaptation planning process in European urban environments, from raising awareness of climate risks through to the implementation of adaptation responses
- offer guidance – where possible – which tools and approach are best suited for a particular situation
- integrate the approaches of both the climate change adaptation world and the world of disaster risk management, targeting urban areas and (critical) infrastructures
- quickly guide end-users in their search for background and experiences that are relevant for their situation
- allow for flexibility to address the non-linearity of the adaptation planning process and the reality of the urban planning process
- allow to be used in an iterative way for re-evaluation when new information becomes available
- incorporate guidelines on how to develop scenarios as a guide for decision makers to provide for robust and resilient planning under a wide range of potential future (long-term) climate conditions
- connect with and integrate existing methods and approaches where possible, thereby building on the experience of other platforms and progress the support that the diverse range of available tools supplies

4.2 Points of departure for development of the e-Guide

- Co-development with stakeholders
- Iterative development
- On-line end user support
    - The need for and ability of the solution to support dynamic content;
    - The need for and ability of the solution to support the integration of external information sources;
    - The need for and ability of the solution to support the storage of user data;
    - Technical feasibility of the solution within the context of the project;
    - User-friendliness of the solution;
    - Intuitiveness of the solution;
    - Familiarity of the end-users with the solution;
    - Accessibility on a range of platforms;
    - Extensibility.
- The e-Guide should refrain as much as possible from replicating functionalities and content already available online. Therefore, focus of WP6 is to find innovative ways to guide and support the decision-making process for climate-resilient cities and infrastructures. In case of limitations of budget or time, testing of innovative functionality and content therefore prevails over completeness of content.

4.3 Envisioned added value over existing platforms

Deliverable D6.2 (Nieuwenhuijs, 2016) lists the expected added value of the e-Guide over other platforms. The summary included in this deliverable is presented below.

	Full cycle	Guidance	Geography	Risk AND adaptation
Urban Adaptation Support Tool	yes	no	Europe	no
Adaptation Pathfinder	yes	yes	Europe	yes
UKCIP Adaptation Wizard	yes	yes	UK	no
SUDPLAN	no	yes	Europe	no
Climate JUST	no	yes	UK	no
Dutch Spatial Adaptation platform	yes	no	NL	no
Local government climate adaptation toolkit	yes	yes	Australia	yes
RESIN e-Guide (Ambition)	**yes**	**yes**	**EU(+)**	**yes**

Legend

Full cycle:	Covering all stages of urban adaptation planning
Guidance:	Providing guidance, e.g. posing questions or checklists, more than information sources and links
Geography:	Potential application area of the DSS
Risk AND adaptation:	Combining the approaches of disaster risk reduction and urban adaptation planning

Figure 4-1: Assessment of existing platforms over the goals set out for the e-Guide (from (Nieuwenhuijs, 2016))

The way these goals were approached in developing the e-Guide is explained in chapter 4 of Deliverable D6.2 (Nieuwenhuijs, 2016). To summarize, the e-Guide was set out to act as an encompassing platform, providing guidance suited to map on other decision frameworks, and acting as a one-stop shop by guiding the user to existing functionality on other platforms wherever this was found useful in the decision process. By not copying existing information and functionality, the development of the e-Guide within the project could encompass a decision platform with wide applicability (EU or bigger applicable, full circle), providing guidance of both risk and the adaptation process, and even many of the steps before, after and in between. On top of that, the platform would introduce and test enhancements for the support of the urban adaptation process.

5 Innovative elements of the e-Guide

To avoid duplicating elements already existent in other platforms, the e-Guide focussed on providing new and innovative functionality for supporting the creation of an urban climate adaptation plan. The end product of the RESIN project is thus a working and validated prototype[1]. A company or institution that is able and willing to develop the e-Guide (or parts of the e-Guide) further into an operational and maintained product will be sought within the course of the project.

To support the creation, development and assessment of innovative elements, a co-creation process was used to find out where the main drawbacks of existing platforms were experienced by users and think of innovative solutions for them, incorporate them in the e-Guide and evaluate them.

Below, the innovative elements introduced to and tested in the e-Guide are presented in separate sections. In each section, we will explain the innovative element and its intended added value over existing climate adaptation planning support platforms, the way we implemented it, the feedback from end users on it and finally we draw conclusions on the level of success and the pros and cons of this innovative element.

5.1 My workspace

5.1.1 Intended added value

'My workspace' was designed to offer the user functionality to manage the group of people working on an adaptation plan and offer a common and persistent picture on the status and information gathered. See also chapter 7: Guiding the user towards a fit-for-purpose climate adaptation plan for an elaboration on the usefulness of this functionality.

5.1.2 Implementation

The implementation of 'My workspace' in the e-Guide offers the following functionality:

- Record progress made with the decision framework (see Figure 5-4)
- Record the essential information for each step in a formalised and uniform way (see Figure 5-5)
- Include all additional information (such as working documents or meeting notes) about each step (see Figure 5-5)
- Divide the efforts into smaller, easier manageable pieces ('projects', see Figure 5-1)

[1] As was concluded from the RESIN Description of Work (RESIN Consortium, 2014) in the high-level design of the e-Guide (Nieuwenhuijs. & Voorthuijsen, 2017), the e-Guide was to be developed to a Technology Readiness Level 5 (TRL 5), as defined by the EU (European Commission, 2014). TRL 5 is defined as 'Technology validated in relevant environment' and is considered the highest level achievable within the time and budget constraints of the RESIN project. The next highest level, TRL 6 (defined as 'Technology demonstrated in relevant environment'), was not considered achievable for the following reasons:

- Demonstration in a relevant environment would require validation of most of the information within the e-Guide and most of the e-Guide functionality in real-life adaptation processes; however, these processes last significantly longer than the duration of the RESIN project. For TRL 5, the validation can be carried out using test scenarios.
- The RESIN project does not mention provisions for defining measures of effectiveness (MOE), life-cycle planning, maintenance, etc., which are associated with a TRL 6 product.

- Determine who is allowed to work on and view which information (see Figure 5-3)
- Get an overview of progress made (see Figure 5-4)
- Get an overview of all information gathered (see Figure 5-2)
- Get a complete track of who made what progress or uploaded what information (see Figure 5-6)
- Work together with other cities also using ‘My workspace’ (see Figure 5-3)

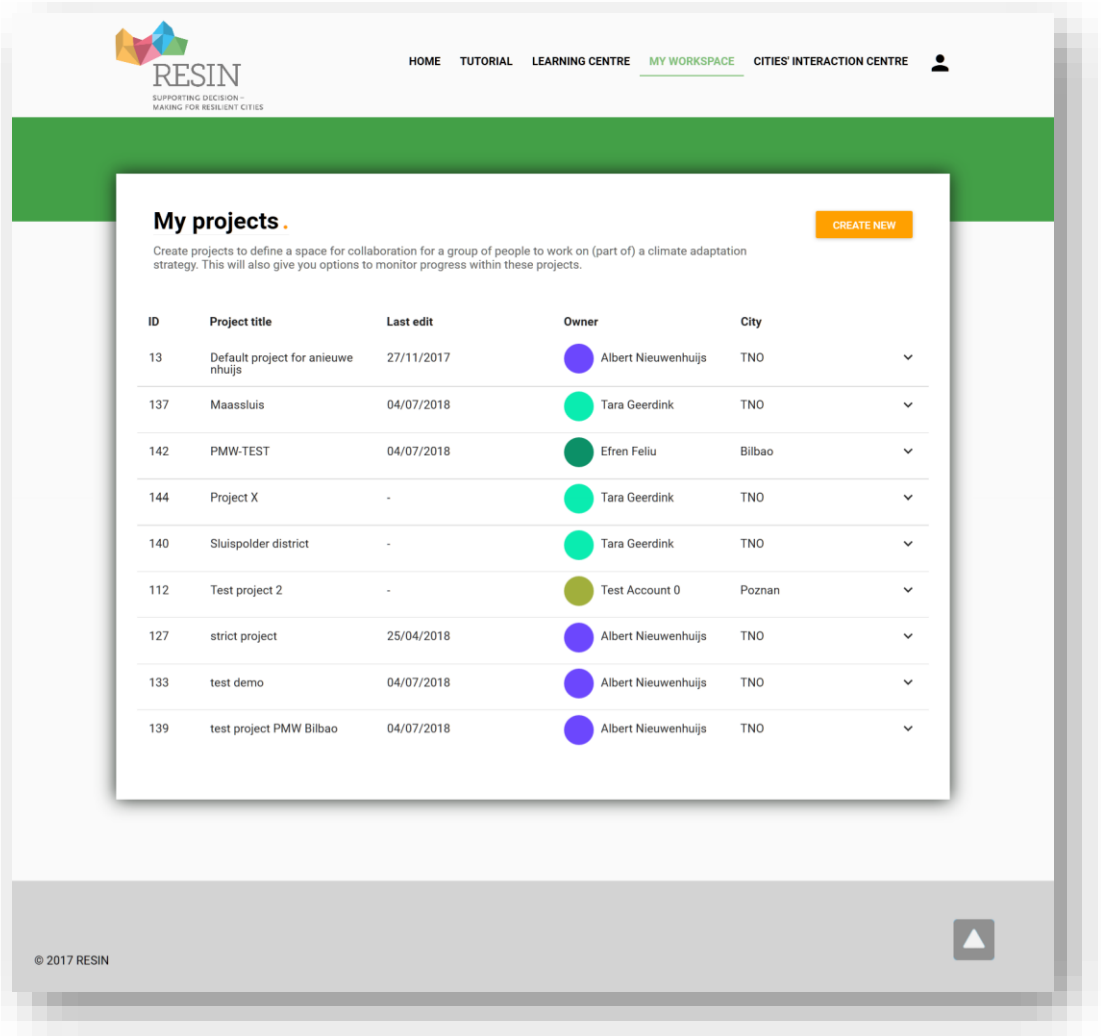


Figure 5-1: Screen for managing projects and co-operation between contributors from different departments or entities or even cities in projects

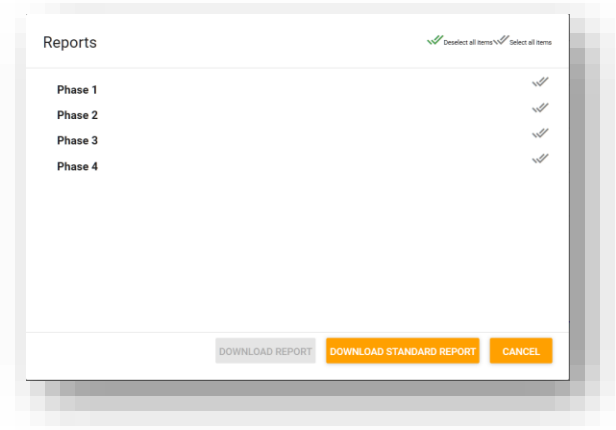


Figure 5-2: Download a complete report of any project showing all information entered on each step

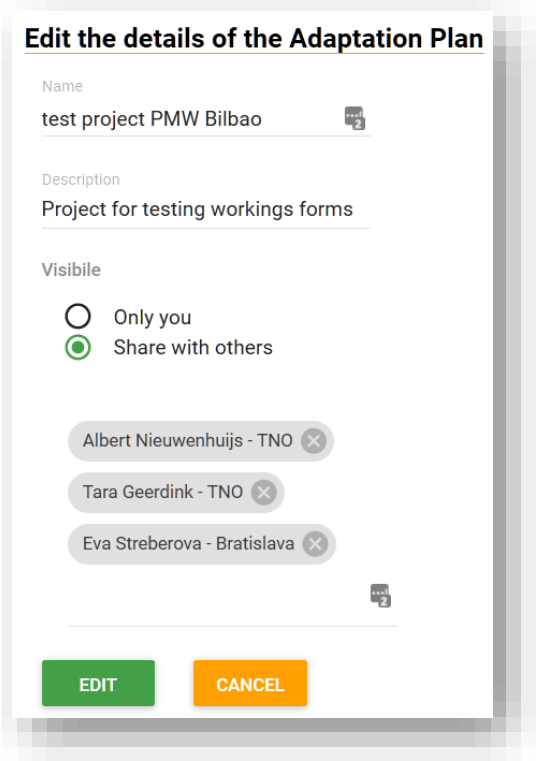


Figure 5-3: Determining who can work on a project and sharing it with other cities

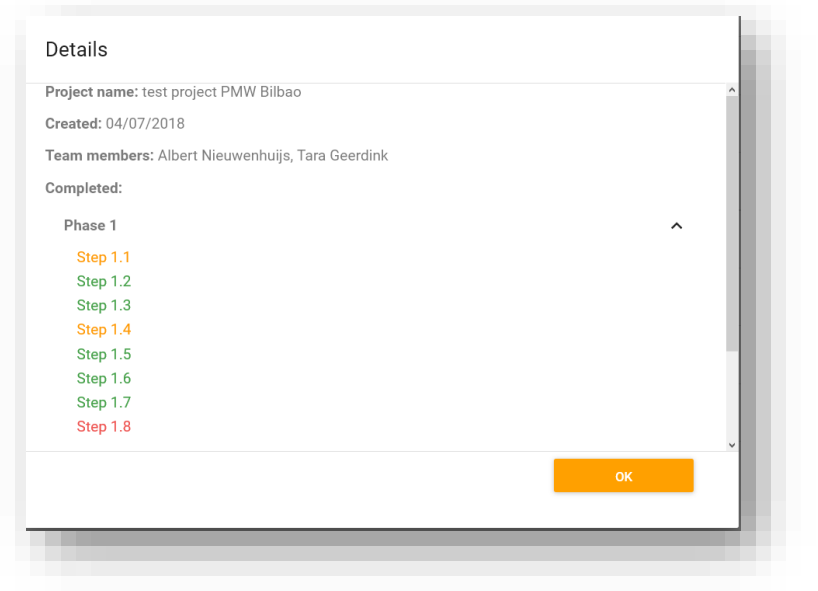


Figure 5-4: Quick overview of the status of a project (green: step finished, orange: step started, Red: step not started

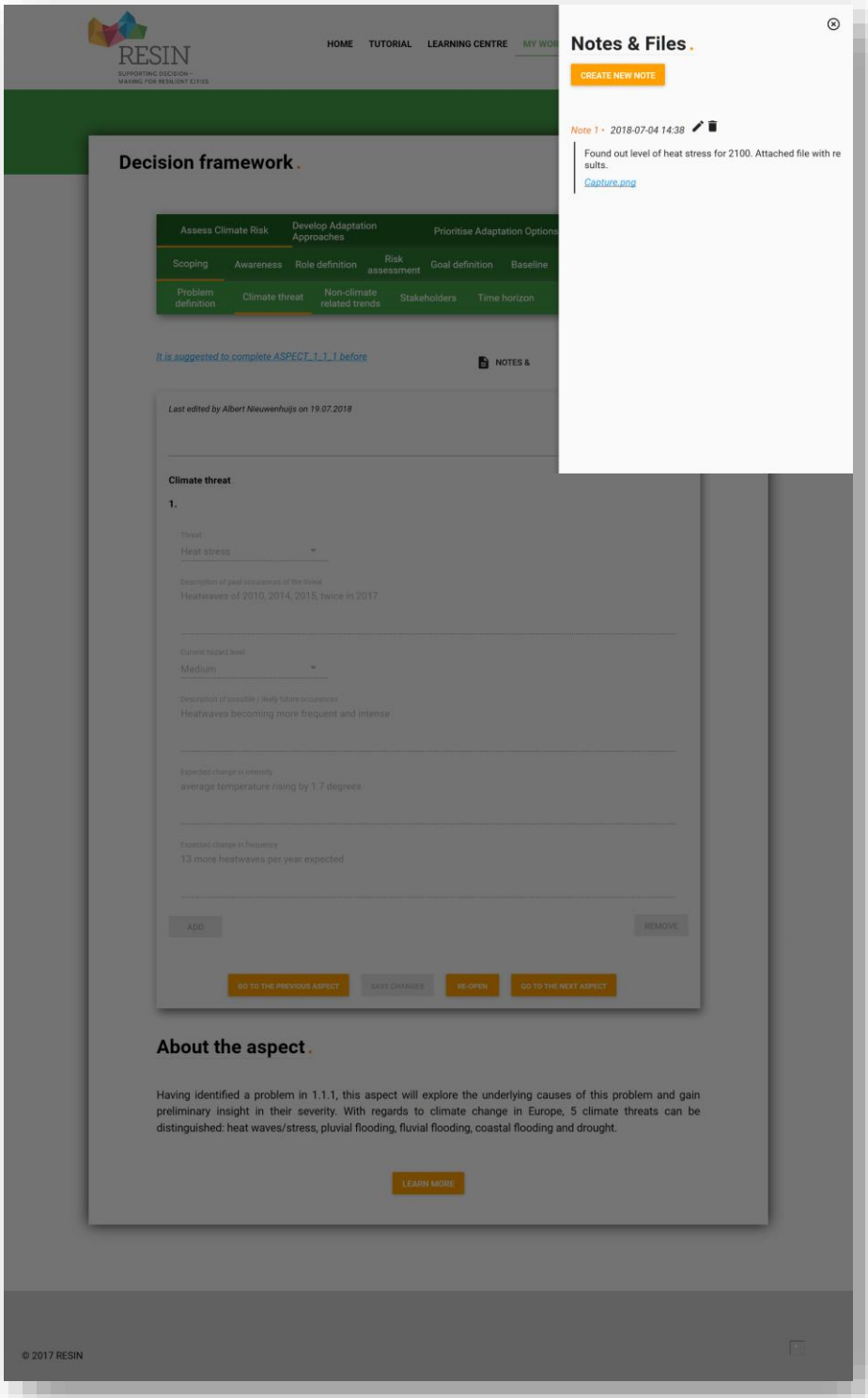


Figure 5-5: Form with formalised information on a step, showing attached information

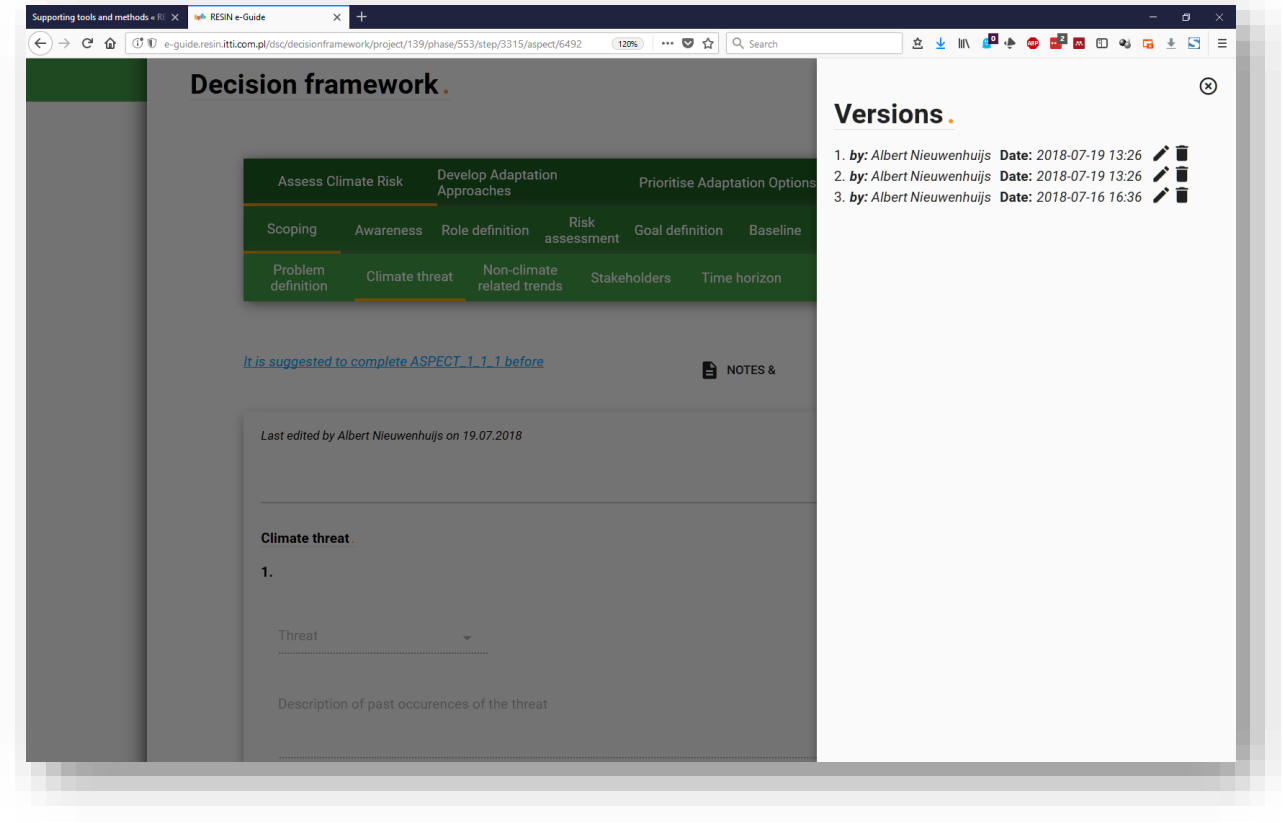


Figure 5-6: Tracking information on a step

5.1.3 Perceived added value

Feedback from the partner cities indicated that the support offered in 'My workspace' is extremely welcome. A particular problem solved by this functionality is loss of information caused by changes of personnel; as creating adaptation plans take a long time, typically several years, changes in personnel are very likely to happen. The facilitation of collaboration with other departments was explicitly mentioned as a welcome feature.

Small comments on the implementation were made (make the use of notes more intuitive, make it easier to find the last changes, make it easier to determine who added what note or file).

5.1.4 Conclusion

This functionality was found to be very useful. The current implementation could be improved and made more intuitive but was already perceived as an important supporting instrument.

5.2 Interactive guide

5.2.1 Intended added value

The interactive guide is designed to guide beginning users to the information that is most relevant for their situation. It allows new users to get relevant information from the e-Guide without studying the structure or workings of the platform. As such, it is meant to lower the threshold for new users to start using the e-Guide. It is not intended to cover the full range of possible user problems, but specific and frequent problems that especially new users may encounter.

5.2.2 Implementation

The functionality was implemented as an interactive list of questions, designed to focus on the specific problem of the user, and if this problem is known, present a list of instances where the e-Guide can be of most use in solving this problem. Figure 5-7 shows the implementation in the e-Guide.

The list of questions is interactive; the questions being asked depend on the answers given in previous questions.

As this functionality is aimed primarily at relatively new users, it would be logical to present it right on the opening page of the e-Guide. However, technical limitations allowed for this functionality to work only when logged in. This is why the functionality is presented on the ‘My workspace’ page instead of on the e-Guide home page.

Creating an intuitive decision tree for the list of questions and references to relevant information for each outcome, proved to be an arduous task. To prevent this task from absorbing too much time and effort, the test was limited to a list of no more than five questions and only one reference to relevant information: the Mayors Adapt reporting interface, which is described later in this chapter.

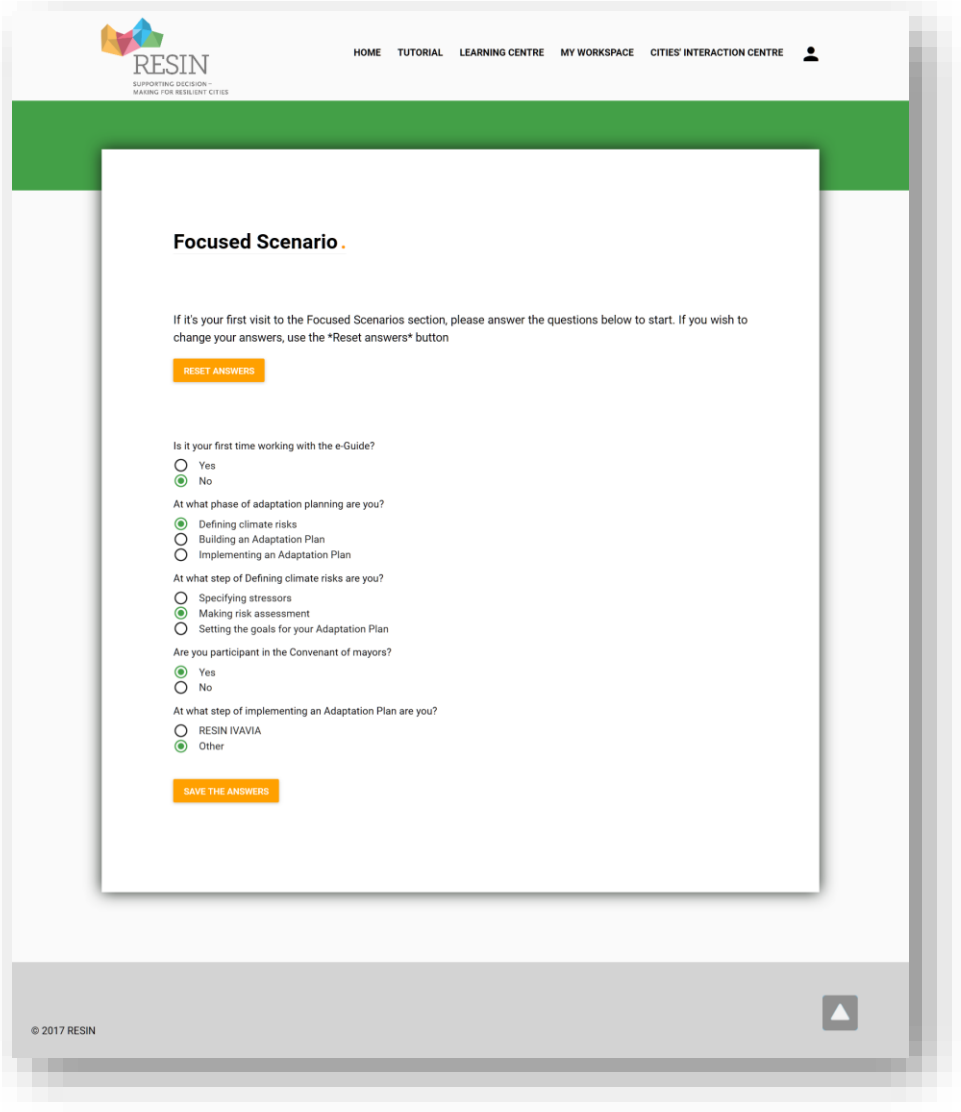


Figure 5-7: Interactive list of questions

5.2.3 Perceived added value

The interactive list of questions was used by the partner cities only after being pointed out to them. The added value was not intuitively apparent, possibly due to the limited number of informational articles behind the list.

5.2.4 Conclusion

Although the intention of this functionality addresses a real concern (how to avoid loss of potential users due to the initial time investment that needs to be made before the platforms shows a return), the added value of this functionality was not demonstrated without doubt.

5.3 One-stop shop for supporting tools

5.3.1 Intended added value

From the start, the intention of the e-Guide was to minimize the amount of duplication of support already available and make it a platform from which all other resources could be accessed in a consistent and easy manner. This would have the added value for users of a single point of entry, while retaining the full spectrum of options available. See also chapter 7:Guiding the user towards a fit-for-purpose climate adaptation plan.

5.3.2 Implementation

To assure the e-Guide is compatible with other resources, a number of decisions were taken in the design of the e-Guide to facilitate this:

- the Decision Framework was designed to be compatible with as many existing frameworks as possible;
- references to all tools were designed to be presented in the same way. For the user there is no functional distinction between tools and methods from different sources, be it RESIN or any other source;
- to allow working with tools and methods from various frameworks, individual instructions were added how to apply each of these tools to each step in a manner that would still allow for a consistent, sound and complete adaptation process;
- where possible, the guidance in the e-Guide was designed to be as much as possible in line with other platforms. This is elaborated further in the next section.

For an overview of tools that are referenced in the e-Guide, see deliverable D6.5 (NIeuwenhuijs, 2018). Figure 5-8 shows an example of how tools and methods from various sources are referred in a step page.

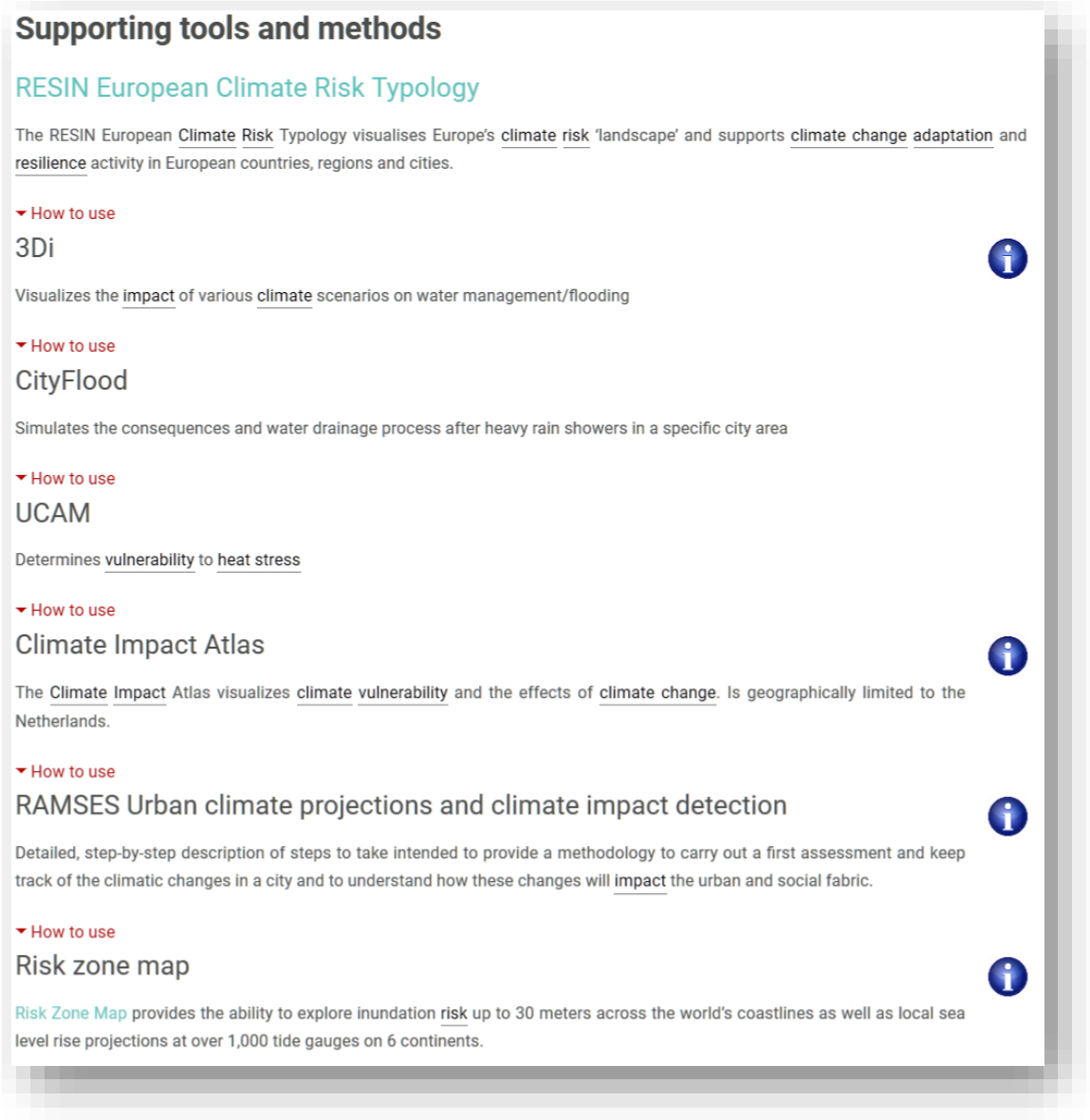


Figure 5-8: Example of a step page referring to a multitude of tools and methods from various sources.

5.3.3 Perceived added value

The partner cities explicitly voiced their appreciation for this approach. It facilitated their overview of what to do and how to do it.

5.3.4 Conclusion

Providing an intermediate role for the user to facilitate access to and use of various sources, is perceived to be an important added value of the e-Guide.

5.4 Specific instructions for small tasks

5.4.1 Intended added value

We identified that the users of the e-Guide would not just be interested in performing a complete climate adaptation process, but would often be interested in performing specific parts of the process. Examples of such small tasks would be filling the Mayors Adapt report with information contained in 'My workspace', or finding other cities facing the same or similar challenges.

5.4.2 Implementation

The user would be provided with specific forms for each small task, directing the users on a very specific path through the information and functionality available in the e-Guide. These forms would outline the steps to take for completing the specific small task and refer to relevant information in the e-Guide, or available tools and methods where possible.

Only one form for such a small task has been developed to date, the Covenant of Mayors reporting template form. This form is described in more detail in the next section.

5.4.3 Perceived added value

Although the added value of the Covenant of Mayors reporting tool form was recognised by the end users, getting other 'small tasks' identified by the end user community that were common enough to substantiate the need of creating dedicated forms for them was found difficult. This would indicate at least for the end users the idea of 'small tasks' do not come intuitively and possibly not many of such small tasks exist.

5.4.4 Conclusion

The added value of having dedicated forms for guiding the user in small tasks which are not necessarily following the sequence of the decision framework is not conclusively demonstrated, as only one such task has been identified and implemented in the course of the project.

5.5 Operationalising alignment with other platforms

5.5.1 Intended added value

In order to be a one-stop shop for urban climate adaptation, the platform needs to encompass the other resources available. One of the consequences is that the platform needs to line up, as well as possible, its approach to urban climate adaptation with all other approaches. This is done in part by choosing the Decision Framework in such a way that it matches available approaches. Another dimension of this kind of interoperability is that the quality requirements of other platforms should match the quality requirements of the e-Guide. Not every adaptation support tool is developed to the extent that a clear set of quality standards for each of the steps in the decision framework is defined.

For the prominent platform Climate Adapt, the associated UAST and Mayors Adapt, this has been operationalised in the form of the mayors Adapt reporting tool.

To ensure the interoperability with this platform, the quality standards of the e-Guide and Climate Adapt (and Mayors Adapt) should be aligned.

5.5.2 Implementation

In co-operation with EEA and the Covenant of Mayors, the required information for each step in the e-Guide was aligned with the defined needs for the Mayors Adapt reporting tool.

To ensure that all information in the e-Guide is in line with the reporting tools, the forms for each relevant step in the e-Guide were designed to encompass at least the information required in the Mayors Adapt reporting tool.

On top of that, a new functionality was built that will help the user to identify the information in the e-Guide needed to fill the Mayors Adapt reporting tool. This functionality basically presents the Mayors Adapt reporting tools questions and lists where the answers to those questions can be found in the user's workspace.

As indicated in 4.3, the e-Guide was set out to offer a decision framework that could be mapped on all other decision frameworks, but would not be necessarily aligned with them. Alignment with more than one of those frameworks would be impossible, as all frameworks differ – to a larger or lesser extent – from each other.

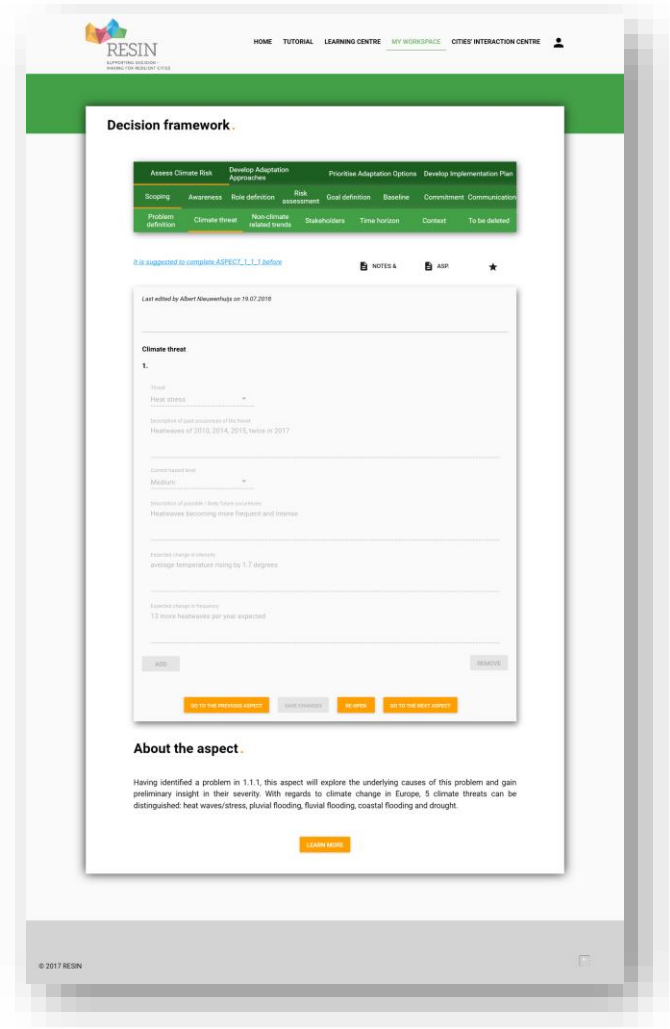
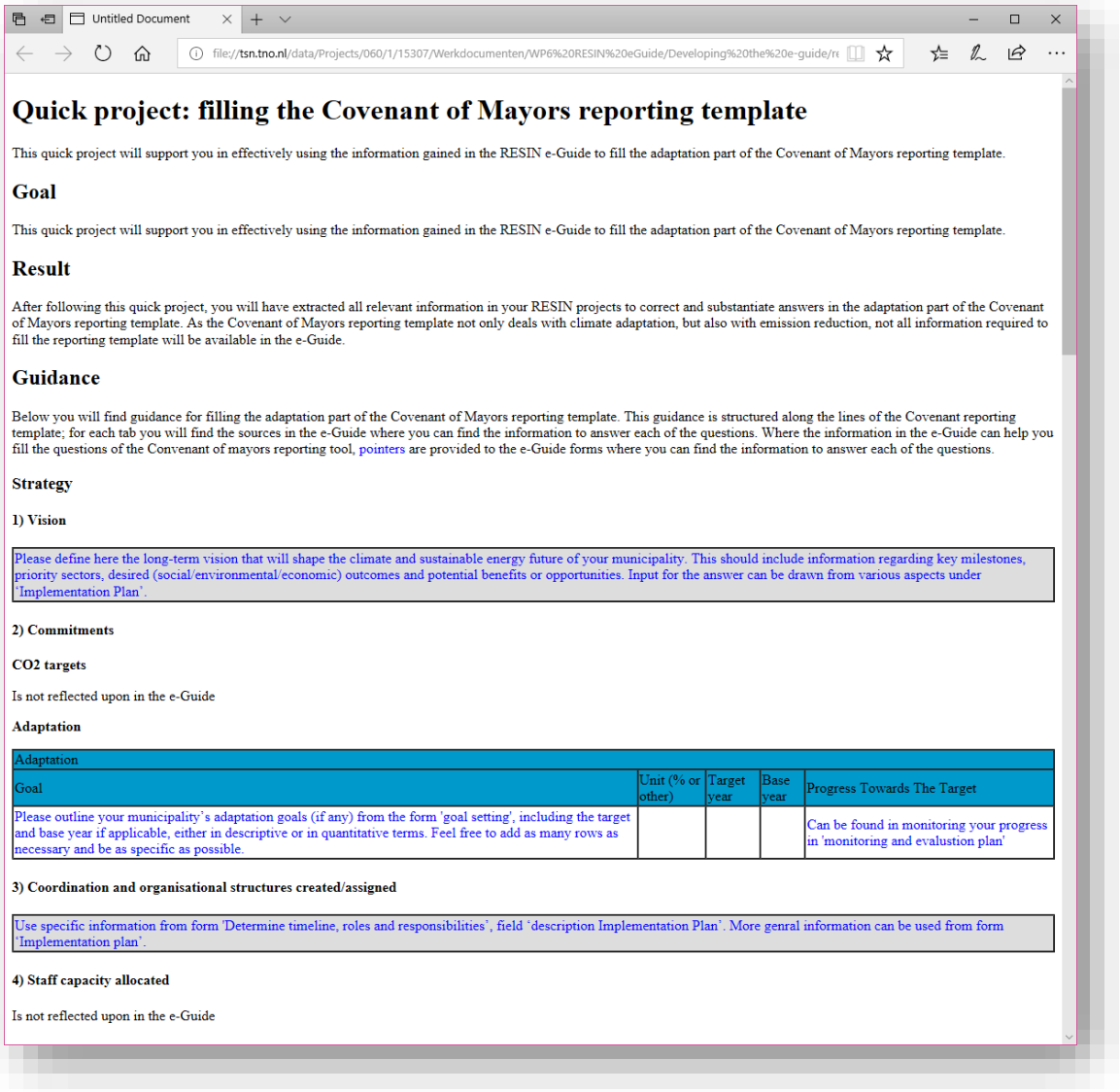


Figure 5-9: One of the e-Guide forms, brought in line with the Mayors Adapt reporting tool requirements



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Quick project: filling the Covenant of Mayors reporting template

This quick project will support you in effectively using the information gained in the RESIN e-Guide to fill the adaptation part of the Covenant of Mayors reporting template.

Goal

This quick project will support you in effectively using the information gained in the RESIN e-Guide to fill the adaptation part of the Covenant of Mayors reporting template.

Result

After following this quick project, you will have extracted all relevant information in your RESIN projects to correct and substantiate answers in the adaptation part of the Covenant of Mayors reporting template. As the Covenant of Mayors reporting template not only deals with climate adaptation, but also with emission reduction, not all information required to fill the reporting template will be available in the e-Guide.

Guidance

Below you will find guidance for filling the adaptation part of the Covenant of Mayors reporting template. This guidance is structured along the lines of the Covenant reporting template; for each tab you will find the sources in the e-Guide where you can find the information to answer each of the questions. Where the information in the e-Guide can help you fill the questions of the Convenant of mayors reporting tool, pointers are provided to the e-Guide forms where you can find the information to answer each of the questions.

Strategy

1) Vision

Please define here the long-term vision that will shape the climate and sustainable energy future of your municipality. This should include information regarding key milestones, priority sectors, desired (social/environmental/economic) outcomes and potential benefits or opportunities. Input for the answer can be drawn from various aspects under 'Implementation Plan'.

2) Commitments

CO2 targets

Is not reflected upon in the e-Guide

Adaptation

Adaptation				
Goal	Unit (% or other)	Target year	Base year	Progress Towards The Target
Please outline your municipality's adaptation goals (if any) from the form 'goal setting', including the target and base year if applicable, either in descriptive or in quantitative terms. Feel free to add as many rows as necessary and be as specific as possible.				Can be found in monitoring your progress in 'monitoring and evalustion plan'

3) Coordination and organisational structures created/assigned

Use specific information from form 'Determine timeline, roles and responsibilities', field 'description Implementation Plan'. More genral information can be used from form 'Implementation plan'.

4) Staff capacity allocated

Is not reflected upon in the e-Guide

Figure 5-10: Mayors Adapt reporting form in the e-Guide

5.5.3 Perceived added value

A large percentage of the partner cities is member of the Covenant of Mayors. The fact that the e-Guide recognises that need for alignment with the Climate Adapt UAST and Mayors Adapt. The support offered to fill the obligatory mayors-Adapt report was highly appreciated by the partner cities. The need for alignment with other platforms has not been mentioned.

5.5.4 Conclusion

Alignment with at least prominent alternative platforms increases the appreciation of users for the e-Guide and is a useful feature to include. Whether alignment with other platforms is considered equally useful is doubtful, as these were not mentioned when solicited from the end users.

5.6 Allow for flexible use of decision framework

5.6.1 Intended added value

One of the comments from the users to the use of platforms was that these platforms did not allow for the dynamics of governmental environments. In these environments, the reality is that one only has limited control of what actions take place when. This means that a strict project-style order of steps to follow are impossible to keep. The e-Guide therefore, should be designed to allow for flexible use, while assuring a basic level of quality of the complete adaptation process. See also chapter 7:Guiding the user towards a fit-for-purpose climate adaptation plan.

5.6.2 Implementation

In the design of the e-Guide, the description of each step was designed to clarify to the user what information and knowledge is required to finish the step successfully. Each step mentioned the requirements for performing that step and the reasons for those requirements, informing the user of the consequences of performing that step without meeting the requirements, but not limiting the user from trying. Figure 5-11 shows an example of how such a precondition is integrated in the step.

An option was added that the users can voluntary limit projects to performing only steps for which all requirements are met.

Figure 5-11: Example of step page with requirements for completing the step successfully

5.6.3 Perceived added value

As they indicated the impossibility to conform to rigid step-by-step processes which should be followed, the flexibility (and particularly the recognition of the need for it) in the decision framework was highly appreciated by the partners cities.

5.6.4 Conclusion

A decision framework for use in urban decision processes should explicitly allow for flexibility in the order of execution of steps.

5.7 Frequently encountered challenges

5.7.1 Intended added value

While developing the decision framework, certain topics kept coming up in many steps of the process. When put to the end user, these topics were shown to be serious problems for nearly all cities involved with climate adaptation and practical support how to deal with them was direly needed. In the Paris project management workshop, these topics were formally identified to encompass:

- Involving stakeholders, establishing a clear role definition, getting commitment and communication
- Monitoring, evaluation and reshaping implementation planning
- Developing business cases for climate adaptation plans
- Integrating climate adaptation and urban planning, sectoral and mainstreaming
- Dealing with uncertainty and complexity in climate adaptation policy

5.7.2 Implementation

A separate section of the e-Guide has been dedicated to these problems (see Figure 5-12). Here, the frequently encountered challenges are introduced and each of these challenges have their own page with practical guidance (see Figure 5-13).

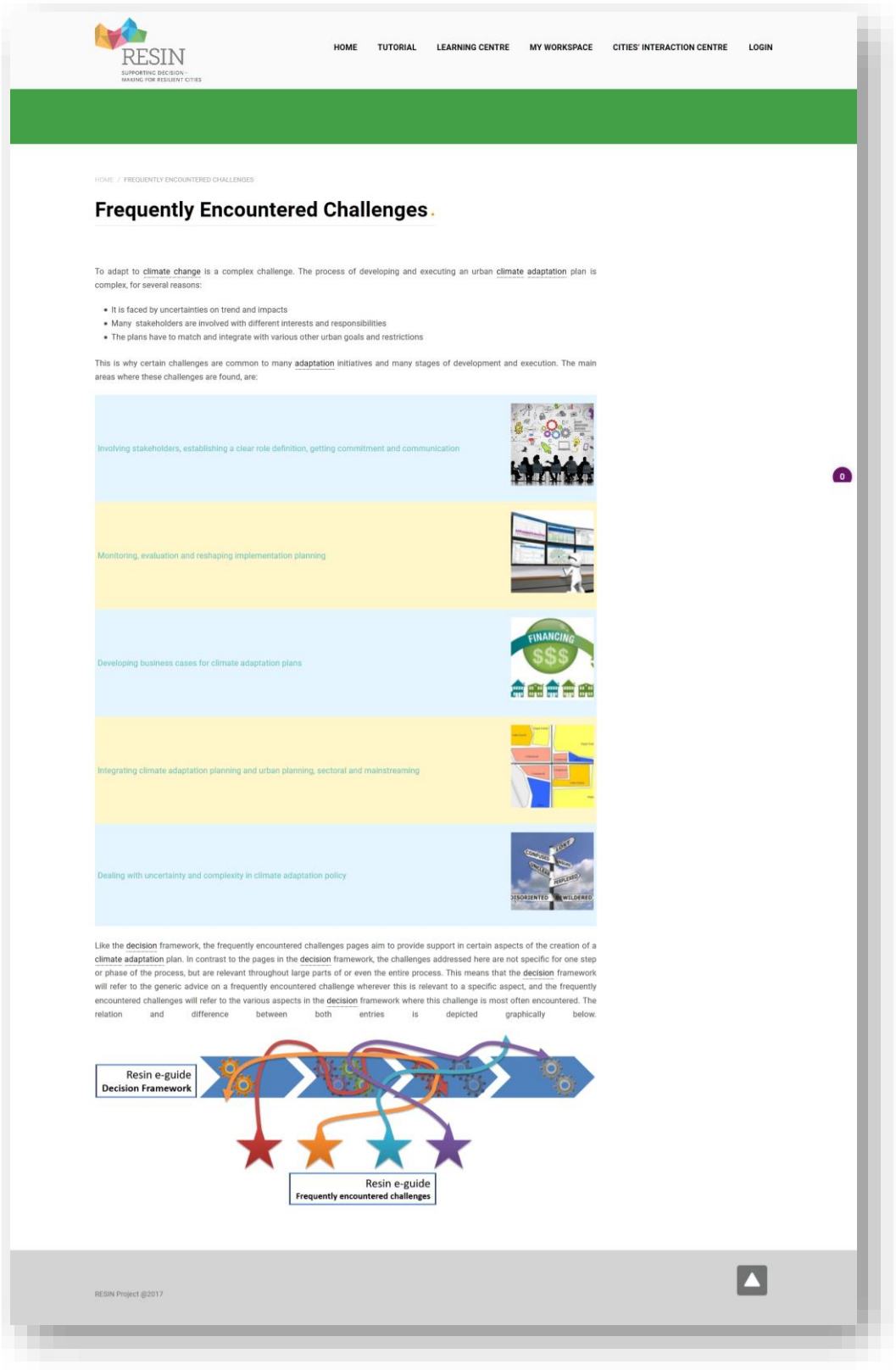


Figure 5-12: Overview page of frequently encountered challenges

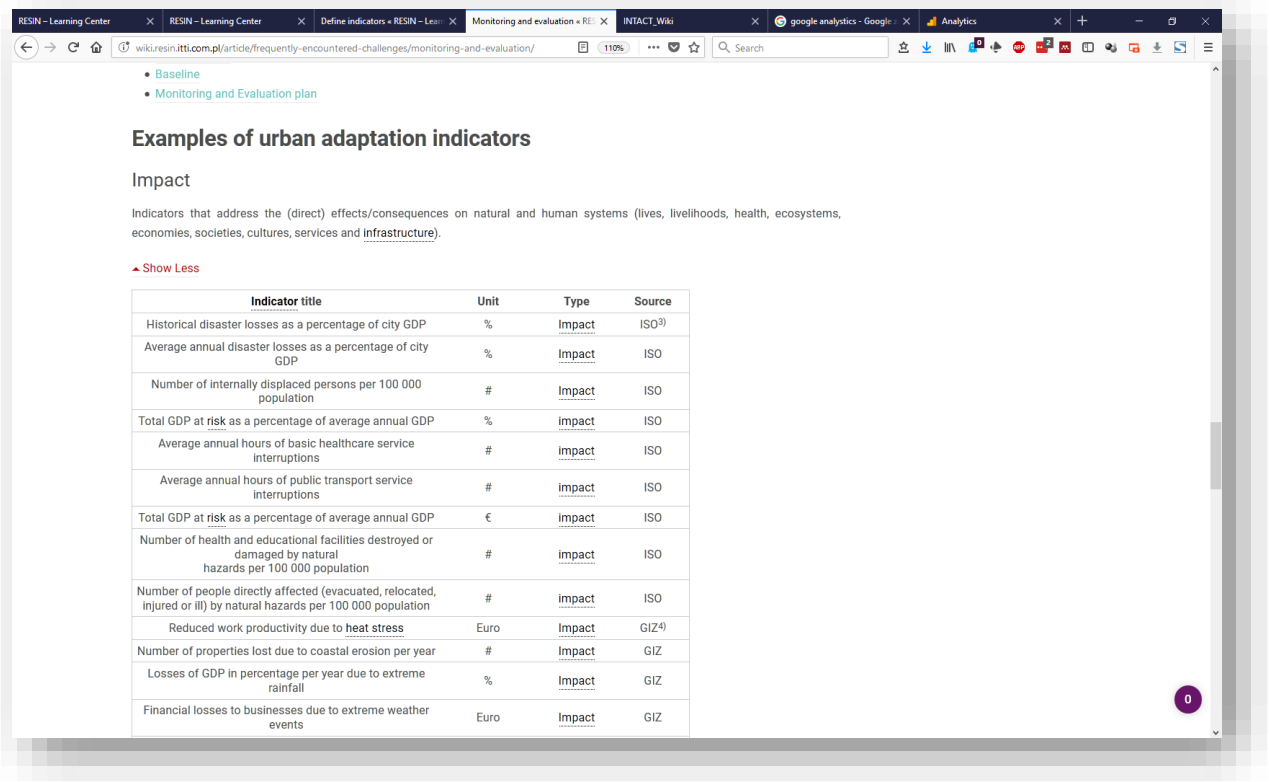


Figure 5-13: Example of practical information on FEC page about monitoring and evaluation

5.7.3 Perceived added value

These FEC pages were perceived as very useful by the partner cities. There was a common agreement of their need, and the information provided was found to be to the point and useful. Still, applying the supportive text in practice remains a challenge. The term ‘frequently encountered challenges’ was challenged several times, but an alternative which covers the content, is univocal and undisputed has to date not been found.

5.7.4 Conclusion

Providing practical information on challenges common to various phases of the climate adaptation process was found to be very useful and well received. Providing it in a manner that it can easily be put into practice by the cities remains a challenge.

5.8 Only lower-level user applicable referrals

5.8.1 Intended added value

While studying various platforms supporting the climate adaptation process and following their references to 'tools', it became obvious that not all references were pointing to information that was more to the point than the information on the website. In fact, guides – providing general guidelines how to address a problem – often referred to other guides with the same or similar level of detail[2], such as a descriptive text on the steps to take or providing an overview of methods. Sometimes these referrals were even found to be circular, the referred guide in its turn pointing back to the referring guide.

This lead to a confusing landscape for the user searching for support in his or her climate adaptation process.

5.8.2 Implementation

To avoid falling in the same trap, a strict policy was put into place for the e-Guide to only present either methods or tools as instruments to achieve a specific goal, both strictly defined as:

Method	Systematic procedure to achieve a particular result
Tool	Method supported by functional (often software based) aids

Both definitions are sharply distinguished from guides by the use of a systematic procedure:

Guide	Advisory texts showing the most favourable pathways towards a goal

Where external guides provide useful information that complements the information already in the e-Guide, this information would be either included in the guiding texts of the e-Guide (of course mentioning the source), or a reference would be made in the text to the external guide indicating the specific added value.

In this way the distinction between browsing on a high level and choosing a concrete way of addressing a problem is made clear for the user.

5.8.3 Perceived added value

When this feature of the e-Guide was presented to a representative of the EEA, it was one of the features that was immediately considered for adaptation in the UAST and Climate Adapt website.

[2] For example, the references in the guidance and tools section of the 'assessing adaptation options' section of the UAST, pointing to four guides (although the MEDIATION toolbox can arguably be considered to be a method, supported by tools).

5.8.4 Conclusion

Although a very basic sanitary feature, making a clear distinction between guides, methods and tools is a new and useful feature of the e-Guide.

5.9 Rating of tools and methods

5.9.1 Intended added value

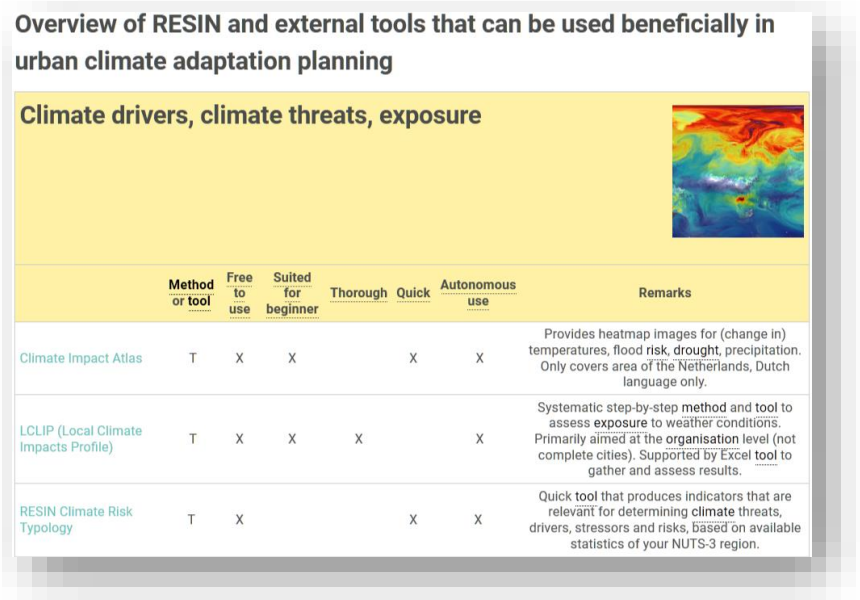
For the user to select a method or tool best suited to his or her environment, capacities and needs, a clear listing of available tools catering to this need would be useful. See also chapter 7: Guiding the user towards a fit-for-purpose climate adaptation plan.

5.9.2 Implementation

The overview of tools and methods is presented in a manner where each of the tools or methods is classified by six distinct qualities. These qualities represent some of the most elementary practical distinctions for choosing one method or tool over another. These are:

- Is it a method or a tool?
- Is it free to use?
- Is it a method or tool that is suited to an inexperienced user (beginner)?
- Is the method or tool particularly detailed or all encompassing?
- Does the tool or method require particularly little effort or time?
- Can the tool or method be used by the user without external support?

Figure 5-14 shows part of the overview of tools page with the classification categories.



Overview of RESIN and external tools that can be used beneficially in urban climate adaptation planning

Climate drivers, climate threats, exposure

	Method or tool	Free to use	Suited for beginner	Thorough	Quick	Autonomous use	Remarks
Climate Impact Atlas	T	X	X		X	X	Provides heatmap images for (change in) temperatures, flood risk, drought, precipitation. Only covers area of the Netherlands, Dutch language only.
LCLIP (Local Climate Impacts Profile)	T	X	X	X		X	Systematic step-by-step method and tool to assess exposure to weather conditions. Primarily aimed at the organisation level (not complete cities). Supported by Excel tool to gather and assess results.
RESIN Climate Risk Typology	T	X			X	X	Quick tool that produces indicators that are relevant for determining climate threats, drivers, stressors and risks, based on available statistics of your NUTS-3 region.

Figure 5-14: Classification of some of the tools and methods

The overview is currently presented as a regular table. If possible (technically, in time and capacity) we will endeavour to make the overview sortable and filterable, so only options that match certain criteria are shown.

Information that doesn't match the six listed classifications, but is still very relevant to the choice of the user, is distilled from the detailed information of the tools (on the tool pages underlying the overview) and presented in a free-text field 'remarks'.

5.9.3 Perceived added value

Both the six categories and the 'remarks field were perceived by the users to be very helpful.

This feature of the e-Guide was another of the features that was immediately considered for adaptation in the UAST and on the Climate Adapt website by a representative of the EEA.

5.9.4 Conclusion

A clear categorisation of tools and methods on the six mentioned dimensions is perceived to be of high value by the users.

5.10 Concrete instructions per tool per step

5.10.1 Intended added value

As the e-Guide supports a wide variety of tools, some of which are designed to fit within the decision framework and some of which are not, the user should apply each of these tools in the right way to obtain valid results of sufficient quality.

To achieve this, the way and conditions for the correct application of each tool for each specific step should be explicitly conveyed to the user. See also chapter 7:Guiding the user towards a fit-for-purpose climate adaptation plan.

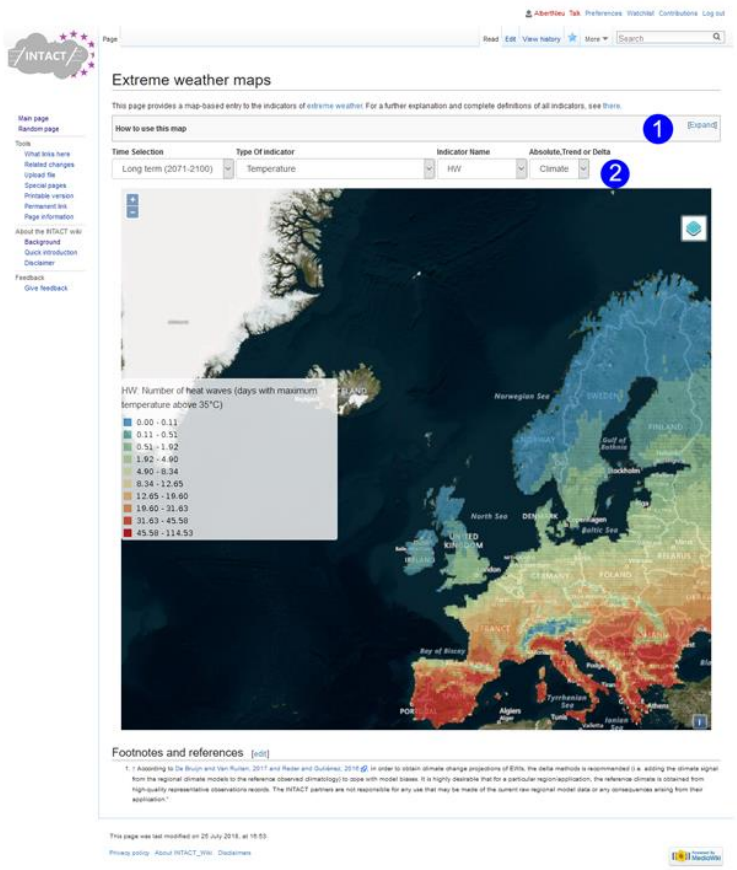
5.10.2 Implementation

In each step of the decision framework, the e-Guide presents a list of tools which will support (part of) that step. Each of these tools descriptions will have an expandable section with specific instructions for that particular tool and that step. Figure 5-15 shows an example of a step page with detailed instructions how to use a tool to get the required input for that step.

INTACT Extreme weather maps

The INTACT 'Extreme weather maps' page represents an on-line visual map of the expected change in 47 weather indicators for temperature precipitation, wind and combinations thereof for the short (-2040), mid- (-2070) and long-term (-2100) period. The data encompassess a roughly 30x30km grid over all Europe.

▲ Hide instructions



- Visit the INTACT extreme weather maps page
- Read the instructions that are collapsed at the top of the page (1) and follow them
- First select the time period you're interested in, then select whether you would like to see temperature, precipitation or other types of indicators
- Then select the most relevant indicators for your climate threats. To see the meaning of the abbreviation, select one and see the legend for a definition or visit this page for an overview of all indicators and their meaning.
- Zoom in and out and pan to the region you're interested in and click any cell to see the value of the indicator
- Choose 'delta' (2) for most reliable results. To know the expected value of the selected indicator in the future, add the displayed value to the current value. The 'climate' value in this tool is based on an estimate for the current value and less precise than adding the delta value to the local value you can get from your meteo institute.
- Draw your conclusions on expected change in likelihood and intensity of extreme weather
- Use the Windows 'snipping tool' or any other screen capture program to record the results in a way you can add them to your workspace
- Record your gathered information and conclusions in your workspace

Figure 5-15: Example of an instruction specific for the application of one specific tool to one specific step.

5.10.3 Perceived added value

The users adopted and used this this functionality without realising the uniqueness of; it was used as a logical and intuitive element of the information provided.

5.10.4 Conclusion

In a context that aims to integrate dissimilar and often (partly) incompatible tools, specific instructions on how, when and in which combination each tool has to be applied to support each step is deemed essential for a consistent and qualitative support of the adaptation process.

5.11 Consistent use of glossary and in-line definitions

5.11.1 Intended added value

As the texts in the e-Guide necessarily use a high number of terms that do not appear every day in the vocabulary of the average user, and this user might not be an English native speaker, a clear and consistent use of terms is required. See also chapter 7: Guiding the user towards a fit-for-purpose climate adaptation plan.

5.11.2 Implementation

The e-Guide incorporates a glossary with detailed definitions and explanations of terms. The glossary is interactive; each time a word or combination of words that is included in the glossary is used in the e-Guide, a tooltip is offered which, when the mouse hovers over it, shows the definition and/or explanation of the term. Figure 5-16 shows an example of a step page with the mouse hovering over a word included in the glossary.

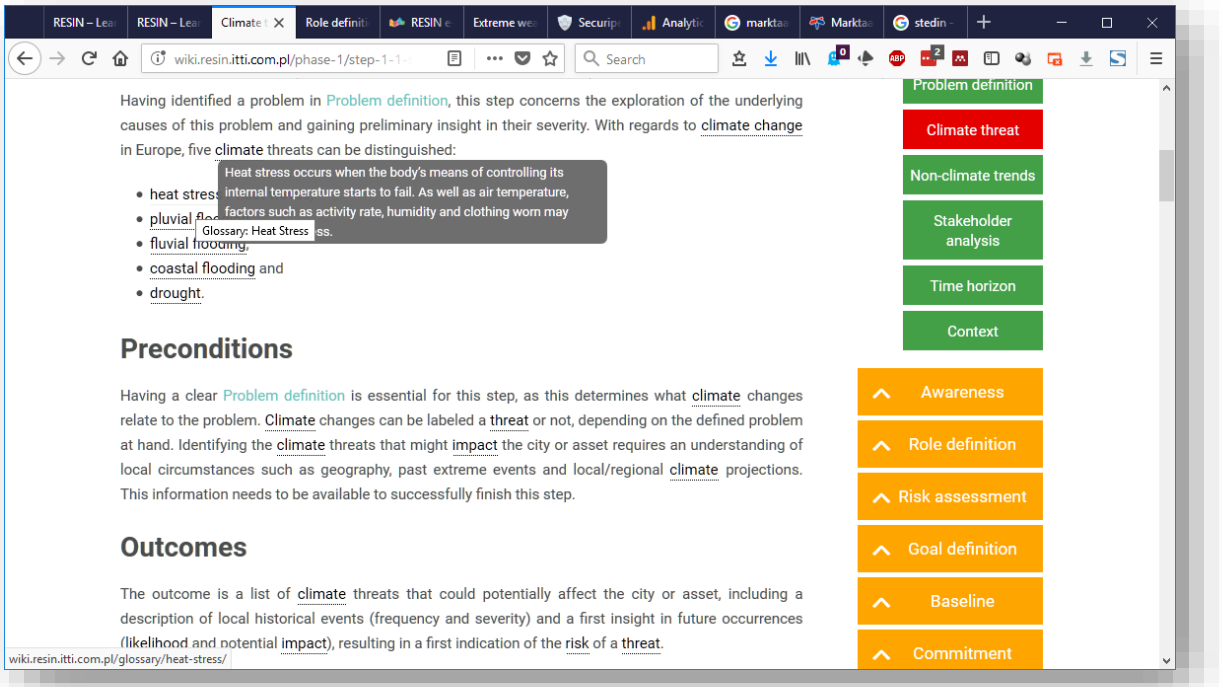


Figure 5-16: Example of in-line glossary definition

5.11.3 Perceived added value

The glossary and its use in the text of the e-Guide are essential for the users, as can be concluded from the fact that since the introduction, the number of clarifying questions have strongly reduced, and the users have actively requested to add a number of definitions missing from the glossary.

5.11.4 Conclusions

A consistent use of terms is invaluable for all support platforms. A direct and interactive way to present these terms where they may be needed is found to be an attractive and useful way to implement it.

5.12 Background information

5.12.1 Intended added value

Climate adaptation in an urban environment covers a fairly wide range of topics. A basic level of knowledge is assumed in the supporting text in the e-Guide to avoid unnecessary verbose and repeating explanations.

However, not every user is expected to have a sufficient level of knowledge in all these topics. Therefore, a glossary entry to explain those topics in sufficient detail to gain sufficient level of

knowledge to understand the supportive texts in the e-Guide is required. See also chapter 7:Guiding the user towards a fit-for-purpose climate adaptation plan.

5.12.2 Implementation

The e-Guide encompasses a special page with sub-pages on ‘background information’. This page explains the goals of the information and presents text with basic information on four specific topics that lie at the foundation of urban climate adaptation:

- Climate change
- Climate adaptation
- Risk management
- Climate resilience

Each of these topics is explained on an underlying, dedicated page about the topic.

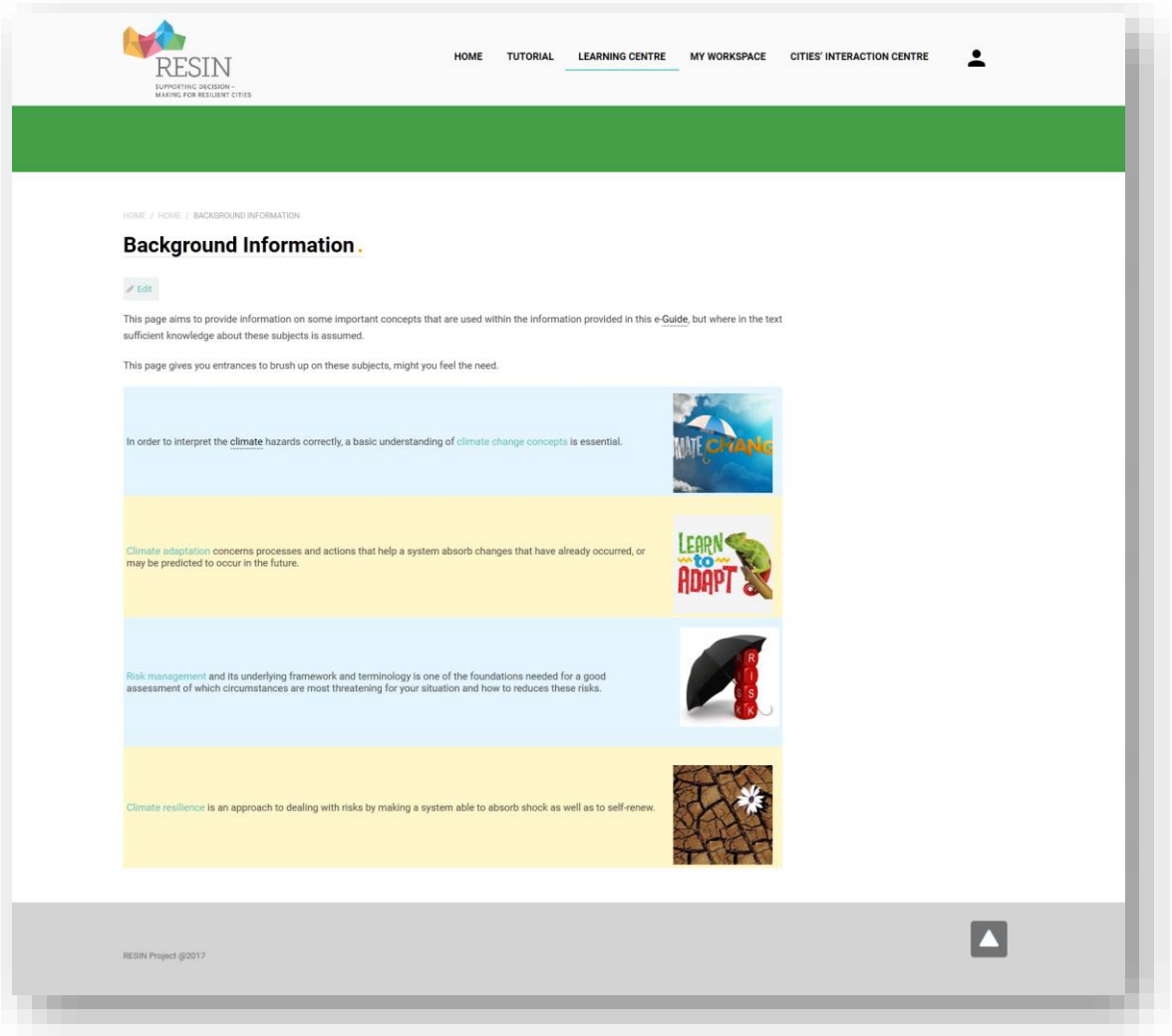


Figure 5-17: Background information page

5.12.3 Perceived added value

No specific feedback was received about this. When asked as to the use of this section, users indicated not to have browsed it due to an assumed sufficient level of knowledge in all background topics.

5.12.4 Conclusion

Providing entries to touch up basic background knowledge required for a good understanding of the topics discussed in the support tool seems common sense. It is hard to get an idea of the need for and the amount of use of such a function, as users will not easily admit needing additional education about basic knowledge.

5.13 Development in co-creation

5.13.1 Intended added value

The decision to develop the e-Guide in a co-creation process, where developers and users both determine the form and function of the product, was taken in light of the realisation that a significant number of support platform were already developed and operational and were struggling to attract or keep users. This is why a platform was needed that filled the needs and matched the ideas of the users. The only way to do this was to involve the users in the development process.

The idea was to involve the user both in the development of the function and looks of the platform, and in determining and filling the content. This was presumed to result in a platform by and for the user, and therefore a high chance of user acceptance.

5.13.2 Implementation

The co-creation process involved the partner cities, but also the other partners of the consortium. Already in an early stage (first project meeting in Freiburg), the expected contributions to and from each partner were agreed upon. These contributions encompassed:

- Guiding texts
- Experiences
- Available, practical tools
- Feedback on new functionalities in questionnaires
- Use cases and sessions for testing (parts of) the e-Guide
- Periodic review of new functionalities in the e-Guide. These were later introduced in the project management workshops.

5.13.3 Perceived added value

Feedback from the partner cities indicated that the interaction in development of the platform (and tools) was very positively received. If anything, more interaction would have been welcome. The added value in terms of outcome of this co-creation process is high in terms of acceptance with the

involved parties, the acceptance of the e-Guide of first-time potential users after the co-creation process (where many user suggestions were processed in the development) as compared to the start of the co-creation process was significantly higher.

5.13.4 Conclusion

Development in a co-creation process does lead to higher acceptance of the end result, but has its drawbacks too, particularly in speed of development, time investment and the need for travel. More on these pros and cons can be found in deliverable 4.2 (Chapman & Peleikis, 2018).

6 Integration of RESIN tools in the e-Guide

6.1 Integration of RESIN tools in the e-Guide

Within the e-Guide, tools and method from various sources are used to support the execution of the various steps within the decision framework. Some of these tools are developed outside of the RESIN project, some are developed within. How the tools outside the RESIN project are referenced within the decision framework is dealt with in deliverable D6.5 (NIeuwenhuijs, 2018). How the RESIN tools are integrated in the decision framework, is the subject of this chapter.

Within the RESIN project three lines of tool development were conducted: The Climate Risk Typology, the guideline for the Impact and Vulnerability Analysis of Vital Infrastructures and built-up Areas (IVAVIA), and the Adaptation Options Library. Each of these lines have resulted in a set of tools and methods. Table 3 shows the tools that were developed and where and how these tools contribute to the completion of the steps in the decision framework and to each other. As the tools are to some extent still being developed, the overview is an indication of the interaction between the e-Guide and these other RESIN tools and is subject to change.

6.1.1 Overview

The RESIN tools are designed to work together and form a consistent part of the adaptation support framework provided in the e-Guide. To this end, various links between the various RESIN tools are put in place. These will be addressed in detail in the next sections of this chapter, but an overview of the various interactions between the tools is provided graphically in Figure 6-1.

In this figure, we see the phases of the decision framework at the bottom. Above it, in three different swimming lanes, the tools and methods developed within the RESIN project are presented. The swimming lanes group respectively the developed tools on adaptation options, risk typology and the IVAVIA vulnerability analysis.

The figure indicates where the tools and methods support the various phases of the framework and what they contribute. The figure also indicates where the methods and tools interact between themselves and what they contribute to each other’s functionality.

Finally, the figure indicates what links are established, what links are automated or done manually and what links are not yet worked out, but possible.

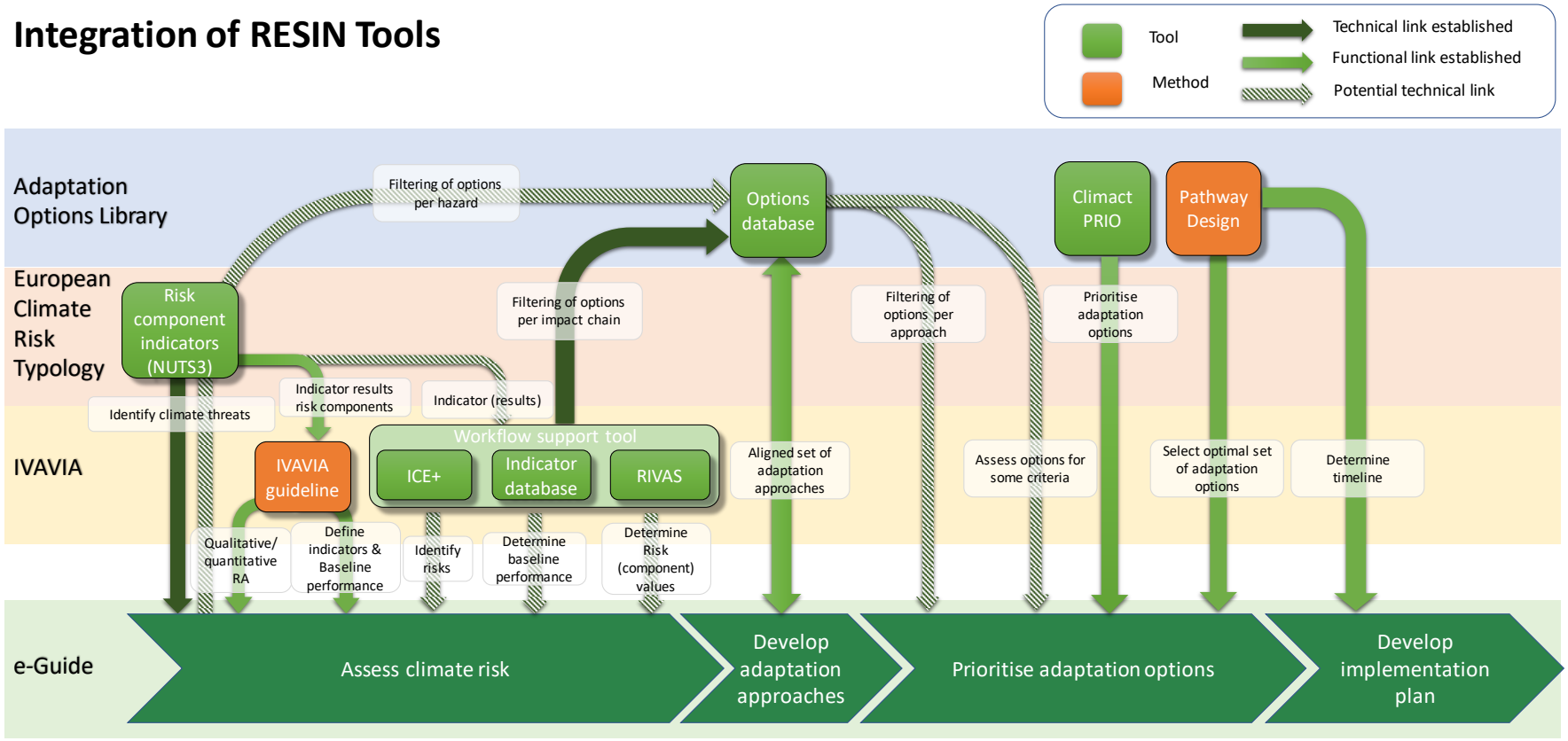


Figure 6-1: Interaction between the RESIN tools.

6.1.2 European Climate Risk Typology and e-Guide

The European Climate Risk Typology (or: 'Typology') will mainly provide input for the completion of the e-Guide step 'Climate threat' within the phase 'Assess climate risk'. The Typology will be intricately linked to the 'My workspace' section of the e-Guide. A form which gathers the typology data for use in the step 'Climate threat' has been developed. By indicating the NUTS3 region the user is interested in within the e-Guide environment, and the type of climate threat, the scores for all indicators in the Climate Risk Typology database that are relevant to that threat for that region are automatically imported and shown. The tool manual for this specific e-Guide step will assist the user in how to provide the input (the NUTS 3 region) and how to interpret the output (the values of the indicators) to achieve the result defined for that step.

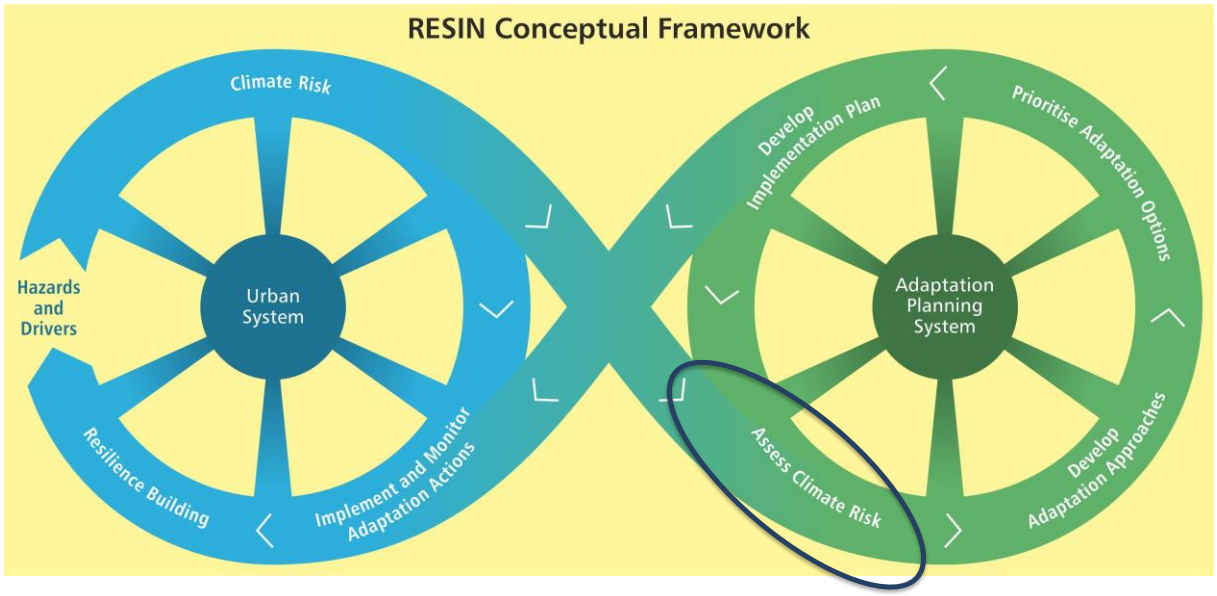


Figure 6-2: Links to the Typology tool within the decision framework

The indicator data provided in the typology tool is integrated in the e-Guide 'My workspace' section and can be accessed from there. The form on climate risk allows you to select your NUTS3 region and will present only the relevant data from the typology database for the selected climate threat and draw your conclusions from this data (see Figure 6-3).

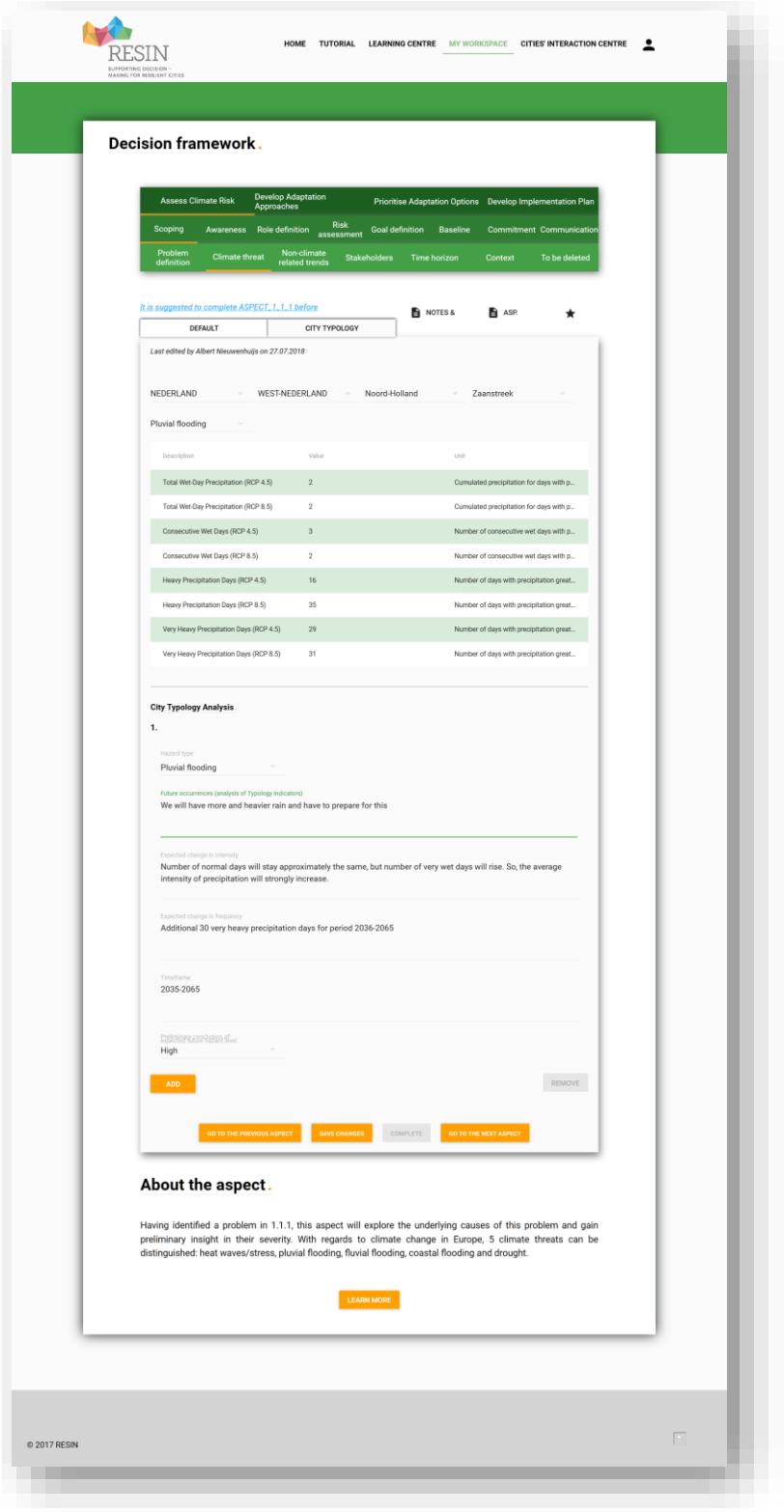


Figure 6-3: Integration of the climate typology indicators in a form

6.1.3 IVAVIA Guideline and e-Guide

The IVAVIA Guideline supports the user in completing several of the steps under the e-Guide phases ‘Risk Assessment’ and ‘Baseline. Apart from the functional and technical links between the e-Guide and the IVAVIA, where relevant and helpful, the e-Guide pages on risk assessment have been aligned to IVAVIA guidance texts to ensure compatibility between the guidance in the e-Guide and the detailed method description in the IVAVIA guide.

6.1.3.1 Risk assessment: Risk identification

For the e-Guide step ‘Risk Identification’, the IVAVIA support is threefold;

1. To prepare the risk assessment, the user will be linked to the webpage which explains module 1 of IVAVIA which in itself is a manual for the preparatory phase. The work plan for the risk assessment can be uploaded manually in the ‘My workspace’ form for this step.
2. One way to identify relevant risks is to develop Impact Chains for which IVAVIA Module 2 provides guidance. The resulting Impact Chain Diagrams can be regarded as a qualitative vulnerability assessment and as such provide a basis for the quantitative risk assessment. The documented Impact Chain Diagrams can be uploaded manually to the ‘My workspace’ and amended with a description and relevance for further (quantitative) assessment.
3. To draft Impact Chain Diagrams, the user can use the Impact Chain Editor (ICE). The resulting diagrams can be exported and subsequently imported in the ‘My workspace’-form for this step.

6.1.3.2 Risk assessment - Risk Analysis

- The IVAVIA Guideline provides a manual to perform a quantitative analysis. A link on this e-Guide step page will direct the user to the webpages of IVAVIA that describe the Modules (3 to 6) that will guide the user through the necessary steps. The intermediate and final results of this step can be included manually in the related ‘My workspace’-form of the e-Guide.
- The IVAVIA Workflow Support Tool has been developed to facilitate and simplify the performance of a quantitative risk assessment. The e-Guide step page provides a link to this tool as well as a short manual on how to use the tool to achieve the output defined by the e-Guide step ‘Risk analysis’. The results can be downloaded as a JSON-file and as such be uploaded manually to the ‘My workspace’ form of this e-Guide step.

6.1.3.3 Baseline - Define Indicators & Baseline Performance

Some of the risk/vulnerability indicators defined in IVAVIA module 3.1 might also be the indicators that the user wants to use to monitor progress towards climate resilience. These indicators and resulting scores can be manually included in the ‘My workspace’ form of both steps of the e-Guide

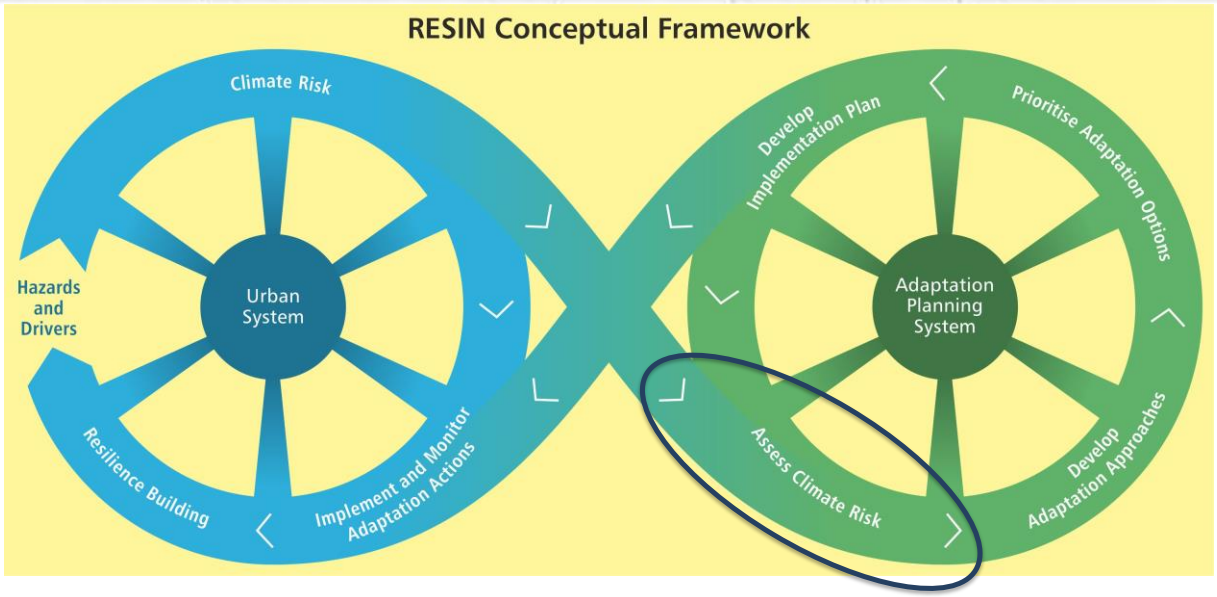


Figure 6-4: Links to IVAVIA within the Decision Framework

6.1.4 Adaptation Options Library/Climact Prio/Adaptation Pathway Approach and the e-Guide

The Adaptation Options Library provides direct input for two steps of the phase 'Prioritise Adaptation Options': 'Generate options for adaptation approaches' and 'Assess adaptation options'.

- A relevant selection of the adaptation approaches identified in the e-Guide phase 'Develop adaptation approaches' can be selected manually in the Library to filter only options that apply to that specific approach (or multiple approaches). The user will be guided from the e-Guide to the Library with a link on the respective step-page. A tool manual will guide the user through the Library to achieve the required outcome. The resulting list of options can be exported and imported in the 'My workspace'-form of this step.
- The Adaptation Options Library might also provide information that can be used to assess adaptation options. What information is needed for this assessment depends on the criteria that have been defined in the step 'Identify methods and criteria'. The tool manual attached to the step 'Assess adaptation options' will show a list of characteristics of options available in the Library that might be useful to evaluate certain criteria[3], and if so, how to extract this information from the Library and import them in the 'My workspace'-form of the e-Guide.
- Also, the other way around, the climate threats that have been identified in the e-Guide, possibly by using the Climate Risk Typology, can be used to (manually) filter options in the Adaptation Options Database and show only the options that are related to these threats.

The Climact Prio tool is a tool developed by the Erasmus University Rotterdam but adapted to be in line with the e-Guide that can support the user in prioritising adaptation options. A link to this tool is provided in the step 'Select methodology and criteria' as well as a manual on how to use the tool. Intermediate results, such as the chosen criteria and weight values of these criteria, can be imported manually in the 'My workspace' form of this step.

[3] The description of the aspect 'Identify methods and criteria' suggests a list of possible criteria. For these criteria, the tool manual will show whether the Library can provide this information.

The Adaptation Pathway Approach is a method/guide that can aid the user in selecting a set of options. A pathway is a combination of adaptation options sequenced in time. Therefore, it can provide support in two steps of the e-Guide: 'Select optimal set of options' and 'Determine timeline, roles and responsibilities'. In both steps, a manual is provided on how to use the Approach. The outcome of the Approach can be imported manually in the related 'My workspace' forms.

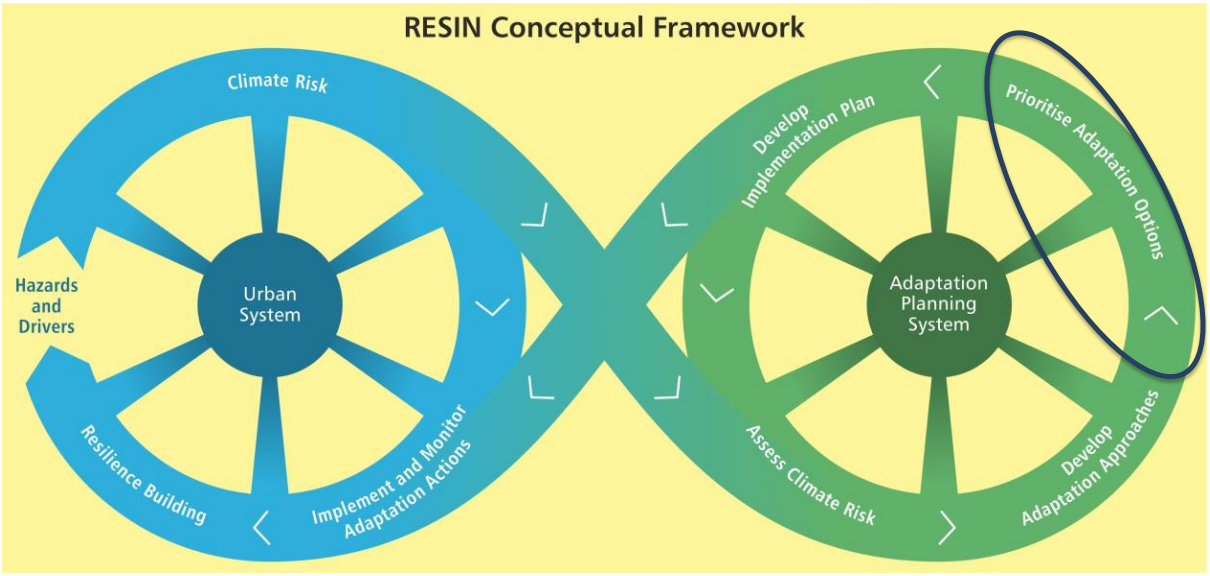


Figure 6-5: Links to the adaptation options database within the decision framework

6.2 Interaction between RESIN tools

As can be seen in Figure 6-1, in two cases these RESIN tools also directly interact with each other.

6.2.1 Climate Risk Typology and IVAVIA

The indicator results of the Climate Risk Typology can also be used when performing a vulnerability assessment, since various risk components (hazard, drivers/stressors, exposure, sensitivity, adaptive capacity) have to be identified and qualitatively or quantitatively assessed. Even if the area of interest is not a specific NUTS3 region, the indicator results of the Typology can provide insight in the risks and risk components for that area. In addition, values of the indicators that assessed in the Typology can provide input when gathering data for the IVAVIA indicators in module 3.3 of the IVAVIA method. Finally, if the area of interest matches the boundaries of a NUTS3 region, the RESIN workflow Support Tool might directly incorporate the indicator results from the Typology to calculate the risk value.

6.2.2 IVAVIA and Adaptation Options Library

Another example of interaction between RESIN tools is the identification of Impact Chains by IVAVIA which can be used to filter adaptation options in the Library. A direct link between ICE+ and the Library has been established to show only options that apply to the Impact Chain created in ICE+.

6.3 Overview of use of RESIN tools in the decision framework

Table 3 Overview of where and how other RESIN tools contribute to the steps in the RESIN e-Guide.

Phases	Steps	Output of this step	Interaction with RESIN tools
1. Assess climate risk			
1.1 Scoping	Climate threat	A list of climate threats the city or asset faces, including a description of local historical events (frequency and severity) and a first insight in future occurrences (likelihood and potential impact).	**Climate Risk Typology** The European Climate Risk Typology output and underpinning data can be used to identify relevant climate hazards/stressors affecting an area. The typology hazard typology layer will provide users with the opportunity to make a quick assessment of the climate change hazard characteristics of the relevant NUTS 3 area(s).
1.4 Risk assessment	Risk identification	The outcome of the risk identification stage is a listing of the different identified risks and risk scenarios that will be analysed in more detail in the risk analysis. This listing will include a brief description for each identified risk and risk scenario	**IVAVIA** IVAVIA Module 1 and 2 support the user in preparing the risk analysis and in performing a quantitative analysis by developing Impact Chains, potentially aided by the ICE+ tool.
	Risk analysis	The outcome of this step is a risk value for each relevant climate hazard or combination of hazards	**IVAVIA** IVAVIA Modules 3-6 guide the user in performing a quantitative risk analysis, potentially aided by the IVAVIA Workflow Support tool.
1.6 Baseline	Define indicators	The outcome of this step is a list of relevant indicators, including a description for each indicator, a calculation methodology and data collection method that allow monitoring the status of and progress made on each of the selected goals.	**IVAVIA** The indicators defined in this e-Guide step can be used as a basis to determine indicators for the vulnerability assessment in IVAVIA module 3.1, and the other way around: Vulnerability/risk indicators defined in IVAVIA can be used as input for the definition of indicators in the respective e-Guide step.
	Determine baseline performance	The outcome of this step will be a report presenting and visualizing the values for each indicator.	**IVAVIA** The information gathered in IVAVIA module 3.3 (for various vulnerability indicators) can be used as input for this e-Guide step

2. Develop adaptation approaches			
2.2 Develop adaptation approaches	Exploration of adaptation approaches	A longlist of approaches that contribute to the set goals and comply with non-climate trends and context	**Adaptation Options Library** The list of adaptation approaches in the e-Guide and the adaptation option database has been aligned to ensure compatibility.
3. Prioritise adaptation options			
3.2 Generate options for each approach	Generate options for adaptation approaches	For each relevant adaptation approach, a list of adaptation options has been generated	**Adaptation Options Library** The Library can filter options related to, among others, adaptation approaches, climate threats and impact chains.
3.3 Prioritising adaptation options	Choose methodology and criteria	The outcome is a preferred method and a list of criteria to use for prioritization of adaptation options	**Climact Prio** The Climact Prio Tool is a methodology that supports the user in prioritising adaptation options and selecting criteria
	assess adaptation options	The outcome is a ranked list of adaptation options	**Adaptation Options Library** The Library can provide information with which to score and assess criteria of options
3.4 Select adaptation options	Select an optimal set of options	The outcome is a selection of options to be included in the adaptation strategy	**Adaptation Pathway Approach** Developing and assessing several adaptation pathways by grouping and sequencing adaptation options.
4. Develop implementation plan			
4.1 Implementation plan	Timeline, roles and responsibilities.	a clear overview of how the selected adaptation options can be implemented	**Adaptation Pathway Approach** An adaptation pathway presents the implementation of adaptation options as a sequence/timeline

7 Guiding the user towards a fit-for-purpose climate adaptation plan

This chapter is aimed at explaining how the e-Guide is designed to providing a fit-for-purpose climate adaptation plan, what considerations were taken into account and what decisions were made in the design.

7.1 Aims

As a structure to guide a wide variety of users in creating a sound and complete climate adaptation plan of sufficient quality, the e-Guide seeks to provide a framework which provides consistency in:

- The quality of the decision process and results
  This means that following the decision framework, all users should assuredly have followed the same process, in the right order, made right considerations in the correct way and by doing so have drawn the right conclusions from these considerations.
- Considered steps
  Following the decision framework, we also would like to make sure that in following the right process, the right steps are taken. For instance, it is one thing to consider external trends, but one would want to make sure each user of the framework considers the same list of external trends. Of course, which of these trends are relevant for any city is highly situational.
- Level of detail considered
  Following the framework, one would like to be sure the steps were considered on the same level of detail. For instance, when considering stakeholders, one can identify 'building developers' as a stakeholder, or specific building developers, each with its own stake and agenda.

Summarizing, one would expect a good supporting instrument to provide a certain amount of standardisation of both the process followed and the quality achieved. What amount of standardisation is needed and / or feasible is discussed below.

7.2 Practical contextual limitations

Having concluded that standardisation is an aim of the decision framework, we want to look at the possibilities and limitation of standardising the urban adaptation process. To this end, we will sum up some typical properties of the urban adaptation process.

7.2.1 Properties of the urban adaptation process

7.2.1.1 Many stakeholders

An urban adaptation process has a potential wide societal impact. Not only does it influence the daily life of the citizens (changes in environment, expected behaviour, shift in moral values), but it also potentially impacts organisational stakes (change of market potential, mobility, economic attractiveness, costs, etcetera) in a wide range of sectors.

Both citizens and organisations will want to influence the process to defend their stakes. In practice, this entails a complex, dynamic and time-consuming process in which the outcomes can be influenced, but not assured.

7.2.1.2 Diverse stakes

Each of these stakeholders has their own set of stakes. Typically, the stakes over all stakeholders contain contradictory goals. For one stakeholder green spaces might be most important, for another economic viability. In general, pleasing all stakeholders is impossible.

7.2.1.3 Long processes

Both the complexity of the process of determining the need for climate adaptation and suitable and acceptable solutions, and the interactions process with the various stakeholders imply creating an adaptation plan is a long process. A consequence of this long process is that during the process, changes in the environment, set of stakeholders or political landscape are likely to happen. This adds to the dynamic nature of the process and the impossibility to run such a process from beginning to end from a fixed set of assumptions.

7.2.1.4 Dynamic environment

Even without a long lead-time, the environment of the urban climate adaptation planner is dynamic. As the field is still under development and the topic is high on the political agenda, changes in priorities and approaches taken are likely to happen.

7.2.1.5 Coordinated action

A climate adaptation plan is in practice never made by a single person, usually not even by a single department. This means that the plan requires coordinated action of a group of people not normally working together and working on several steps at the same time. This requires a high level of coordination to keep all efforts on track.

7.2.1.6 Limited level of control over process

All these factors, combined with the fact that the role of urban climate adaptation planner is fairly new, and typically is placed in line with many other urban departments, such as mobility, economy, social affairs, etcetera, place the urban climate planner in a difficult situation. This implies the urban planner typically has little mandate to influence these departments, and as a relative ‘newcomer’ in the governmental arena, does not have the comfort of long-standing relationships with other departments, but has to create these over the course of time. This complicates the necessary process to integrate climate adaptation in all steps of urban planning and necessitates flexibility in the program of the urban adaptation planner. Without compulsory cooperation, often progress is gained by finding existing action plans and modifying these to suit both the needs of the other department and climate adaptation. The drawback of this strategy is that it leaves little room for planning and walking your own path.

Considering these points, one may conclude that standardising the urban adaptation process to a strict sequential process is unpractical or even impossible.

7.2.2 Properties of the urban adaptation activities

7.2.2.1 Various and diverse tools and methods

Each of the steps in the adaptation process is supported by a variety of tools and methods. These are developed by various people and organisations, at various times, for various purposes, serving various frameworks.[4]

It comes as no surprise then, that these tools are not all compatible with each other. Also, not all tools deliver the same level of detail, not all tools conform to the same level of scientific quality, and not all tools are equally suited to facilitate the needs of an end user.

7.2.2.2 Not every tool is suited for every situation

This variety in tools may be considered negative, but there are positive aspects too: some tools may be of low scientific quality, but easily applied by laymen. Other tools offer precise and complete results, but at the cost of much time and effort. In short, the variety gives the user the option to choose a tool that fits his or her needs and possibilities.

7.2.2.3 Choices for one tool may affect future options

Something that complicates the choice for any one tool, are possible dependencies between tools. A tool that offers quick, but approximate results may not produce the level of information to allow the analysis of these results in detail later by another tool; a tool that supports more than one step may be more attractive than choosing two different tools for these steps.

These consequences (both positive and negative) are relevant for making the right choice for a tool in a step.

7.2.2.4 The right level of detail is situational

One should realize that more detail not always yields better results. Sometimes the results can even be worse, for example by obfuscation of relevant results in an abundance of information. Therefore, the user should be supported in the choice of what level of detail is suited for his or her situation. This level of detail is highly situational and cannot be fixed at the same level for every situation.

Considering these points, one may conclude that flexibility in application of the method is essential, but at the same time one can conclude that this necessarily comes at the cost of strict compatibility of results.

By guiding the user in how to apply the tools, one can achieve that dissimilar tools used in the various steps are used in such a manner that a certain level of quality is assured. However, depending on the choice of tools, the results may surpass this level considerably, either for the complete process or just certain steps in the process, depending on the choices made by the user. The individual results can therefore be quite dissimilar, and only match on the basic level of quality assured by the overarching framework.

[4] For example, detailed hydrological models originally developed for sewerage specialists, such as Infoworks or Sobek, can be used for mapping where streets will be flooded under a certain scenario. The same result can also be achieved – with obviously lesser accuracy – by GIS based models such as WOLK

7.3 e-Guide approach to ensuring fit-for-purpose adaptation plan

A number of functionalities have been built into the e-Guide to assure a fit-for-purpose result when following the decision framework. These functionalities and their contribution to this goal are described in the sections below.

7.3.1 Ensuring a uniform process

Here we will discuss features of the e-Guide which ensure that the users all follow the same process. In other words: ensuring a sufficient quality of WHAT they do.

7.3.1.1 Uniform steps

The first and most fundamental functionality to guide the user in the adaptation process, is to offer clear and univocal steps that incorporate all considerations that need to be made to generate an adaptation plan of sufficient quality.

These steps are presented in the e-Guide as the ‘decision framework’. It consists of 44 steps, grouped in similar activities and phases. Figure 7-1 gives a complete overview of the structure of the decision framework.

Figure 7-1: Complete decision framework as it is presented in the e-Guide

This overview enables the user to see what steps need to be taken and what is involved in each of the steps. This allows for planning of time and resources.

7.3.1.2 Uniform preconditions for steps

As we already concluded that the controllability of this process is particularly limited in the context of creating an urban adaptation plan, just providing a sequential process is not good enough. In the e-Guide this is addressed by defining the steps in such a way, that it allows the user to start and stop at any point of the decision framework, while being informed of the consequences this may have. For more information, see section 5.6, ‘Allow for flexible use of decision framework’.

7.3.1.3 Uniform execution of steps

To ensure that not only the same steps are taken, but that these steps are addressed in the same way by all users, guidelines for executing each of the steps are provided.

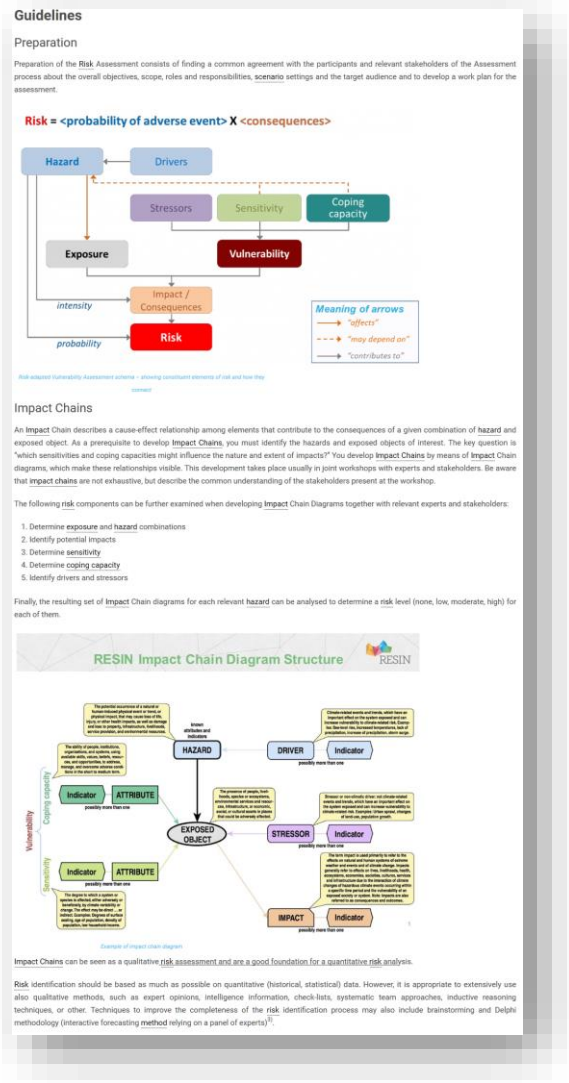


Figure 7-2: Example of guideline how to address the 'risk identification' step

7.3.1.4 Uniform working/collaboration space

In order to manage the process, with many people involved, a system is needed to keep track of all these activities, their progress and interrelation. To this end, the e-Guide offers a functionality called ‘My workspace’ where the activities can be divided between people (even outside your organisation), progress can be monitored, and a complete set of always up-to-date information gathered in the process can be made available to all groups involved. For more information, see section 5.1, ‘My workspace’

7.3.2 Ensuring uniform outcomes

Here we will discuss features of the e-Guide that ensure the users all follow the steps correctly. In other words: ensuring a sufficient quality of HOW they do it.

7.3.2.1 Overview of available options and consequences

Each step page will list what tools can be used in support to complete the step and what their added value and limitations to the step might be.

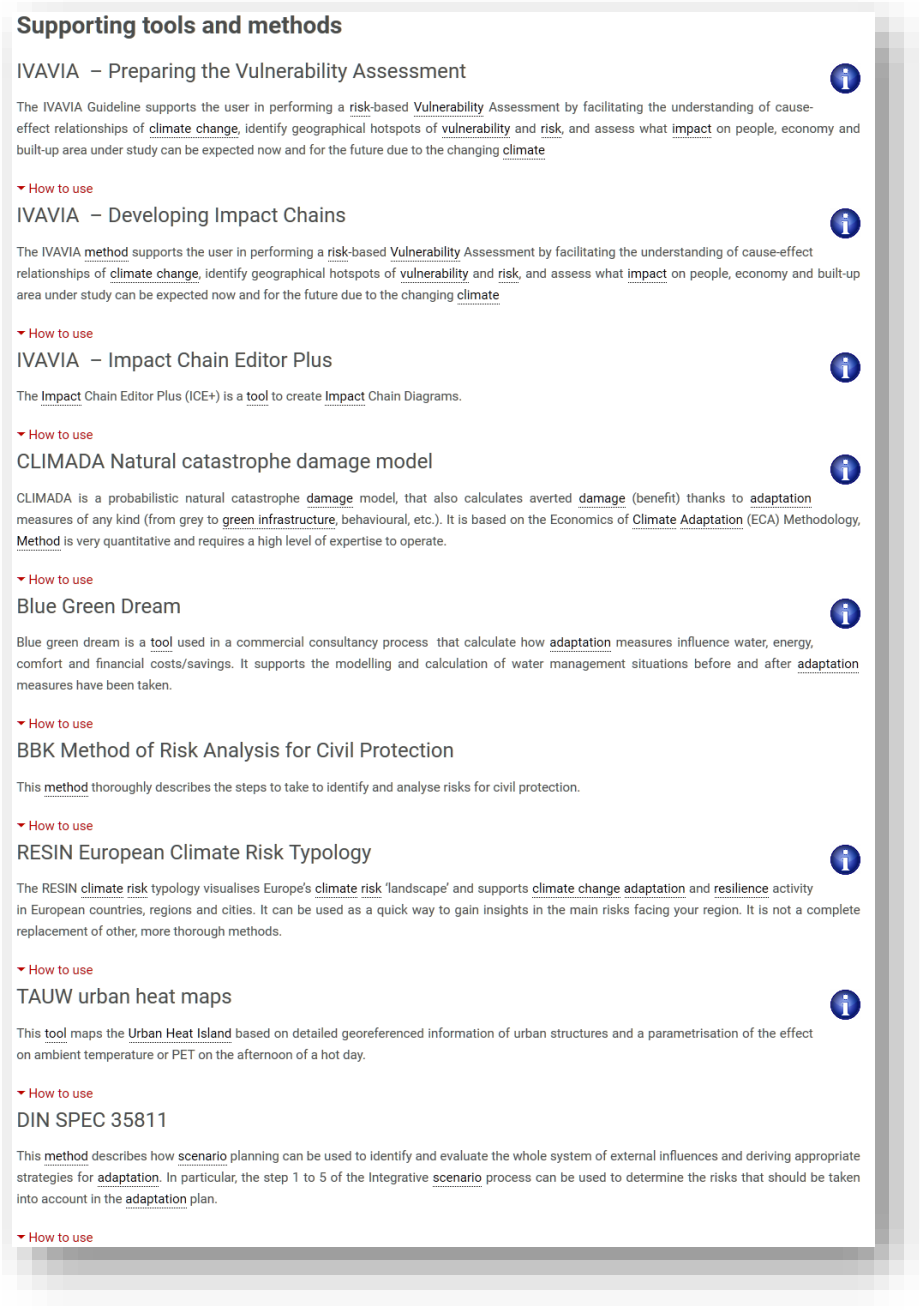


Figure 7-3: Example of listing of supporting tools for a step in the decision framework

7.3.2.2 Concrete instructions how to apply tools to conform to standards

To ensure the correct application of supporting tools and methods in each step, the e-Guide offers descriptions dedicated to the manner any tool should be applied to any step in the decision framework. This will ensure that regardless to what (combination of) tool(s) is chosen in a step, it

always meets minimum quality requirements. More information on this can be found in section 5.10, ‘Concrete instructions per tool per ’.

7.3.2.3 Overview of all tools and where in the decision framework they may be used

In addition to this, the e-Guide offers an overview of tools categorised on a number of practical aspects for easy selection of the tools that are most relevant to the needs and circumstances of the user. More on this can be found in section 5.9, ‘Rating of tools and methods’.

7.3.2.4 Comparison of suitability of tools for user’s situation

In addition to this, the e-Guide offers a complete informational page on each of the tools offered in each of the steps. This page will describe the respective tool, its use in the various steps of the decision framework (this can be helpful to identify whether the tool is in line with the application in later steps), required input of the tool, and outline of how it is used (in general) and what output may be expected of the tools. Finally, experiences with the tool are presented (if available) and a link to the tool and more information is provided.

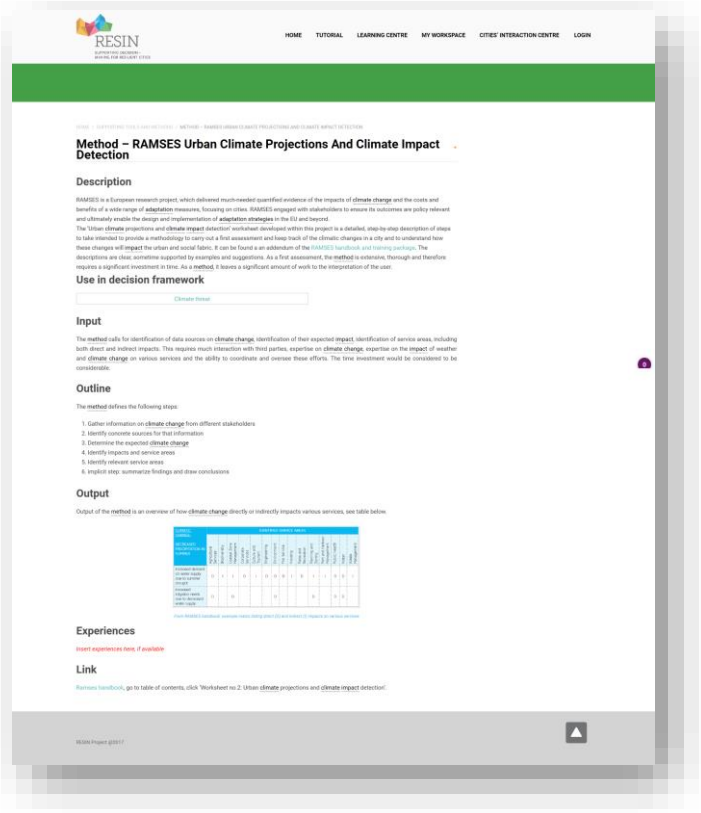


Figure 7-4: Example of a tool page with detailed information on one specific tool

7.3.2.5 Uniform terminology

To avoid ambiguity and misunderstanding of terms, which could lead to incorrect executions of steps, the e-Guide offers a glossary of terms and a functionality to consult that glossary without leaving the page.

More on this can be found in section 5.11, ‘Consistent use of glossary and in-line definitions’.

7.3.2.6 Guidance of results by forms

To guide the user further in the required information and decisions to be made in each step, the ‘My workspace’ functionality offers the use of forms for each step where the required information has to be submitted in order to mark the step ‘done’.

More on this can be found in section 5.1, ‘My workspace’.

8 Evaluation

8.1 Initial goals

Below the initial goals are listed and a self-assessment of whether they were reached is given.

Table 4: Goals reached

Goal	Goal reached?
Provide the user with standardised tools, information, checklists and practical examples, to advance through all phases of the adaptation planning process in European urban environments, from raising awareness of climate risks through to the implementation of adaptation responses	Goal reached (through combination of decision framework, overview of tools, experiences, content of steps within the framework)
Offer guidance – where possible – which tools and approach are best suited for a particular situation	Goal reached – see sections 5.3, 5.8, 5.9, 5.10.
Integrate the approaches of both the climate change adaptation world and the world of disaster risk management, targeting urban areas and (critical) infrastructures	Goal partly reached; terminology, tools and methods from disaster risk management have been included (for instance CLIMADA Natural catastrophe damage model), urban planning is specifically addressed (as frequently encountered challenge) but critical infrastructure appeared to be less relevant for the partner cities.
Quickly guide end-users in their search for background and experiences that are relevant for their situation	Goal partly reached; experiences prove very hard to collect
Allow for flexibility to address the non-linearity of the adaptation planning process and the reality of the urban planning process	Goal reached, see section 5.6

Allow to be used in an iterative way for re-evaluation when new information becomes available	Goal reached, see conceptual framework, updatability of my workspace and design of RESIN tools
Incorporate guidelines on how to develop scenarios as a guide for decision makers to provide for robust and resilient planning under a wide range of potential future (long-term) climate conditions	Goal partly reached, guidance to prepare for all information to develop scenarios can be found in step 'Climate threat', but it does not contain explicit guidelines how to make scenarios.
Connect with and integrate existing methods and approaches where possible, thereby building on the experience of other platforms and progress the support that the diverse range of available tools supplies	Goal reached, see 5.5

8.2 Innovative elements

In developing the e-Guide, we sought out to experiment with novel functionalities that would make the support more fit-for-use for the user. In total, 13 of such functionalities were introduced and evaluated. These are listed below and an assessment on the success of each functionality is provided in the right column.

Table 5: Assessment of innovative elements

Functionality	Assessment
My workspace	Found to be very useful by the user. Complex functionality. Although developed functionality is already found to be functional for users, many opportunities for enhancement which could not be worked out within the project remain. (see 5.1.4)
Interactive guide	Inconclusive what the added value of this functionality is. (see 5.2.4)

One-stop-shop for supporting tools	Found to be very useful by the user. The completer the set of tools, the more attractive this functionality is found to be. (see 5.3.4)
Operational alignment with other platforms	Found to be very useful by the user. Currently only aligns with UAST. Whether alignment with other platforms are appreciated as much, is doubtful. (see 5.5.4)
Allow flexible use of decision framework	Found to be an essential function of the support platform. (see 5.6.4)
Concrete instructions for small tasks	Inconclusive what the added value of this functionality is, due to the fact that only one useful task was found and worked out. (see 5.4.4)
Development in co-creation	The developers find this to be both essential to align the platform with the user's needs, and to have major effects on software development time, required flexibility in development design and software, required time and frequency of interaction and complexity of the development process. (see **Error! Reference source not found.**)
Only lower-level user applicable referrals	Found to be very useful by the user. Avoids confusion and unnecessary browsing time. (see 5.8.4)
Rating of tools and methods	Found to be very useful by the user. (see 5.9.4)
Concrete instructions per tool per step	Adopted as a logical function by the user, found to be methodological essential for any platform supporting external tools at any step by the developers. (see 5.10.4)

Consistent use of glossary	Essential for any platform. (see 5.11.4) The tooltip functionality providing explanation of any glossary term in any text is found to be useful and nice, but not essential.
Background information	Inconclusive what the added value of this functionality is. (see 5.12.4)

8.3 Conclusions and recommendations

The development of the e-Guide has reached almost all goals it set out at the start of the project. All goals were met to some extent. Two of these goals were only partly reached because during the course of the project, new insight developed that reduced the priority of these goals below other, competing goals. Specifically, this is valid for integrating the disaster risk management approaches in the climate change world and including critical infrastructures analysis in climate risk assessment. In both cases, the topics were addressed, but to a lower extent.

In the guidelines how to provide for robust and resilient planning under a wide range of potential future (long-term) climate conditions, the use of scenarios was identified as just one of the options, which resulted in the fact that guidelines on how to develop scenarios were only included at a general level.

8.3.1 Potential for future integration

The introduction of new features for supporting end users in creating a fit-for-use climate adaptation plan was very successful. Out of thirteen introduces new features, eight were found to be useful or essential. Specifically, the functions found to be essential for any platform, are:

1. Support for flexible user of decision framework
2. Development in co-creation
3. Concrete instructions per tool per step
4. Consistent use of glossary

The e-Guide provides a live and functioning example how these functions might be integrated into any platform.

Other new functionalities that were deemed by users to have a high added value to any climate-adaptation supporting platform, are:

5. A workspace to store information from the adaptation process and coordinate work between departments
6. Operational alignment with other major platforms
7. Use of only lower-level user applicable rereferrals
8. Rating of tools and methods

Finally, the existence of one all-inclusive platform where all relevant information and references can be found (one-stop-shop), was also deemed to be very useful.

Any platform that intends to support the urban climate adaptation process in a practical, applicable way, is strongly advised to incorporate a way to allow the user a flexible use of the decision framework, provide concrete instructions per step / per tool, to involve the users in the design and development of the platform (however, whether co-creation is the only way to reach this is not known), and enforce consistent use of terminology.

The inclusion of a workspace, operational alignment with other major platforms, the use of only lower-level user applicable rereferrals and a rating mechanism for tools and methods should also be included if possible.

9 References

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