BeWater

Making society an active participant in water adaptation to global change

Project no. 612385

Start date of project: 1 October 2013

Duration of project: 42 months

Coordination and Support Action

FP7-SIS.2013.1.2-1
Mobilisation and Mutual Learning (MML) Action Plans:
mainstreaming Science in Society actions in research

D2.3 Guideline report on the BeWater approach outlining principles, methodology, concepts and protocols of the project

Due date of deliverable: **31 March 2015**

Actual submission date: **30 March 2015**

Organisation name of lead contractor for this deliverable: **CREAF**

Dissemination level: **PU**

www.bewaterproject.eu

This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 612385

Authors

The authors of each one of the protocols included in this guideline report is specified in the different sections.

Reference

Deliverable D2.3, Guideline report on the BeWater approach outlining principles, methodology, concepts and protocols of the project. BeWater, FP7 project no. 612385-SIS.2013.1.2-1 European Commission

Executive summary

The present Deliverable -D2.3 Guideline report on the BEWATER approach outlining principles, methodology, concepts and protocols of the project- is related to Task 2.2 Building the BeWater common approach, that aims at standardizing project activities, making them comparable among Case Study Riber Basins (CSRBs) and replicable beyond project limits.

The guideline report is constituted by four protocols detailed in the following sections:

D2.3- Section 1: Protocol for data compilation and harmonization. Protocol to guarantee data and information spatial and temporal homogeneity among CSRBs.

D2.3- Section 2: Protocol for formulation of water management options. Protocol to define water management options adapted to each CSRB.

D2.3- Section 3: Protocol for performance of participatory processes. Protocol to guide and homogenise the participatory activities among CSRBs.

D2.3- Section 4: Protocol for design of river basin adaptation plans. Protocol to guide the process to generate an adaptation plan per CSRB.

D2.3– Section 1: Protocol for data compilation and harmonization

Authors

Joint Research Centre, Water Resources Unit, Institute for Environment and Sustainability
Iban Ameztoy, Andrea Iervolino, Giogia Donin, Andrea Leone, César Carmona-Moreno

Contributing authors:
Hans Verkerk - EFI
Elsa Varela - EFI
Anabel Sánchez – CREAF
Annelies Broekman - CREAF

Reference

Iban Ameztoy, Andrea Iervolino, Giogia Donin, Andrea Leone, César Carmona-Moreno (2015). Protocol for Data Compilation and Harmonization. Deliverable D2.3, BeWater, FP7 project no. 612385-SIS.2013.1.2-1 European Commission, 42 pp.

Executive summary

Data harmonization and integration schemes intend to provide users with procedures and tools to combine information from different sources in order to have a unified view of them, giving the ability to share a common method that allows information to be passed in an understandable, ordered and comparable way. In this context, this protocol describes the needed processes to generate harmonized information and files produced during the implementation of the project and give guidelines explaining the different data integration options provided by the “Water Knowledge Management Platform“ known as Aquaknow (www.aquaknow.net) in the frame of the BeWater project: “Making society an active participant in water adaptation to global change”. The main project's objective in terms of information harmonization is to provide a space and a procedure to organize information related to the four Case-Study River Basins (CRBS).

Contents

1. Introduction 3
2. Overall approach 4
3. Protocol for Data Compilation and Harmonization 9
Annex I – About Quantitative Information 25
Annex II – Required data types 27
Annex III – Factsheets for Quantitative and Qualitative data (metadata fill-in tables) 29
Annex IV - Description of Metadata fields in Aquaknow 37
Annex V – webGIS tools in Aquaknow 39

1. Introduction

The JRC/IES/Water Resource Management unit has been in charge of the implementation and development of the Aquaknow platform, which is a web-based tool for improving the communication and exchange information among the international community on water issues. Knowledge management and capacity building are key elements in the design and implementation of sustainable water management policies.

The online management platform integrates a dynamic virtual space for facilitating communication between the different users. The platform's contents (documents, news, scientific articles, events, links, spatial data, information, etc…) are continuously expanded and updated by and for the community of practitioners. In this regard, this protocol relates to D2.3 Section 2 protocol for formulation of Water Management Options and provides guidelines towards the compilation and harmonization of information collected and generated throughout the project[1] with the objective of integrating the information in the Aquaknow platform. The information contained in the platform is key to make the scientific information of the project accessible to a wide number of users and to disseminate the project databases. It will be a remaining tool after the project ends.

The community and so the CSRBs within the BeWater project can benefit from the custom and online tools; facilitating information sharing through a dedicated structure that has been designed to store the information related to the river basins with the objective of better understanding their characteristics and providing a space where partners and beneficiaries can share and consult the availability of information gathered and generated during the implementation of the mentioned protocol.

Previous to the integration step, it should be considered that data gathering and harmonization processes are topics requiring considerable preliminary effort. It is important to correctly define the main characteristics of the required data sets, not only from the technical point of view but from the objectives. A good understanding of those can help on the design of a well-established protocol to minimize data inconsistencies and make them intercomparable.

In this regard, a preliminary survey on quantitative data was carried out by the European Forest Institute to get a first impression on data availability and its characteristics (Annex I). This showed the diverse and heterogeneous nature of the received list of data sets, being the most common issues the differences on data availability and nature of them for a given topic, the different spatiotemporal resolutions and acquisition periods, format types and lack of information, data accessibility restrictions, etc.
In addition, it was also noticed that in some cases there were file formats without any associated location information, meaning that they were not georeferenced file formats, in other cases, the accessibility to the files was restricted.

Taking into account mainly the latest limitations, an alternative and complementary integration strategy has been adopted; rather than uploading the quantitative data itself using the GIS capabilities of Aquaknow, it has been created a standardized structure that will be replicated in each basin to allow querying the information in a homogenized way, so allowing the inter-comparability between the basins. Each dedicated structure will serve as a centralized repository and will include descriptions, characteristics and a long list of compulsory and optional information fields. Additionally, the platform provides the option to upload georeferenced datasets, if they are available and do not have any sharing constraints. A protocol for intermediate products has also been provided towards the harmonization of the generated outputs, as well as guidelines to handle qualitative information and governance related documents.

[1] Such as input from Deliverable 3.3 and other project's outputs (DOW - WP4 and WP6) related to i.e. Governance aspects.

Finally, it is recommendable to have in mind that data gathering, its characterization, harmonization and integration steps should be seen as iterative processes, meaning that the proposed schema as well as any other future step can be changed and enriched when new requirements arise.

2. Overall approach

2.1 General Description

One of the objectives within the project, described in WP3 (DOW document) is to exchange information, knowledge and experiences between the scientific community and society. Some actors contributing with the compiled data from the river basins and others with their local knowledge, perceptions, needs and concerns. Related to this and as stated in the introduction, this protocol provides, in one hand, guidelines towards the **compilation and harmonization** of information generated during the implementation of the protocol related to the "Formulation of Water Management Options" (D2.3.2), concretely focusing its attention on step 2.2. "Eliciting the current state and future expectations of each river basin".

The protocols developed in the present document have been subdivided taking into account the steps required in the protocol mentioned above. These steps and so our protocols can be listed as follows:

- The compilation of information on the current state and future expectations towards a better understanding of the river basins, which is translated into the protocol about "Compilation of Information" (Figure 1, P3.1);
- The creation of a basin narrative where the collected information is organized and synthesized with the objective to provide a coherent framework for the formulation of water management options, which at the same time can be divided into two sections:
    - A graphical component that describes the basin in the form of a Fuzzy Cognitive Map (FCM), which requires a protocol to harmonize the information used and created in this process: "Harmonizing Fuzzy Cognitive Maps" (Figure 1, P3.2)
    - A written component that describes the narrative in words.

On the other hand, a protocol is also provided to;

- **Integrate** all the generated information on a system that shares a common structure ("Integrating Information in Aquaknow" Figure 1. P3.3.). Integration process will start once the basin written narratives have been finished (Annex II, D2.3-Section 2), as it will serve as a reference document from where to get access to some of the information required in this step. This space or platform will serve as a dissemination tool and will provide harmonized background information about each of the four river basins to make them comparable in terms of generated information.

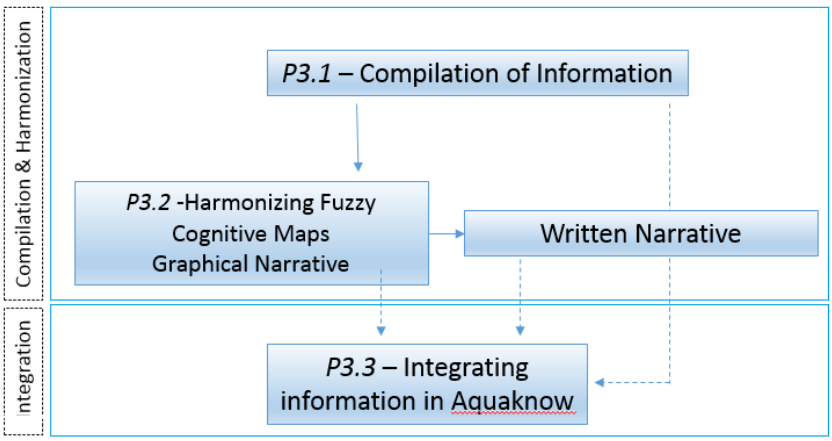


Figure 1. Protocol subdivisions. Find detailed information in section 3 of the present protocol.

2.2 CSRB custom structure – A standardized information repository

As mentioned before, Aquaknow structure has been adapted to the needs and processes established in the "Protocol for formulation of water management options" (D2.3- Section 2). The structure is designed to reflect the steps described and followed in this methodology while it will serve as a repository of information generated during its implementation. Thus, the structure has been divided into two general blocks;

- A block which summarizes the outputs generated during the Fuzzy Cognitive Mapping development (Figures 2 and 3, Block A), which encompasses the graphic narratives of the basins, associated data and FCM analysis outcomes. This information will be harmonized using the Mental Modeler tool (Protocol 3.2);

- An information section where additional inputs about the basin will be stored, including Qualitative information, Governance aspects, Water Management Options and written Basin Narratives (Figures 2 and 3, Block B).

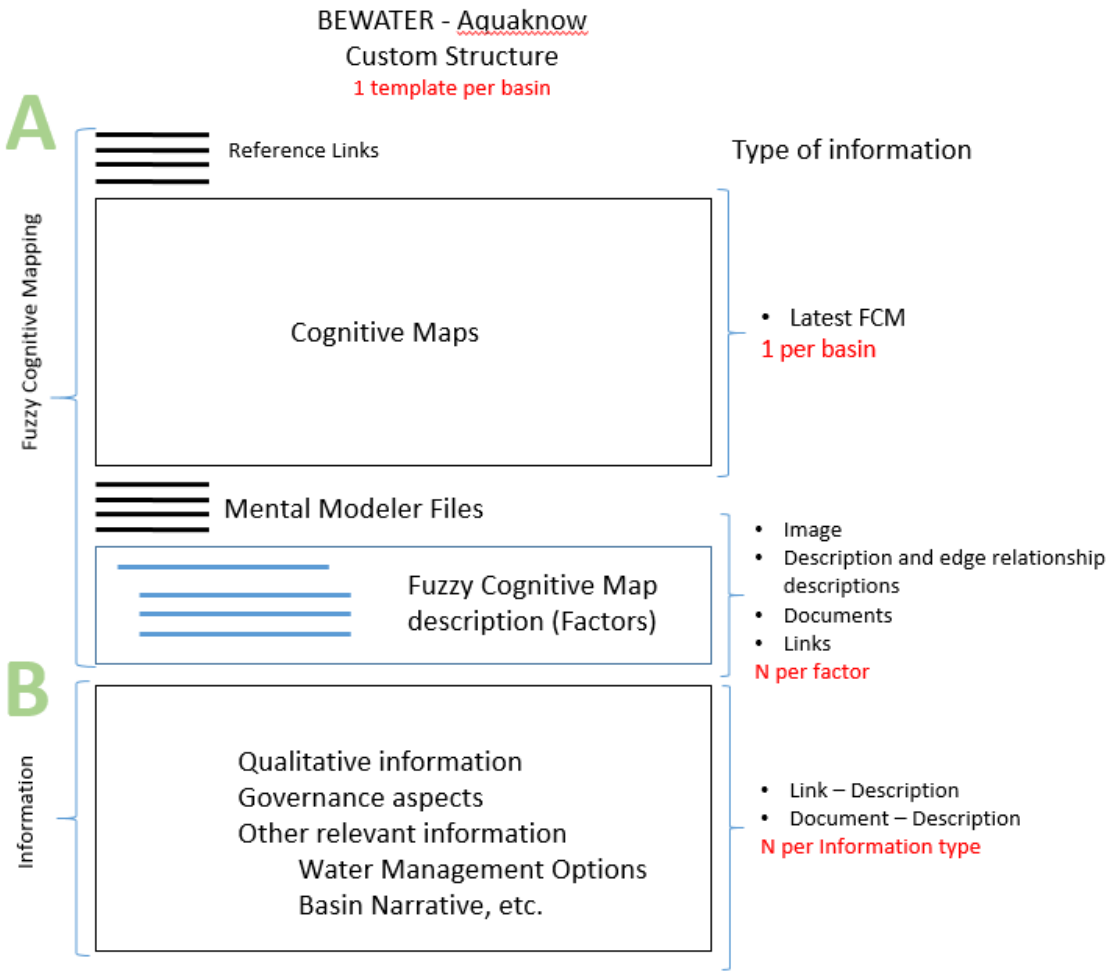


Figure 2. Aquaknows standardized structure for each CSRB.

Additional information on the structure can be found in Annex II.

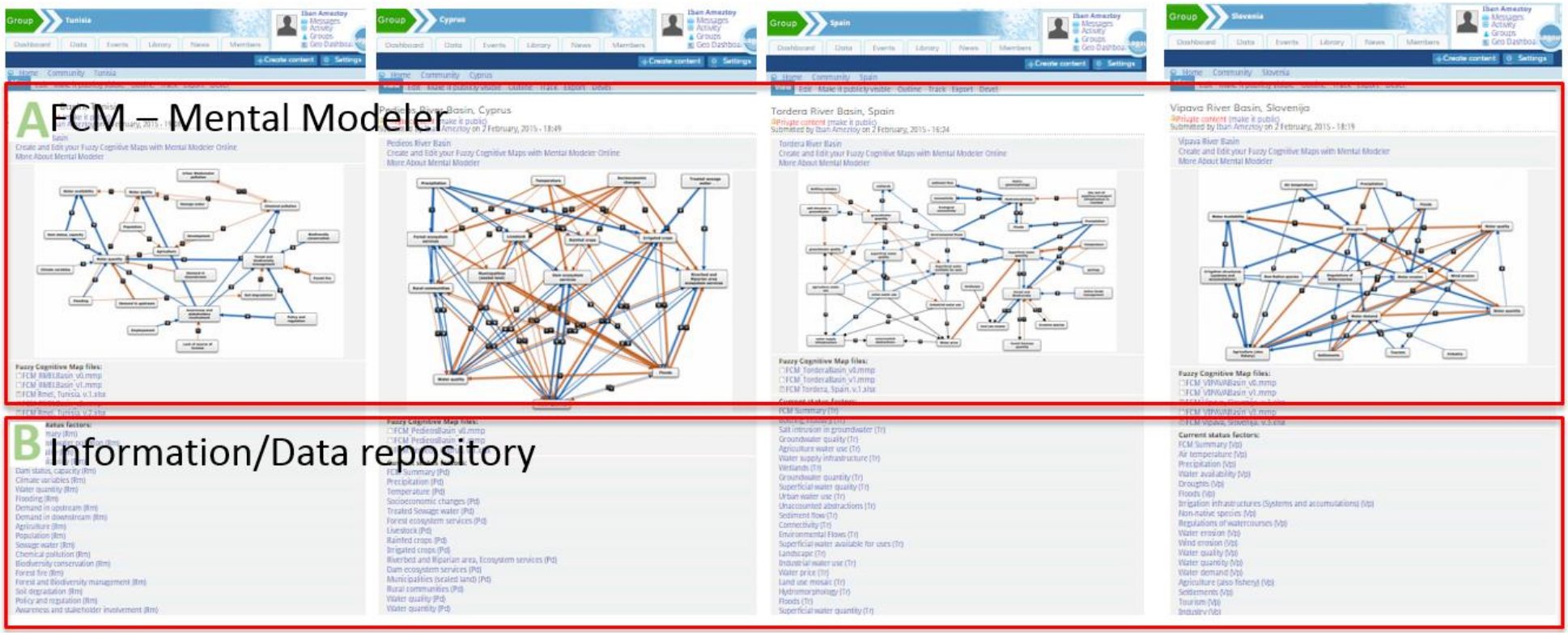


Figure 3. Preliminary Aquaknow structure divided in two main blocks: Block A. Fuzzy Cognitive Mapping; where Mental Modeler and analysis outputs are integrated and Block B. Information/Data repository where factors are described and qualitative information, governance aspects, water management options and written narrative documents are stored.

2.3 Information requirements and compulsory data

- Block A (Protocol 3.2):

  Required files will be generated using Mental Modeler tool (www.mentalmodeler.org), which is a modeling software that helps individuals and communities capture knowledge in a standardized format (see section 3.2. about the use of Mental Modeler).

- Block B (Protocol 3.1 and 3.3):

  It will contain information related to the factors identified in the FCM development, the intermediate analysis outcomes, quantitative and qualitative information, governance aspects, as well as documents related to the identification of Water Management Options, final written Basin Narratives and any other relevant information that might be of interest.

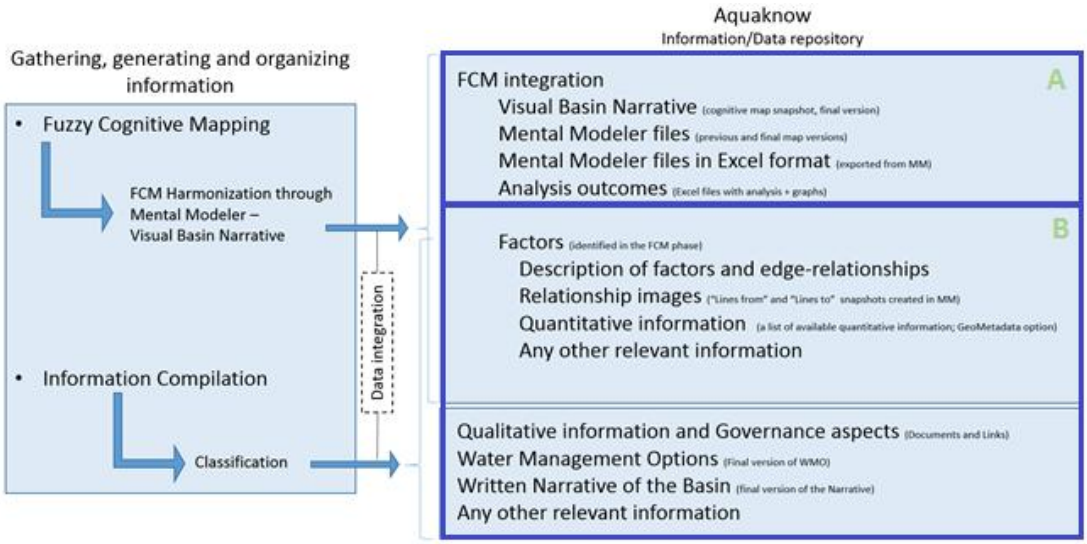


Figure 4. Graphical representation of the required information.

Following the paragraphs commented in the previous section, the following list describes more in detail the required information that needs to be obtained, generated and uploaded into one of the two blocks (figure 4). It should be noticed that data compulsoriness is driven by those factors identified during the FCM development, therefore, "additional information" should be focused on those factors.

- Block A (Fuzzy Cognitive Mapping)
  - Reference Links (Mental Modeler and BeWater Project websites)
  - Fuzzy Cognitive Map (screenshot)
  - Files:
    - Mental Modeler files in eXtensible Markup Language format (xml). This file will contain:
      - Components of the river basin (factors);
      - Edge-relationships between factors and their weights;
      - Descriptions about the factors and reasoning behind the relationships.
    - An Excel format file (xlsx) with the information contained in the xml file (exported from Mental Modeler). This Excel file will contain:
      - A tabular representation of the cognitive map (Matrix table);
      - FCM statistics (doc).
    - FCM analysis outcomes (Excel file with analysis and related graphics).

- Block B (Information related to the factors and River Basin Characteristics)
    - A list of factors identified in the Fuzzy Cognitive mapping phase. For each factor the following information will be added:
        - A screenshot of the Fuzzy Cognitive Map (image) showing just the relationships for the filtered factor; “view only Lines from” and “view only Lines to” (image);
        - Description of factors (text field);
        - Geometadata link: A repository of quantitative data resources related to the factors;
        - Documents of interest related to each factor (presentations, documents, statistics, images, etc.).
    - There are three sub-sections which share the same structure:
        - Qualitative Information;
        - Documents or links related to governance aspects of the basin
        - Other relevant information:
            - Water Management Options (document)
            - Written Basin Narrative (document)
            - Any other relevant document related to the basin.

3. Protocol for Data Compilation and Harmonization

3.1 Compilation of Information

As stated in the “Protocol for formulation of water management options” (D2.3- Section 2), the WMOs are identified and formulated based on information collected previously. Some of this information corresponds to quantitative or qualitative information.

The quantitative and qualitative information will serve as an input for the development of the Fuzzy Cognitive maps. The quantitative data can be used to brief the participants about the basin both on the current situation and most importantly on the future projections under global change (incl. climate change) scenarios. Quantitative information on the current status of the basin in terms of water availability, hydrology or water quality will help to depict the current status of the basin. Existing future projections on population, climate change and their impact on water availability, water flow and water reserves for example, will be needed to show to the stakeholders the water challenges in the basin under global change. This information will then be used to develop storylines for the basin considering these projections, and so to better identify factors and establish qualitative weights to their relationships.

To clarify the information that is available from the CSRBs, a series of fill-in tables were elaborated by EFI (Annex III). In the case of quantitative data, two metadata fill-in tables were sent to the partners to list all the available information both for the current and future status of the basins. These fill-in tables intend to systematize the information on the available data, allowing identifying data gaps and foreseeing ways of covering these gaps, i.e. alternative data sources, production of new data. (a preliminary survey was already carried out; its conclusions can be seen in Annex I)

- The fill-in table on current data covers water related aspects for the basin such as information available from gauging stations, existing hydrological models for the basin, estimates of groundwater, water quality. Climate data and information on extreme events is also gathered. The next block of information relates to existing information on land cover/land use, elevation models and orthophotos. Information on the different land uses is then requested and whether information is available on these uses regarding their water consumption, fluctuations, location and contribution to the economy of the basin. The table ends requesting information on water related and other infrastructures (Annex III. Factsheet 1).

- The fill-in table on future data collects information on available simulations on water availability and future climate. Also information on existing projections for the different land uses are requested as well as on any relevant studies on future plans or scenarios. (Annex III. Factsheet 2)

- A fill-in table was also prepared to collect qualitative data for the basins. This document consists of a fill-in table with questions plus an open space for the partners to summarize the aspects related to the basin that they consider more relevant. This table asks the partners to list the main and competing uses in terms of water consumption and water quality in the basin. Also the main conflicts among the different users are listed in this table. Partners are also requested to list these ongoing initiatives that represent an example of good practices in water management. Finally, a list of the policies affecting management planning in the basin as a whole as well as existing water management plans are also requested. At the end of the document the partners are expected to provide, in an open non structured format, a brief description of the basin, detailing main features, important past events or future plans that they consider relevant for the basin. Information on the relevant actors present in the basin is not collected in this table. (Annex III. Factsheet 3)

3.2 Harmonizing Fuzzy Cognitive maps – Mental Modeler

Mental modeler is a participatory modeling tool based in fuzzy-logic cognitive mapping developed by a group of experts led by Steven Gray (University of Boston), which makes the mental models of different actors explicit and provides an opportunity to incorporate different types of knowledge into environmental decision-making processes. The goal of this tool is to facilitate user-centered model construction, promote learning in disparate stakeholder communities through knowledge sharing and allow flexibility for users to refine and manage the different versions of the created cognitive maps.

Within the frame of BeWater, the CSRBs should create a graphical and written narrative, and is in the graphic building process were Mental Modeler becomes relevant, not only to create the required conceptual maps, but to integrate in a single file all the information in a harmonized manner. Thus, the tool is to be used in order to harmonize data generated while developing the Fuzzy Cognitive Maps. This file as well as the intermediate products and the written narrative will be afterwards uploaded into Aquaknow, and so future users will be able to view, consult or edit them.

As commented, Mental Modeler is based on Fuzzy-logic Cognitive mapping and is comprised by three main user interfaces:

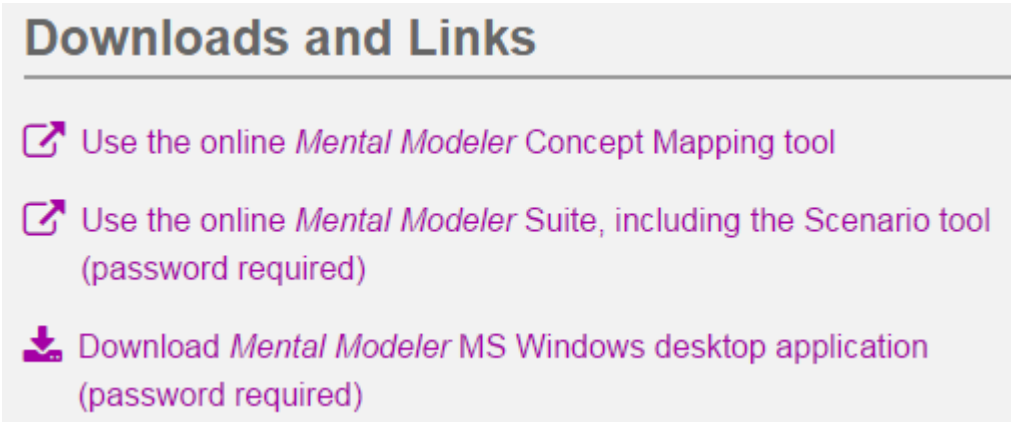
1. The concept mapping interface that provides a space for model building and parameterizes model construction in the format required for FCM analysis;
2. The matrix interface that allows the structural properties of the cognitive map to become clear by examining pair wise relationships, and;
3. The scenario interface which allows running and comparing changes within the system under different potential scenarios.

Note that the analysis run within the BeWater project are to be done outside the Mental Modeler tool, and that this tool is to be used just to create the cognitive conceptual maps and to create harmonized files containing all the produced information.

The steps required to access the tool, create factors, edge-relationships and weights, their descriptions, summary statistics and intermediate files are described in the following chapters.

3.2.1 Getting started

The tool can be accessed in different ways, as a downloadable desktop application or as an online application.



Option 1.- http://www.mentalmodeler.org/online/
Option 2.- http://www.mentalmodeler.org/scenario/
Option 3.- http://www.mentalmodeler.org/resources/mentalmodeler.exe
Option 4.- Mental Modeler MS Windows desktop application Beta version (under request)

The difference between the options lies on their functionality: Option 1 is a web based tool that presents the basic features. It is focused on giving only the option to create cognitive maps. Options 2 (web based app.) and 3 (desktop app.) offer increased functionality in the sense that is possible to run "what if scenarios". Nevertheless, only those functionalities related with the possibility to create the cognitive maps should be considered.

Additionally, a Beta version of the software is also provided to the partners. This version has an extra function which exports the cognitive maps and its associated statistics to an Excel readable file. This option should be used in order to create intermediate files that will be used in the analysis phase. Users are recommended to use this last version in order to have access to all the options available.

3.2.2 Creating a new project

Once the tool is opened, the user have two options; to import an existing model or to start a new model. First option will be used to edit changes in an already existing model. To create a new one (figure 5), user should first define the author, name and a brief description of the model.

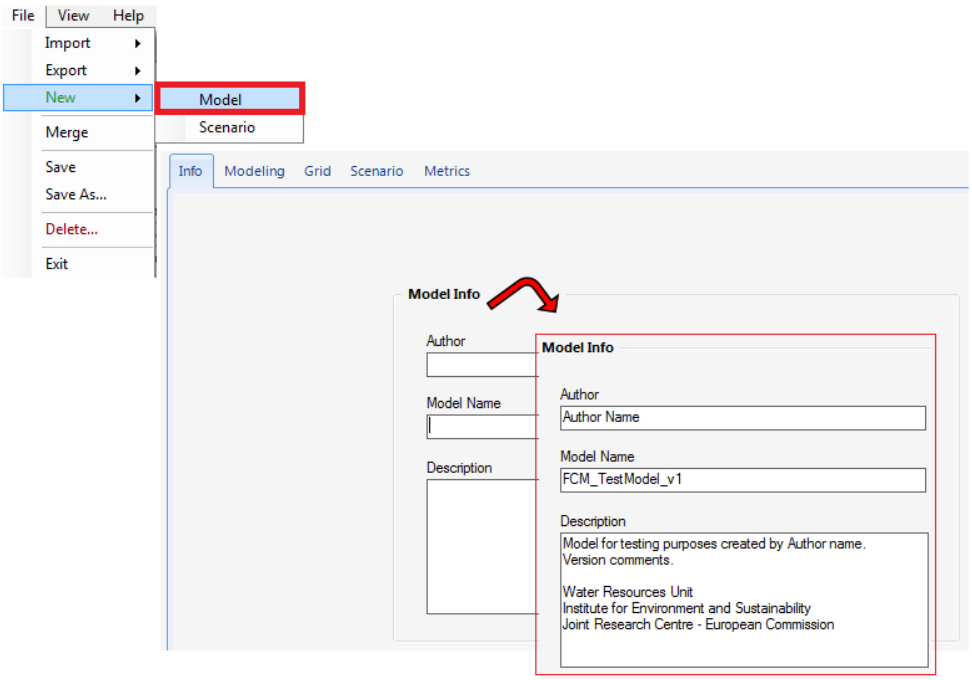


Figure 5. Creating a new model in Mental Modeler

Each river basin manager or a responsible working on the cognitive map should add his/her name in the author field and the Model name must show the River Basin name as well as the creation date:

FCM_RiverBasinName_YYYYMMDD:

FCM_TorderaBasin_20141215, FCM_TorderaBasin_20150315, etc.

As there might be different versions of each cognitive map, this information should be mainly used to keep track of those versions and to explain which have been the changes in between them. Additionally it would be also an advantage to add contact information of the author. Once this information is provided, the model should be saved with the same name used in the "Model Name" field. The model will be available in the "My Models" section and it will be ready to start editing it.

3.2.3 Adding factors, setting edge-relationships and notes

By accessing the concept mapping interface, the user has the option to add components (basin factors) and labelling them using the plus sign (figure 6).

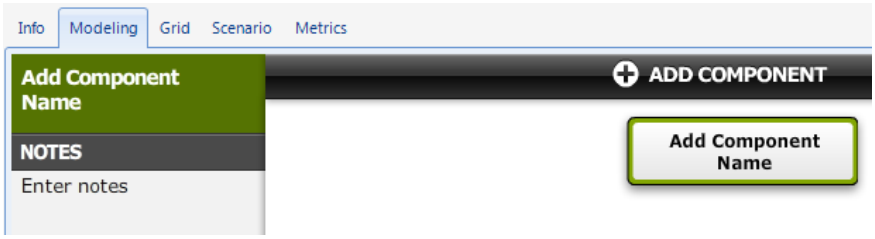


Figure 6. Adding River Basin Components (factors) in Mental Modeler

After components have been defined, the relationships between them can be added by using directional arrows (figure 7, 1 and 2). The degree of influence one component can have on another, called edge-relationships, should also be defined in this step. Components or factors included in the model can have positive (high, medium or low) or negative (high medium or low) or no (no relationship defined) edge relationships (figure 7, 3).

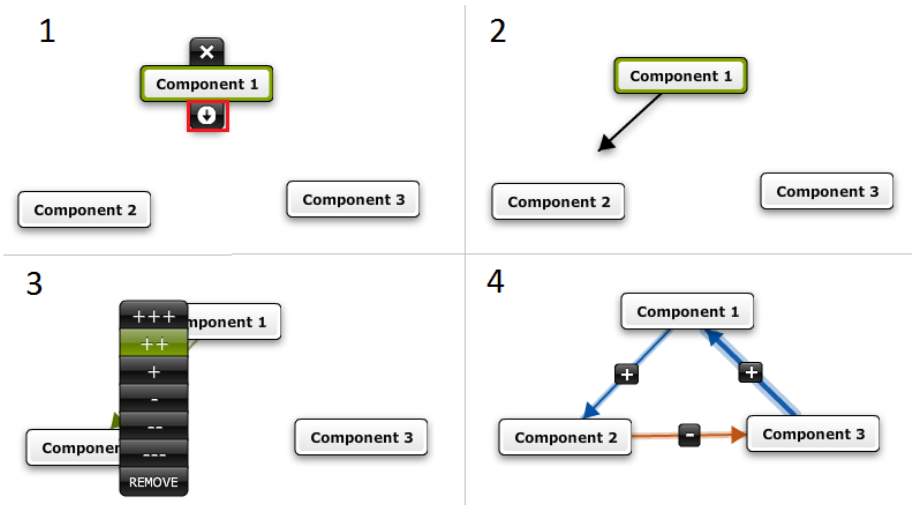


Figure 7. Setting edge-relationships and weights between componets.

The colors of the arrows represent whether the relationship is positive (blue) or negative (orange) and the line thickness shows the degree of influence (figure 7, 4). The thicker the line the more influence. If the relationship weight hasn´t been set during the definition of the relationship, the user has the opportunity to assign it moving the cursor overt the “?” sign (Figure 8).

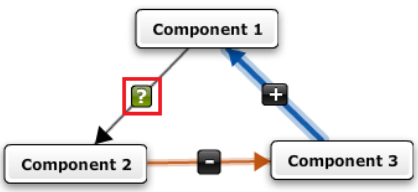


Figure 8. Editing edge-relationship weights that haven´t been previously stablished.

Those qualitative weights of the relationships between factors are translated into quantitative values between -1 (high negative) to 1 (high positive) in the matrix interface or Gird tab (Figure 9). This interface lists all factors included in the model on the *i* and *j* axes and represents the concept map in the form required for matrix algebra calculations. Any changes made to the matrix version of the model will affect the schema built in the modelling interface.

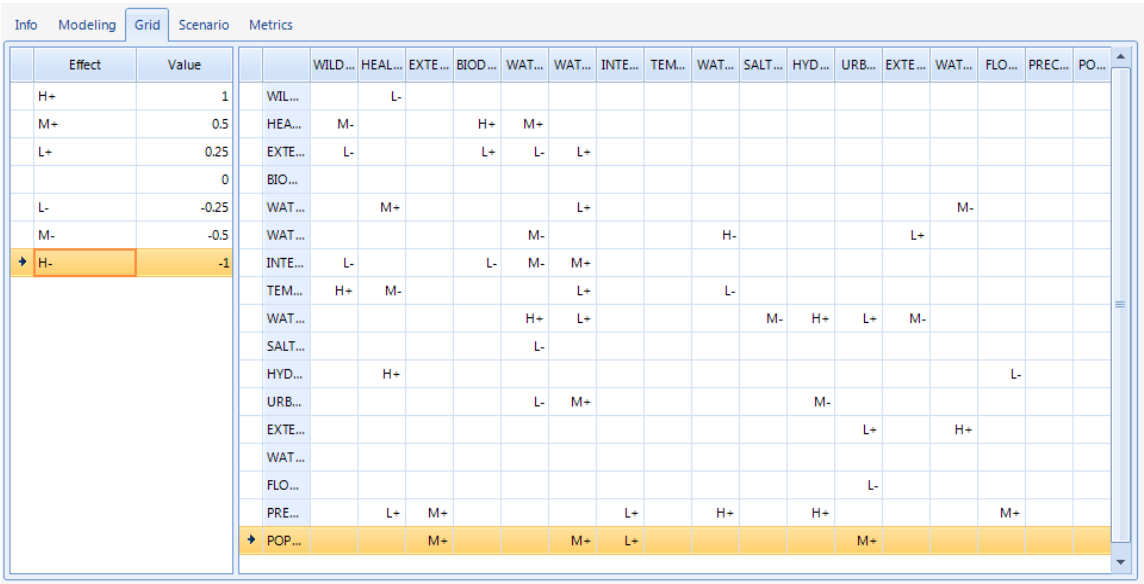


Figure 9. Matrix interface or Grid tab in Mental Modeler.

Once the factors and their relationships have been defined and a final model version is available, CSRB partners are asked to add descriptions on the factors and reasons behind the edge-relationships. These descriptions will be first added to the written basin narrative document (Annex II, DLV 2.3.2 “Protocol for formulating Water Management Options”). The written narrative document will be used as a reference document to add the information required in this step, so to avoid duplications, double work and inconsistencies. The users will just copy and paste the information contained in Tables II.2 and II.3 of the referred protocol into the “Notes” option in Mental Modeler (see instructions below).

The concept mapping interface includes additional functionality enabling the concept map to be layered with additional information. This is done through the “Notes” option within both the factors (Figure 10, 1) and the relationships (Figure 10, 2).

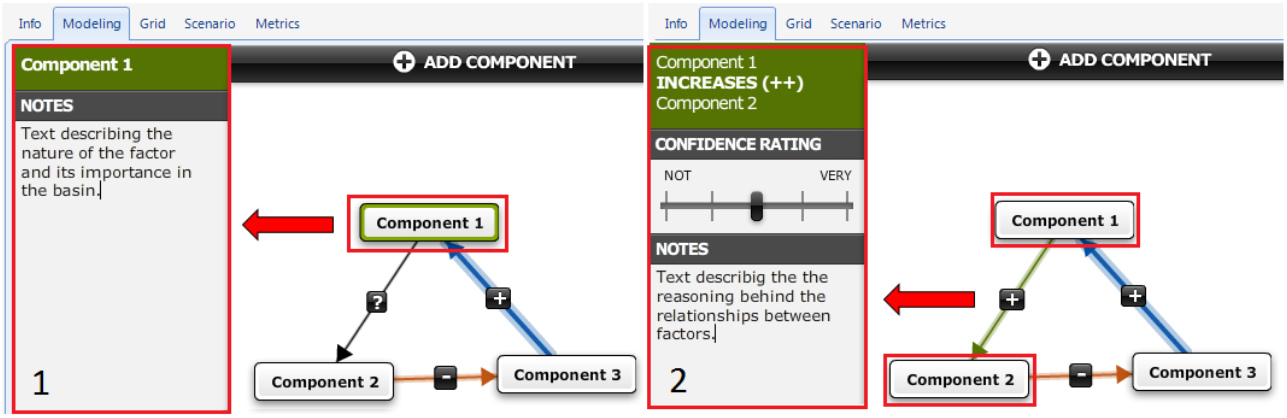


Figure 10. Adding notes about factors and reasons behind edge-relationships

Additionally but not compulsorily, users can add the degree of confidence (Confidence Rating) about the existence of the relationship on a 5 point Likert scale from Not confident to Very confident, as well as define the unit measurement that might be used to collect data to validate

perceived relationships between components. All these features are intended to encourage users to support their claims with evidence and to define the degree of uncertainty within their claims.

3.2.4 Saving and exporting maps

Once the model has been set up, two files which will be uploaded to Aquaknow should be generated:

1) A Mental Modeler file (mmp file format): it corresponds to an eXtensible Markup Language file were all the information contained in the project is saved (factors, edge-relationships, weights and notes) (Figure 11, a)

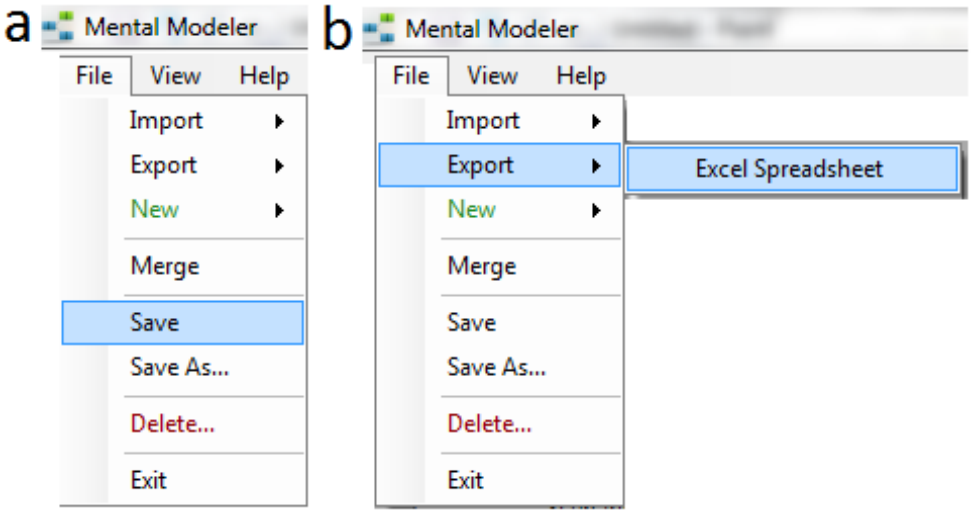


Figure 11. Saving models and exporting model information to Excel

2) An Excel Spreadsheet where, among others, the matrix tables and summary statistics of the model are exported into an Excel readable file. (Figure 11, b and Table 1)

	WILDFIRE	HEALTH O	EXTENSIV	BIODIVERS	WATER QU	WATER US	INTENSIVE	TEMPERA	WATER QU	SALT INTR	HYDRO - G	URBAN EX	EXTERNAL	WATER CO	FLOOD\n	PRECIPITA	POPULATION
WILDFIRE	0	-0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HEALTH OF ECOSYSTEMS Forests, Wetla	-0.5	0	0	1	0.5	0	0	0	0	0	0	0	0	0	0	0	0
EXTENSIVE/ TRADITIONAL AGRICULTUR	-0.25	0	0	0.25	-0.25	0.25	0	0	0	0	0	0	0	0	0	0	0
BIODIVERSITY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WATER QUALITY rivers and aquifers	0	0.5	0	0	0	0.25	0	0	0	0	0	0	0	-0.5	0	0	0
WATER USES Tourism, Urban, Industry,	0	0	0	0	-0.5	0	0	0	-1	0	0	0	0.25	0	0	0	0
INTENSIVE AGRICULTURE LAND USE	-0.25	0	0	-0.25	-0.5	0.5	0	0	0	0	0	0	0	0	0	0	0
TEMPERATURE	1	-0.5	0	0	0	0.25	0	0	-0.25	0	0	0	0	0	0	0	0
WATER QUANTITY rivers and aquifers	0	0	0	0	1	0.25	0	0	0	-0.5	1	0.25	-0.5	0	0	0	0
SALT INTRUSION	0	0	0	0	-0.25	0	0	0	0	0	0	0	0	0	0	0	0
HYDRO - GEO- MORPHOLOGICAL QUALI	0	1	0	0	0	0	0	0	0	0	0	0	0	0	-0.25	0	0
URBAN EXPANSION Scattered houses,	0	0	0	0	-0.25	0.5	0	0	0	0	-0.5	0	0	0	0	0	0
EXTERNAL WATER Tranfered or produ	0	0	0	0	0	0	0	0	0	0	0	0.25	0	1	0	0	0
WATER COST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLOOD\n DAMAGE	0	0	0	0	0	0	0	0	0	0	0	-0.25	0	0	0	0	0
PRECIPITATION	0	0.25	0.5	0	0	0	0.25	0	1	0	1	0	0	0	0.5	0	0
POPULATION	0	0	0.5	0	0	0.5	0.25	0	0	0	0	0.5	0	0	0	0	0

Table 1. Example of an Excel sheet (Matrix table) exported from Mental Modeler.

As commented in section 3.2.2, the naming of the file should make reference to the basin it has been created for and to the creation date of the model:

FCM_RiverBasinName_YYYYMMDD

(i.e.FCM_TorderaBasin_20141215, FCM_TorderaBasin_20150315, etc.)

3.3 Integrating information in Aquaknow

3.3.1 Accessing the BeWater Group

This group can be accessed through the following link: http://www.aquaknow.net/en/be-water/

The BeWater Group is a private group, which means that the group has restricted access to its content and that permissions are granted under request and validated by web-managers. It is supposed that partners of each CSRBs or at least managers contributing with their information will request an account in order to be able to start the integration process. In addition, any potential user, stakeholders or researchers involved in the project whiling to access the information will also have the opportunity to ask for an account and access the group, and so to consult the information and the Fuzzy Cognitive Maps. The information contained in the platform is key to make the scientific information of the project accessible to a wide number of users and to disseminate the project databases.

A request for a new account can be done at http://www.aquaknow.net/en/user/register Users must insert all the mandatory information (*) like Username, Email address, Country. In the "About Yourself" text-field the term "BeWater" should be added in order to give the administrator information to let the user join the group.

Once an account has been created, the user will have the option to access the BeWater group:

1) Log in to Aquaknow and click in the "community tab" (Figure 12)

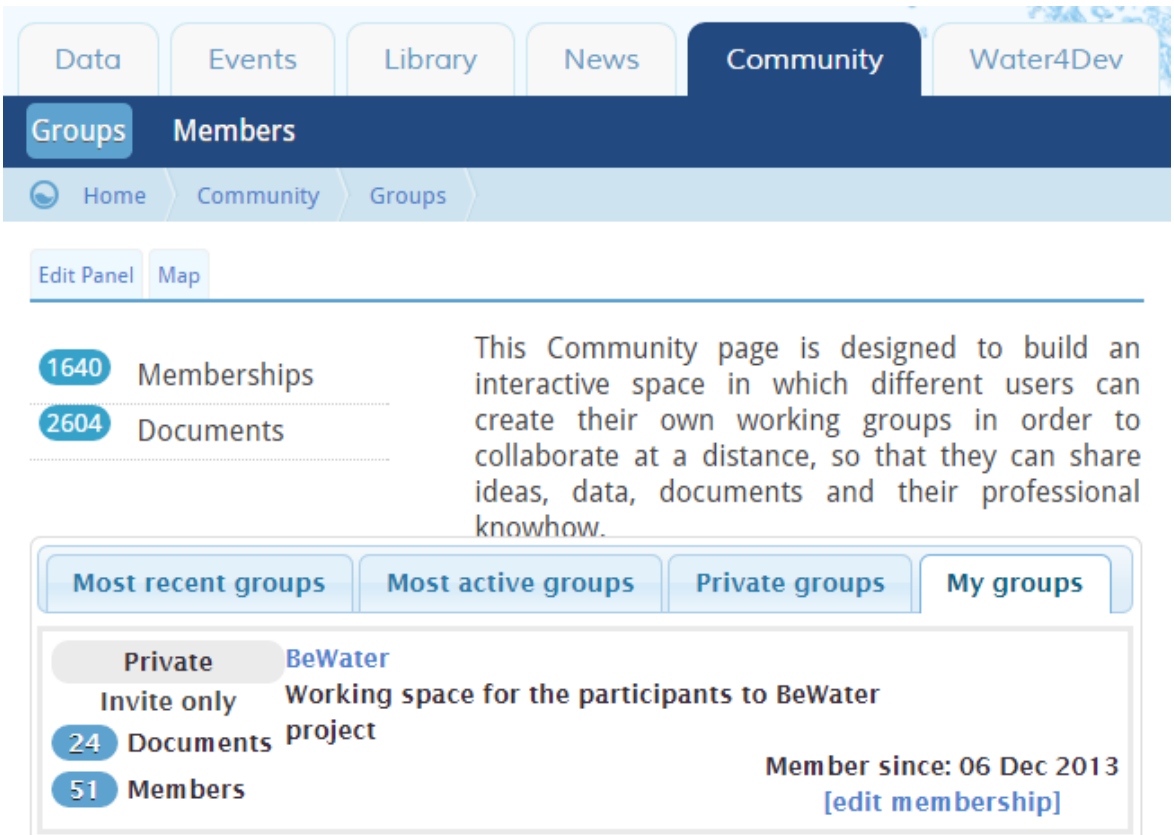


Figure 12. Accessing the BeWater group in Aquaknow.

2) Accessing BeWater private group (Slovenia, Spain, Cyprus or Tunisia)

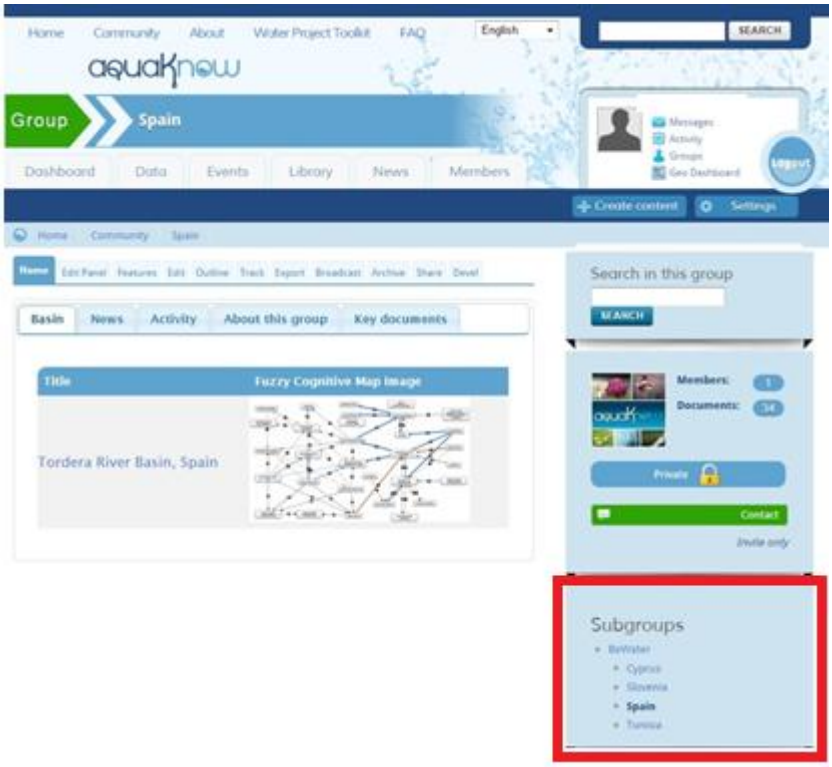


Figure 13. Accessing BeWater subgroups.

3.3.2 Creating the basin's narrative framework

Each single case study within BeWater should first create a basin narrative framework, which is the general structure where all the information will be integrated. The required steps are the following:

1) Create content and choose the option "Basin"

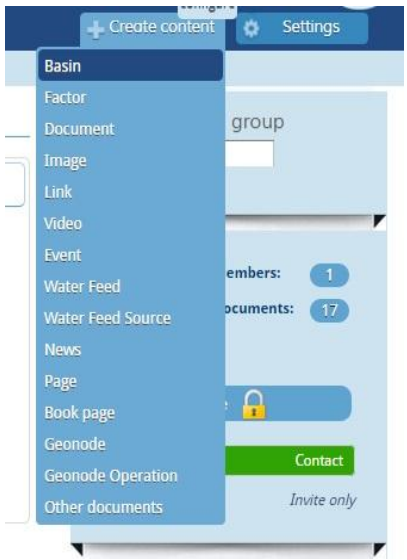


Figure 14. Creating Basin content (a standardized structure)

2) A form will appear in which the user can start creating the Basin structure and adding information in the appropriate fields;

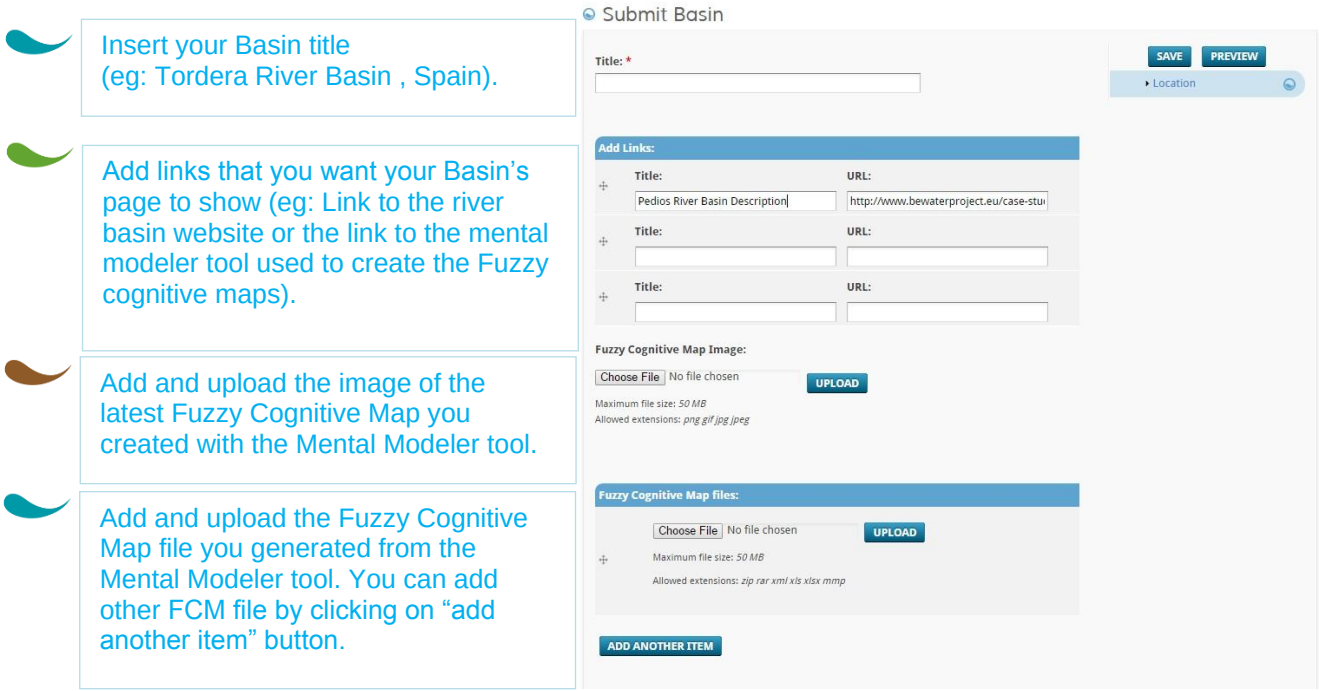


Figure 15. Filling the standardized structure form.

3) Once the user will have inserted and saved the needed information in the dedicated fields the information added will look as shown below:

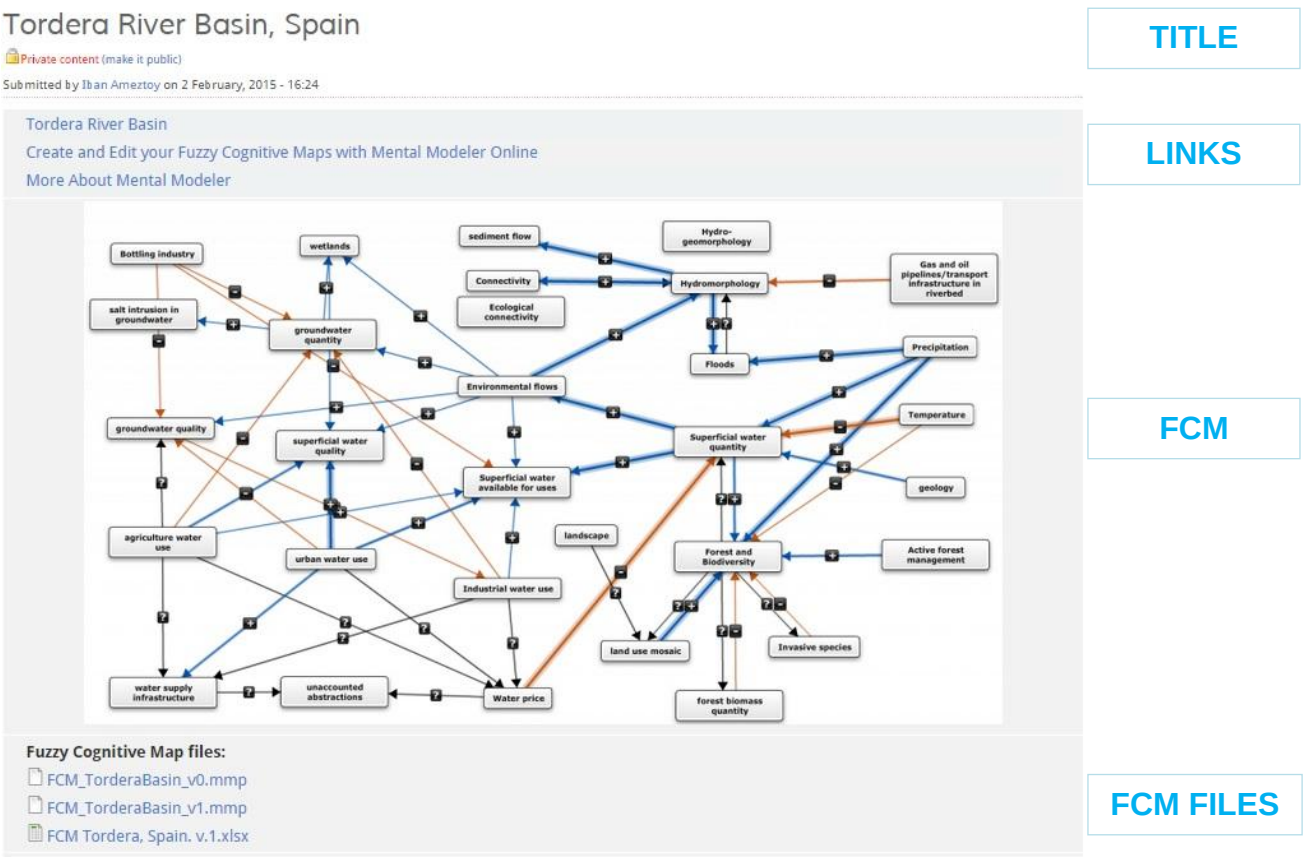


Figure 16. An example on how the structure (block A) will look like after saving the changes.

3.3.3 Editing the Basin structure and adding information

Once the main structure have been created and in order to add factors, qualitative information, governance aspects and other relevant information, users should enter the structure (Figure 17) and edit the form (Figure 18):

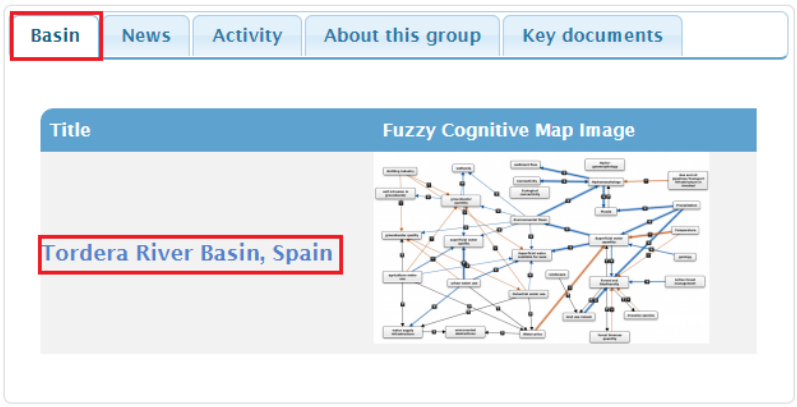


Figure 17. Accessing an already existing structure in Aquaknow.

Figure 18. Editing an already existing structure.

After entering the form, the user can start adding or editing its content.

It should be clarified that information related to factors, qualitative information, governance aspects and other relevant information will be first created and linked afterwards to the main structure using their names as linking references.

The structure, and so the optional fields within these contents have been adapted to the underlying methodology characteristics. Qualitative information, Governance Aspects and “any other information” share the same structure, and the option to create them can be found in the main content form.

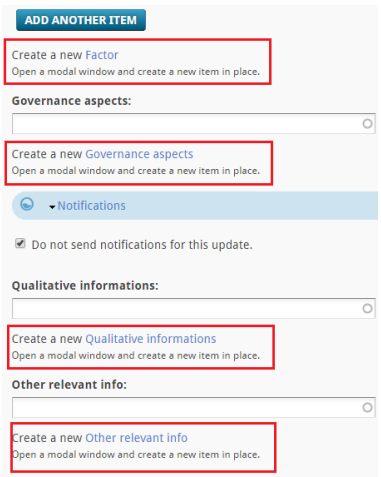


Figure 19. Creating additional documents.

a. Creating a Factor

In Aquaknow creating a factor means creating the page in which the relative information of a specific factor contained in the Fuzzy Cognitive Map is illustrated and explained. The steps to follow are the following:

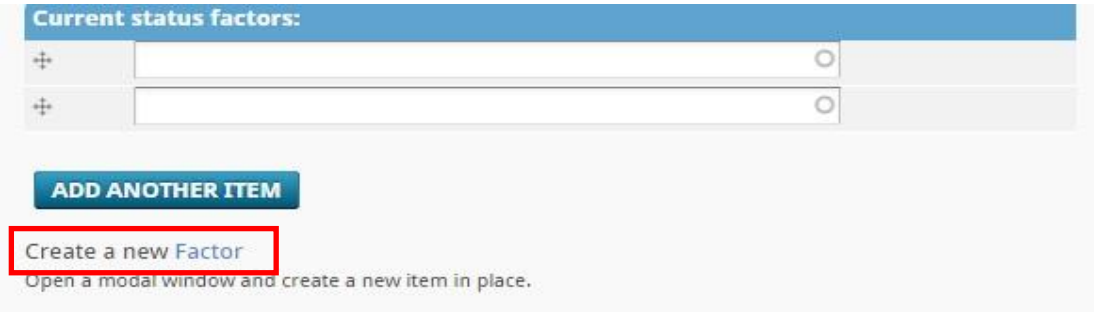
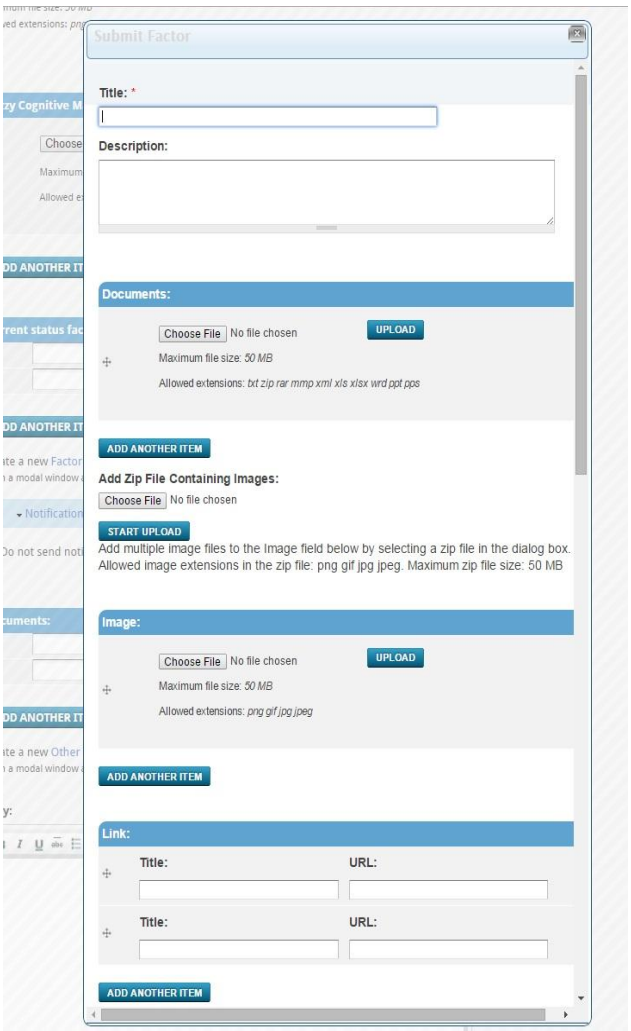


Figure 20. Creating a new factor.

Push the "**create a new factor"** option. A pop-up as illustrated below (figure 21), will appear allowing you the user to add the relative information of the factor of interest.



The user will have to complete the information fields regarding the factor being created such as:

1. Title
2. Description
3. Related document
4. Image (zip file also allowed)
5. Link

These are not mandatory fields however the more information is given to a factor the more interesting and useful it becomes.

Once the information are inserted, to be published the user will have to click **"save".**

Figure 21. Required fields to create a new factor.

Once the user will have created and saved a new factor, the user will have to add the factor's name in the "**current status factor**" field as shown below. Automatically Aquaknow will show a list of factors to pick from (Figure 22).
The user can add as many factors to the list as the user wishes by simply clicking on "**add another item**" tab. Nevertheless, the number of factors that the user should add correspond to the factors identified in the Fuzzy Cognitive Map.
In the example shown below (Figure 22) the **bottling Industry factor** of the Tordera Basin (Tr) is being inserted.

Figure 22. Linking the created factors to the main structure

By doing so the user is basically adding a list of factors that will then appear in their river basin framework under the "**Current Status Factors section**" as shown below (figure 23):

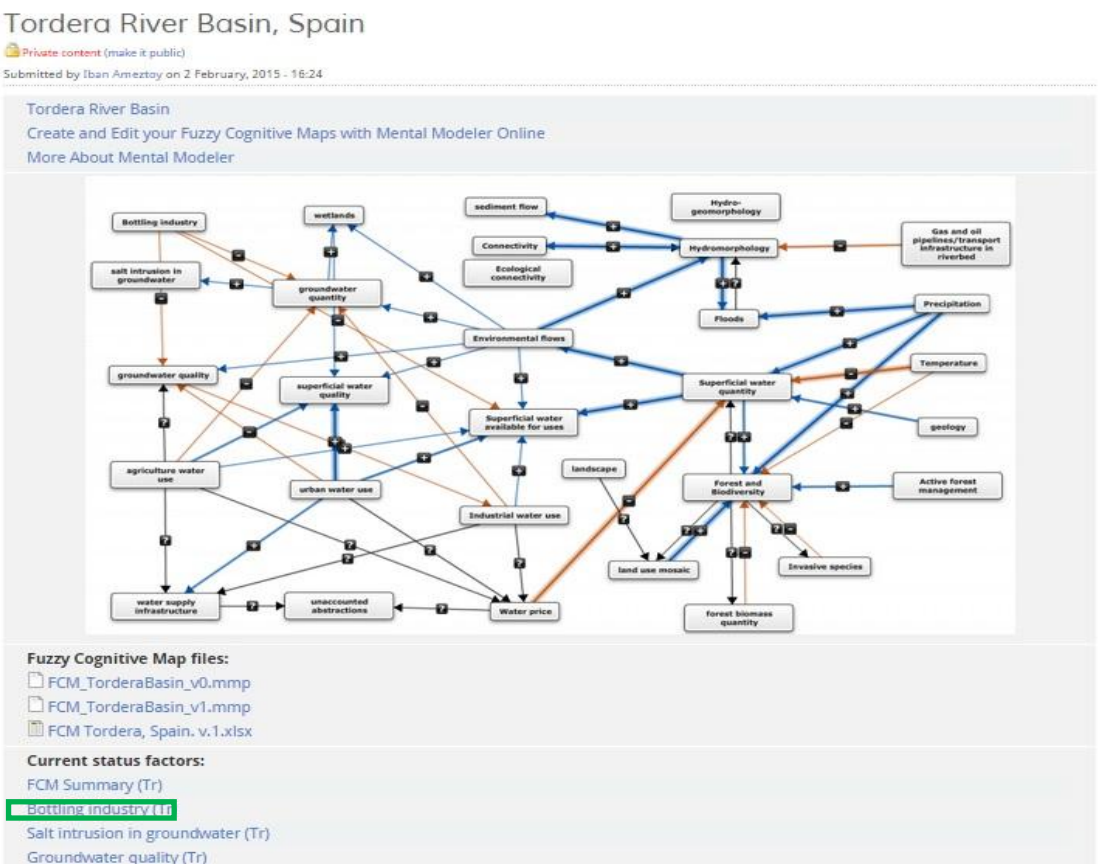


Figure 23. Factor added to the main structure.

The user by clicking on the related factor (e.g. bottling industry) will then have access to more detailed information that has been inserted when the factor was created (Figure 24).

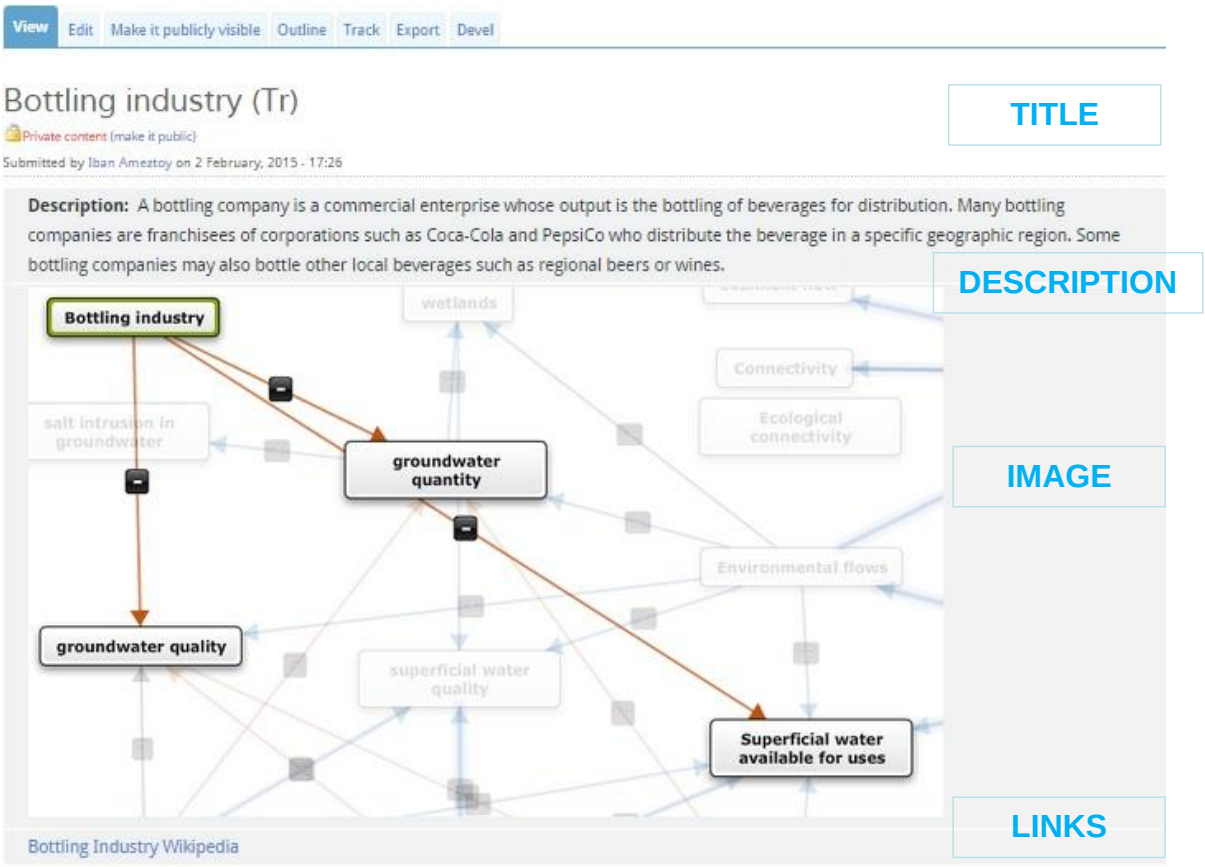


Figure 24. Example on how the information within a factor will look like.

b. Adding other documents

Within this category users can upload three kind of documents; Qualitative information, Governance aspects and other relevant information which has been identified in the tables designed in protocol 3.1. The procedure is similar to the one explained in the “adding factors” section. Adding other documents means creating the page in which the relative information of a specific document type will be stored (documents, links and descriptions). The steps are the following:

1) In the general structure, select from the list of options the document type you want add information for (Figure 25).

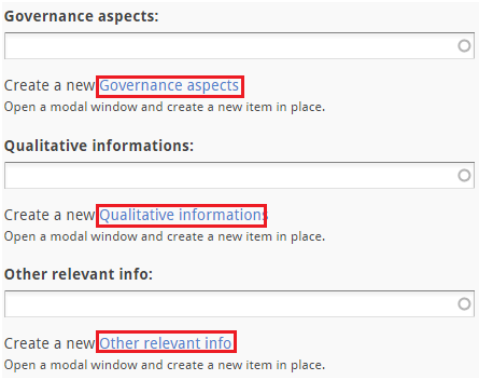


Figure 25. Options to create additional documents.

2) Complete the information fields for the selected document type (Figure 26):

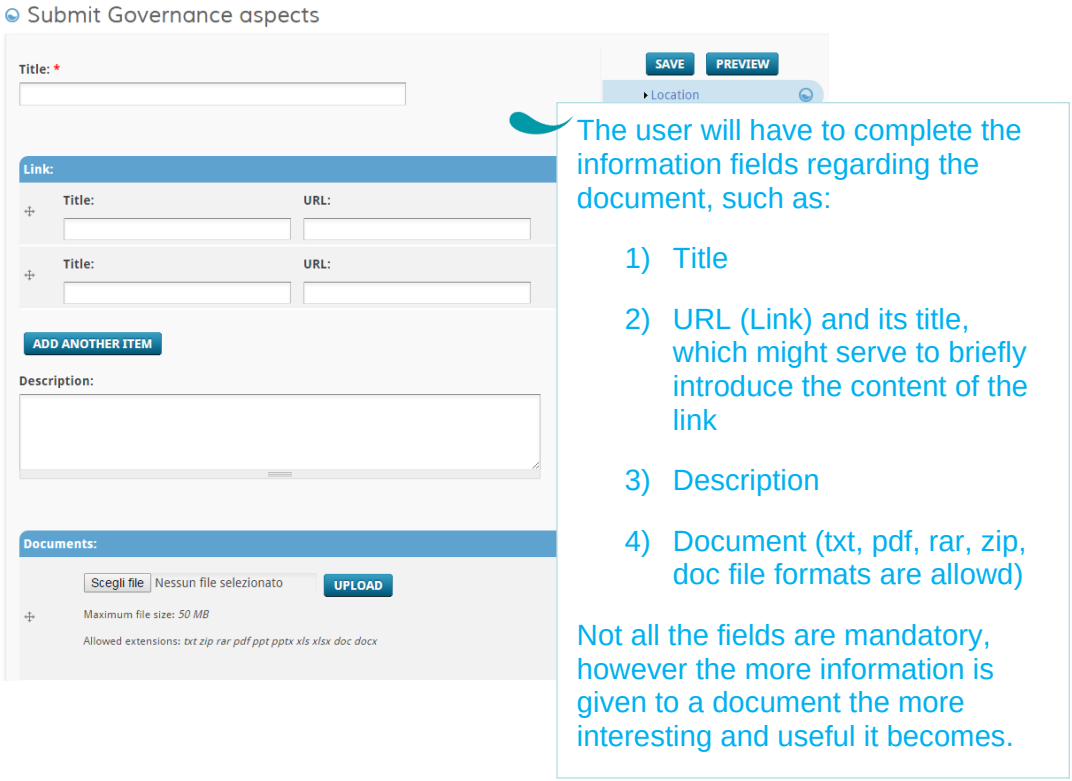


Figure 26. Information fields required to create additional documents.

3) Saving the form, the information will be added to the basin structure framework.

3.3.4 Creating GeoMetadata for Quantitative information

The geo-metadata form is a special section within the structure designed to be used as a repository of quantitative data sources. It is based on the information collected in the quantitative fill-in tables (protocol 3.1) and it has been created in order to avoid, among others, raw data sharing issues (Annex I).

Metadata usually refers to a particular data type, and so due to this reason the created metadata forms should be associated with the factors identified in the Fuzzy Cognitive Maps (protocol 3.2 and deliverable 2.3.2). For example, if a quantitative data source covers climatic topics (i.e. temperature), the geo-metadata link must be added within the Temperature factor, and so the quantitative metadata will be added to it. In this way, future users will have the option to access quantitative information sources and their characteristics associated with a given factor, and so, if considered appropriate, access or request raw data to the owner institution.

The template has been created following some of the recommendations of the Inspire Metadata implementing rules, mainly those included in the Metadata elements section. This Directive, 2007/2/EC, lays down general rules for the establishment of the Infrastructure for Spatial Information in the European Community. In its first article states that it is necessary for a user to be able to find spatial data sets and services and to establish whether they may be used and for what purpose. It also recommends to provide descriptions in the form of metadata for those spatial data sets and services. Since such metadata should be compatible and usable in a Community and trans-boundary context, it is necessary to lay down rules concerning the metadata used to describe those data sets and services. So even the directive is not strictly applied in the present framework, its guidelines have served to build the metadata fields.

The module can be accessed through the “about this group” tab within the BeWater group;

http://www.aquaknow.net/en/be-water/node/add/geometadata

A form will be shown where the user is requested to fill different fields. It is recommended to provide as much information as possible in order to give a detailed description of the data set of interest (A detailed description about each of the requested fields can be found in Annex IV).

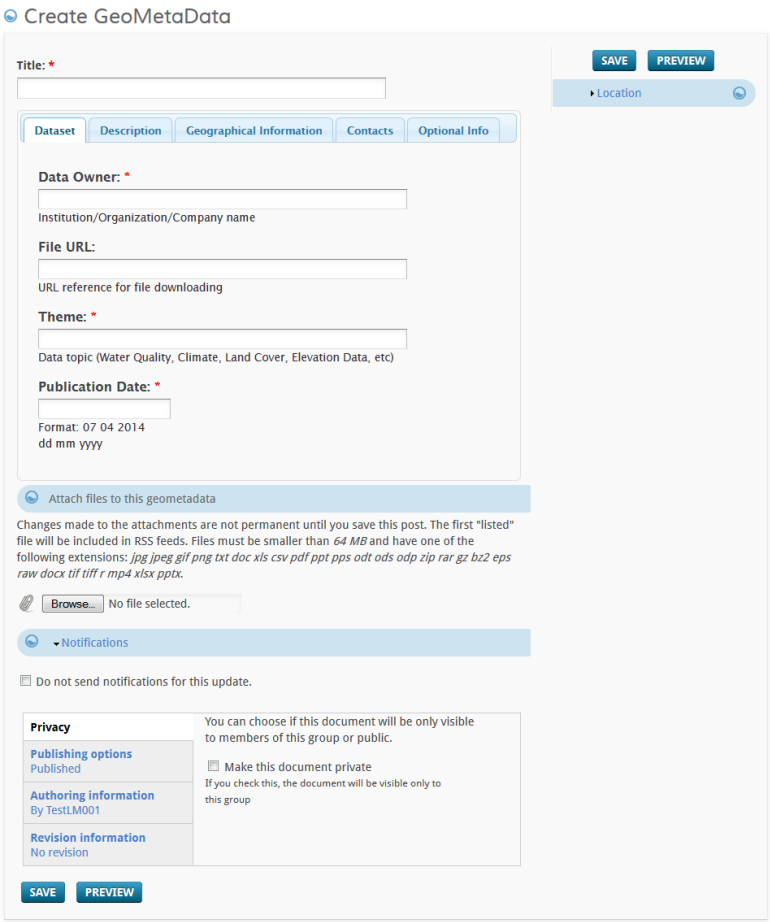


Figure 27. Requested fields to create geometadata nodes for Quantitative Information.

Steps to follow:

1) Access the metadata module, fill the form (Figure 27) and save it;
2) Once the GM is created copy the url;
   (i.e. http://www.aquaknow.net/en/be-water/node/20292)
3) Identify which is the factor this geo-metadata form belongs to;
4) Go to the Basin structure and select the edit option;
5) Look for the target factor and edit it;
6) Add the title and the link you have copied before (Figure 28) and save the changes.

The metadata will be associated the selected factor.

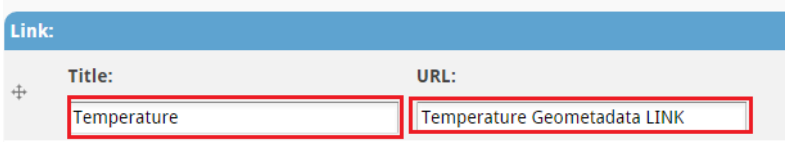


Figure 28. Linking geometadata with factors.

3.3.5 Adding spatial datasets to Aquaknow

The Geographic Information Systems (GIS) module within Aquaknow and specifically within the BeWater group might be seen as a complementary data integration tool. In this sense, it has been stated that at the moment and due to the data peculiarities, the core repository of quantitative information would remain in the GeoMetadata module. Nevertheless, if the users consider appropriate to add georeferenced data, Annex V contains a description of the different available options and guidelines to complete the uploading process.

Annex I – About Quantitative Information

From a quantitative information point of view, it's necessary to know what data is currently available to characterize the basins, which are their main characteristics in terms of spatial and temporal resolution, formats, descriptions, source references, permissions, etc. In this sense, the European Forest Institute designed and sent to the CSRB partners a table requesting this information. It was mainly focused on quantitative data for current and future projections, and topics like water (hydrology, groundwater, quality, etc.), climate, land uses, etc. were included.

As often happens when gathering environmental data, this first survey showed its diverse and heterogeneous nature (table 2), both from a technical and probably from a data model point of view.

Some of the detected and most common issues are:

- The nature of the data itself for a given topic (e.g. Hydrology: water level vs information on dams vs. modelled hydrologic cycle)
- Availability and number of datasets depending on the CSRB.
- Different spatial resolutions and scales.
- Different acquisition periods and frequencies.
- Many different format types, some non georeferenced
- Lack of information.
- Data accessibility (restrictions)

		CYPRUS			SLOVENIA	
Future	TYPE	Description	FORMAT		Description	FORMAT
	Water availability	Analysis of future stream flow (in process)			Estimation stream flow and GW level changes	doc,...
	Climate data	rainfall, Tmin, Tmax	ascii-raster	restricted	Temp./Precip. Change	doc, pdf
	Future land use-agriculture				Prediction Water availability, etc.	doc, pdf
	Future Land uses-Urban				Potentially significant flood risk areas	shp
	Future land uses-forestry				Assessment of vulnerability	pdf
	Land uses-industry				Potentially significant flood risk areas	shp
	other relevant future projections/scenarios				recommendation on adaptation regarding natural hazards	doc, pdf
Present						
	Water flow	daily mean flow	excel	restricted	Streamflow data, temperature, transport of material	xls
	hydrology	information on damn	pdf		Water level and level of precipitation	xls
	groundwater	existing but not available			Level of underground water, some water quality data	xls
	water quality	some existing but not available			Water analysis data (T, ph, O2, COD, BOD, etc.)	xls
	Climate data	Daily rainfall, Tmin, Tmax	csv	restricted	Climatological stations data (wind speed, direction, air temp,...)	xls
		Daily gridded rainfall, Tmin, Tmax	Ascii-raster	restricted		
	Extreme events	List of flood events	pdf		Water level, dates, return periods of extrem P,...	doc, xls
	Land Cover/Land Use	Corine 2006	shp	open (EEA)	CORINE 1995, 2000	shp
	Elevation data	Elevation model	Ascii-raster	restricted	DEM	ascii
	Digital orthophotos	Google Earth			Scanned ortophoto	tiff, MrSID
	Soils	Soil maps 1961, 1970, 1999	shape	restricted	Pedological maps	shp
	Geology	Geological map	shape	restricted	Geological map	shp
	User agriculture	Land zone maps	pdf		Land Cadastre // National Land use data	xls, shp
		Claimed agricultural plots	shape	restricted		
		Agricultural water use				
	Uses Urban	Land zone maps	pdf		Land Cadastre // National Land use data	xls, shp
		Population by community				
	Uses-forestry	Land zone maps	pdf			
		State forest maps	pdf	restricted	Land Cadastre // National Land use data	xls, shp
	Uses-industry	Land zone maps	pdf		Industrial buildings, water consumption, etc.	xls, shp
	Other relevant uses				Data on overgrowing areas	ascii
	Water related infrastructures	Tamasos Dam	pdf		Water accumulation	shp
	Other infrastructures relavant in the river basin				Highways, rodas,...	shp

		SPAIN		TUNISIA	
Future	TYPE	Description	FORMAT	Description	FORMAT
	Water availability	SWAT model // stream flow, PET, future water demand	ascii		
	Climate data	A2/ECHAM5 and B1/ECHAM5 downscaled	ascii		
		Future climate analysis	ascii		
	Future land use-agriculture	Future agric. Water demand	raster		
	Future Land uses-Urban	Land use, population and water demand scenarios 2030	raster and ascii		
	Future land uses-forestry	Future simulation of main forest species evolution	ascii		
		Climate suitability of main forest species	ascii		
		Future simulations of fire risk	raster		
	Land uses-industry	Two future land use scenarios 2030	raster		
		Two future water demand scenarios 2030	raster		
	other relevant future projections/scenarios				
Present					
	Water flow	Stream flow data	ascii	discharge data	txt/excel
	hydrology	modelled hydrologic cycle information	ascii	Rainfall data	txt/excel
	groundwater	Characterization of all aquifers, groundwater flux, etc.	Maps and tables	?	
	water quality	Indicators to define ecologic status of water bodies	tables	Water quality at the dam	
	Climate data	Digital Climatic Atlas	raster	Temperature and Evaporation	txt/excel
		Daily meteorological station data	ascii		
		Historical climatic series analysis	ascii		
	Extreme events	Metereological drought index calculations	ascii	Data series can display exceptional events	
		Socio-economical drought registers	document		
		Flooding plan	map (pdf)		
	Land Cover/Land Use	Corine LC (1990, 2000) and Local LC map (1993, 2000, 2	raster	yes 2004	shp
	Elevation data	DEM	raster	yes	shp
	Digital orthophotos	Orthophotos	raster	need to be purchased	
	Soils	Tordera Soil map	raster	yes	shp
	Geology	Geological map of Catalonia	raster	yes	jpeg
	User agriculture	Distrib of main crops	raster	Land use map	shp
		Agricultural water uses	ascii		
		Agriculture water uses stimation	graphic/tables		
	Uses Urban	Urban water uses	ascii	Data being gathered	
		Population in the basin	ascii		
	Uses-forestry	Main forest areas	raster, ascii	Some and the rest is being gathered	shp
	Uses-industry	Location	raster	Data being gathered	
		Industry water uses	ascii		
		Industry water uses stimations	graphic		
	Other relevant uses	Bottling industry, non consumptive uses, recreative uses	tables aggregated data	Mineral water/thermal station	
	Water related infrastructures	dams, channeling, desalting, potabilization, etc.	raster and tables aggregated data	Different size of reservoirs, etc.	shp
	Other infrastructures relavant in the river basin	Highways, pipelines	raster, unknown	Data being gathered	

Table 2. Summary of some dataset characteristics

These issues were taken into account when designing the characteristics of the integration schema within Aquaknow, giving the process enough flexibility to receive any kind of data. The definition of these issues has also served as a reference when writing the guidelines for the harmonization process in order to guarantee a common structure between the four different basins.

It has to be considered that data gathering, its characterization, harmonization and integration must be seen as an iterative process, meaning that the proposed schema as well as any other future step can be changed and enriched when new requirements arise.

Annex II – Required data types

- Basin

Label	Name	Type	Operations
Title	Node module form.		
Link	field_basin_link	Link	Configure Remove
Fuzzy Cognitive Map Image	field_bacin_image	File	Configure Remove
Fuzzy Cognitive Map Files	field_basin_mmp	File	Configure Remove
Current status factor	field_basin_factor	Node reference	Configure Remove
Governance aspects	field_basin_governance	Node reference	Configure Remove
Qualitative informations	field_basin_qualitative_info	Node reference	Configure Remove
Other relevant info	field_basin_other_relevant	Node reference	Configure Remove

- Factors

Label	Name	Type	Operations
Title	Node module form.		
Description	field_factor_description	Text	Configure Remove
Image	field_factor_image	File	Configure Remove
Documents	field_factor_documents	File	Configure Remove
Link	field_factor_link	Link	Configure Remove
Video	field_factor_video	Embedded Video	Configure Remove

- Additional information (qualitative information, governances aspects, other relevant information)

Label	Name	Type	Operations
Title	Node module form.		
Link	field_governance_aspect_link	Link	Configure Remove
Description	field_governance_doc_descr	Text	Configure Remove
Documents	field_governance_aspects_doc	File	Configure Remove

- GeoMetadata strucutre

Label	Name	Type
Title	Node module form.	
Dataset	group_bw_dataset	Standard group
Data Owner	field_bw_data_owner	Text
File URL	field_bw_filename	Text
Theme	field_bw_theme	Text
Publication Date	field_bw_publication_date	Date
Description	group_bw_description	Standard group
Short Abstract	field_bw_short_abstract	Text
Data Type	field_bw_data_type	Text
Spatial Resolution	field_bw_spatial_resolution	Text
Temporal Extent	field_bw_time_frame_scale	Text
Temporal Resolution	field_bw_temporal_resolution	Text
Quick Look	field_image_0	File
Geonode Reference	field_bw_geonode_ref	Node reference
Geographical Information	group_bw_geo_info	Standard group
Extent	field_bw_description	Text
Bounding Coordinates	field_bw_bounding_coord	Text
Reference System	field_bw_reference_system	Text
Contacts	group_bw_contacts	Standard group
Organization	field_bw_organization	Text
Person	field_bw_person	Text
Email address	field_bw_email_person	Text
Phone / Email / Website	field_bw_phone_email_web	Text
Optional Info	group_bw_optional_info	Standard group
Creation Date	field_bw_creation_date	Date
Lineage Statement	field_bw_lineage_statement	Text
Progress	field_bw_progress	Text
Maintenance and Update Frequency	field_bw_maintenace_update	Text
Format	field_bw_format	Text
Medium	field_bw_medium	Text
Fees and terms	field_bw_fees_terms	Text

Annex III – Factsheets for Quantitative and Qualitative data (metadata fill-in tables)

Factsheet for quantitative data: current situation

QUANTITATIVE data on the CURRENT situation					
WATER FLOW: do you have information on stream flow data? Is the RB a gauged basin? Do you have historical/current data of stream flow?					
Description of available data	Number of gauging stations and location	Spatial resolution	Time frame/scale	Format of the data	Reference/ source of information
HYDROLOGY: do you have information on the hydrology of the river basin? Is there available information on the hydrological structure of the basin and its water balances?					
Description of available data		Spatial resolution	Time frame/scale	Format of the data	Reference/ source of information
GROUNDWATER: is there any data available on groundwater? Do you have historical/current data of groundwater levels and/or groundwater springs?					
Description of available data		Spatial resolution	Time frame/scale	Format of the data	Reference/ source of information
WATER QUALITY: is there any data available on the water quality? Do you have historical/current data of water quality?					
Description of available data		Spatial resolution	Time frame/scale	Format of the data	Reference/ source of information
CLIMATE DATA: Do you have historical/current climate data?					
Description of available data		Spatial resolution	Time frame/scale	Format of the data	Reference/ source of information
EXTREME EVENTS: Do you have information on historical extreme events that have taken place in the RB (e.g. droughts, flooding) and associated damages?					
Description of available data		Spatial resolution	Time frame/scale	Format of the data	Reference/ source of information
LAND COVER /LAND USE: Are there land cover maps available?					
Description of available data		Spatial resolution	Time frame/scale	Format of the data	Reference/ source of information
ELEVATION DATA: Are there any digital elevation models of the RB available?					
Description of available data		Spatial resolution		Format of the data	Reference/ source of information

QUANTITATIVE data on the CURRENT situation			
DIGITAL ORTHOPHOTOS/SATELLITE IMAGES: Are there any digital orthophotos/satellite images of the RB available?			
Description of available data	Spatial resolution	Format of the data	Reference/ source of information
SOILS: are there soil maps of the RB available?			
Description of available data	Spatial resolution	Format of the data	Reference/ source of information
GEOLOGY: are there geological maps of the RB available?			
Description of available data	Spatial resolution	Format of the data	Reference/ source of information
USES-AGRICULTURE: what type of information exists on the agricultural uses of the basin? What is the water consumption of the agrarian uses? What are the main crops grown and where are these located (land use maps)? What is the contribution of the industries to the economy of the basin (e.g. benefits/year, number of employments generated)?			
Description of available data	Spatial resolution	Format of the data	Reference/ source of information
USES-URBAN: What type of information exists on the urban areas in the basin? Are there fluctuations in the people living in the basin along the year? What is the water consumption share of the urban areas? What is the contribution of the tertiary sector to the economy of the basin (e.g. benefits/year, number of employments generated)?			
Description of available data	Spatial resolution	Format of the data	Reference/ source of information
USES-FORESTRY: Where are the main forest areas in the basin? What are the features of these forests (species, management)? Are there intensive plantations? Is there any study on how these forests affect water flows in the CSRB? What is the contribution of forestry to the economy of the basin (e.g. benefits/year, number of employments generated)?			
Description of available data	Spatial resolution	Format of the data	Reference/ source of information
USES-INDUSTRY: Where are the main industries located in the water basin? Is there any estimation of their share of water consumption? What is the contribution of industries to the economy of the basin (e.g. benefits/year, number of employments generated)?			
Description of available data	Spatial resolution	Format of the data	Reference/ source of information

QUANTITATIVE data on the CURRENT situation			
OTHER RELEVANT USES: are there other uses that are relevant in relation with water that have not being mentioned before in these sectors? (e.g. bottling plants) What is their contribution to the economy of the basin (e.g. benefits/year, number of employments generated)?			
Description of available data	Spatial resolution	Format of the data	Reference/ source of information
WATER RELATED INFRASTRUCTURES: what are the main infrastructures related with water in the basin? (e.g.: diversion dams, dikes, etc…)			
List of relevant infrastructures	Description of available data, including spatial data availability	Format of the data	Reference/source of information
OTHER INFRASTRUCTURES RELEVANT IN THE RIVER BASIN: What are the main infrastructures that you consider have an impact on the water uses in the river basin? (e.g. roads or highways)			
List of relevant infrastructures	Description of available data, including spatial data availability	Format of the data	Reference/source of information

Factsheets for quantitative data: future projections

QUANTITATIVE data on the FUTURE situation				
WATER AVAILABILITY: do you have information on projections of future stream flow? Is there any projection on future groundwater levels? Is there any projection on future water balances?				
Description of available data	Spatial resolution	Time frame/scale	Format of the data	Reference/ source of information
CLIMATE DATA: Are there any projections available on future climate?				
Description of available data	Spatial resolution	Time frame/scale	Format of the data	Reference/ source of information
FUTURE LAND USES- AGRICULTURE: Are there any projections on future land use scenarios for agricultural land use? Are there any projections on the future development of the agricultural sector and its likely contribution to the basin GDP?				
Description of available data	Spatial resolution		Format of the data	Reference/ source of information
FUTURE LAND USES-URBAN: Are there any projections on future land use scenarios for urban land use? Are there any projections available on future population scenarios in the RB? Are there any projections on the future development of the tertiary sector and its likely contribution to the GDP?				
Description of available data	Spatial resolution		Format of the data	Reference/ source of information
FUTURE LAND USES-FORESTRY: Are there any projections on future land use scenarios for forest land use? Are there any projections on the future contribution of the forestry sector to the basin GDP?				
Description of available data	Spatial resolution		Format of the data	Reference/ source of information
	☐Basin ☐Regional ☐National			
LAND USES-INDUSTRY: Are there any projections on future land use scenarios for industrial land use? What is expected to be the future contribution of the industrial sector to the economy of the basin?				
Description of available data	Spatial resolution		Format of the data	Reference/ source of information
	☐Basin ☐Regional ☐National			
OTHER RELEVANT FUTURE PROJECTIONS/SCENARIOS and OTHER RELEVANT STUDIES: are there other sectors not mentioned before for which future scenarios/plans/projections are available? Are there any other studies available that make projections for the whole basin?				

QUANTITATIVE data on the FUTURE situation			
Description of available data	Spatial resolution	Format of the data	Reference/ source of information
	☐Basin ☐Regional ☐National		

MAIN USES: What are the main uses in terms of water consumption, water quality in the basin? (e.g. wood plantation, industry uses).			
List these uses	These uses are relevant in terms of	Type of information existing on these uses	Reference/source of information
	☐Water Quality ☐Water Quantity ☐Both		

COMPETING USES: What are the main competing uses in terms of water consumption, water quality in the basin? (e.g. agriculture irrigation vs. summer tourism).		
List of these competing uses (possibly per pairs)	Type of information related to competing uses (e.g. irrigation data)	Reference/source of information

CONFLICTS AMONG THE DIFFERENT USERS: What are the main conflicts among the institutions/actors in the river basin due to water related issues? What are the reasons? (e.g. water quality, water quantity, water scarcity downstream/upstream…).			
Conflict description (brief)	Actors involved	Existing agreements	Initiatives in conflict solving (if any)

BEST PRACTICES IN WATER MANAGEMENT: Are there any initiatives ongoing in the basin that represent an example of sustainable management of the water resources in the basin?		
Brief description of the initiative	Actors involved	References/sources of information

LEGISLATION AND POLICIES AFFECTING MANAGEMENT PLANNING IN THE CSRB[2]: what are the policy instruments that affect directly or indirectly water management in the basin? Are there policies in place to mitigate the impact of climate change in the basin? This list includes policy instruments implemented by the governments (top-down) and bottom-up initiatives (such a NGOs signing agreements with landowners to conduct certain practices).		
Name of the policy instrument Describe it in terms of the problem it addresses and the objective(s) it tries to fulfill.	Type of policy instrument: * Economic (e.g. tax, subsidy) * Informational (e.g. campaign) * Legal (e.g. laws, norms)	Scale of application

WATER MANAGEMENT PLANS: Is there already a water management plan in place for the RB? Have some efforts been made to develop a plan? Was such a plan implemented following the WFD (For the European RBs)? If no plan is nowadays in place, is it foreseen to implement one?		
Description of available data	Format of the data	Reference/source of information

Factsheets for qualitative data on the current situation

QUALITATIVE data on the CURRENT situation			
MAIN USES: What are the main uses in terms of water consumption, water quality in the basin? (e.g. wood plantation, industry uses). *Please use a separate row for each identified use. Add as many rows as you need.*			
List these uses	These uses are relevant in terms of	Type of information existing on these uses	Reference/source of information
	☐Water Quality ☐Water Quantity ☐Both		
COMPETING USES: What are the main competing uses in terms of water consumption, water quality in the basin? (e.g. agriculture irrigation vs. summer tourism). *Please use a separate row for each competing use. Add as many rows as you need.*			
List of these competing uses (possibly per pairs)	Type of information related to competing uses (e.g. irrigation data)		Reference/source of information
CONFLICTS AMONG THE DIFFERENT USERS: What are the main conflicts among the institutions/actors in the river basin due to water related issues? What are the reasons? (e.g. water quality, water quantity, water scarcity downstream/upstream…). *Please use a separate row for each conflict. Add as many rows as you need.*			
Conflict description (brief)	Actors involved	Existing agreements	Initiatives in conflict solving (if any)
BEST PRACTICES IN WATER MANAGEMENT: Are there any initiatives ongoing in the basin that represent an example of sustainable management of the water resources in the basin? *Please use a separate row for each initiative. Add as many rows as you need.*			
Brief description of the initiative	Actors involved		References/sources of information
LEGISLATION AND POLICIES AFFECTING MANAGEMENT PLANNING IN THE CSRB[3]: what are the policy instruments that affect directly or indirectly water management in the basin? Are there policies in place to mitigate the impact of climate change in the basin? This list includes policy instruments implemented by the governments (top-down) and bottom-up initiatives (such a NGOs signing agreements with landowners to conduct certain practices). *Please use a separate row for each policy instrument or initiative. Add as many rows as you need.*			

QUALITATIVE data on the CURRENT situation		
Name of the policy instrument Describe it in terms of the problem it addresses and the objective(s) it tries to fulfill.	Type of policy instrument: * Economic (e.g. tax, subsidy) * Informational (e.g. campaign) * Legal (e.g. laws, norms)	Scale of application
		☐ Basin ☐ Regional ☐ National ☐ Supranational
WATER MANAGEMENT PLANS: Is there already a water management plan in place for the RB? Have some efforts been made to develop a plan? Was such a plan implemented following the WFD (For the European RBs)? If no plan is nowadays in place, is it foreseen to implement one?		
Description of available data	Format of the data	Reference/source of information

Annex IV - Description of Metadata fields in Aquaknow

Dataset tab

- Resource Title: which is a characteristic name by which the resource is known.
- File URL: In those cases where the data source is known the url link would point to the external service providing the original dataset.
- Theme or topic category which will assist in the grouping and topic-based search of available data resources.
- Publication date of the resource when available, or the date of entry into force.

Description tab

- Short Abstract: This is a brief narrative summary of the content of the resource.
- Data type: This fields classifies data into groups, the georeferenced ones which can be vector or raster files and “others”, those which refers to quantitative/qualitative data but with non geographical information.
- Spatial resolution: Refers to the level of detail of the data set. It shall be expressed as a set of zero to many resolution distances (typically for gridded data and imagery-derived products) or equivalent scales (typically for maps or map-derived products).
- Temporal extent: Defines the time period covered by the content of the resource. This time period may be expressed as any of the following: an individual date, an interval of dates expressed through the starting date and end date of the interval and a mix of individual dates and intervals of dates.
- Temporal resolution: Is the frequency with which data is collected or acquired.
- Quick Look: Gives the possibility to upload an image file of the data, it is specially thought for raster files but any kind of snapshot could be uploaded. It has a limit of 64MB.
- Geonode reference: If a given data set is integrated in the web-GIS (geonode creation), this reference gives the opportunity to link both the geometadata and the data.

Geographical Information tab

- Extent: It refers to the geographic location of the data set.
- Bounding coordinates: This is the extent of the resource in the geographic space, given as a bounding box. The bounding box shall be expressed with westbound and eastbound longitudes, and south-bound and north-bound latitudes in decimal degrees, with a precision of at least two decimals.
- Reference System

Contacts tab

- This table intends to compile the description and the contact information of the organization responsible for the creation and maintenance of the metadata. The description shall include the organization, person, email address and phone/website.
- **Optional Info tab**
- Creation Date: The date which specifies when the metadata record was created or updated.
- Lineage Statement: This is a statement on process history and/or overall quality of the spatial data set. Where appropriate it may include a statement whether the data set has been validated or quality assured, whether it is the official version (if multiple versions exist), and whether it has legal validity.
- Progress: States if the data generation is in process or if it is a final product.
- Maintenance and Update Frequency of the data set.
- Format: File format (TIFF, geoTIFF, PNG, shape, CSV, etc.)
- Medium and Fees and terms.

Annex V – webGIS tools in Aquaknow

A number of GIS tools have been developed and integrated within the AquaKnow platform (Figure 1). The GIS module includes many functionalities that can be summarized as follows:

- Find and download spatial datasets from the AquaKnow Geodata Library;
- Share data among registered members uploading data and maps into the system;
- Represent them in a map (geocoding tools) exploring data tables, customizing this maps/graphs;
- Perform simple spatial operations and visualize maps using the Map tool.

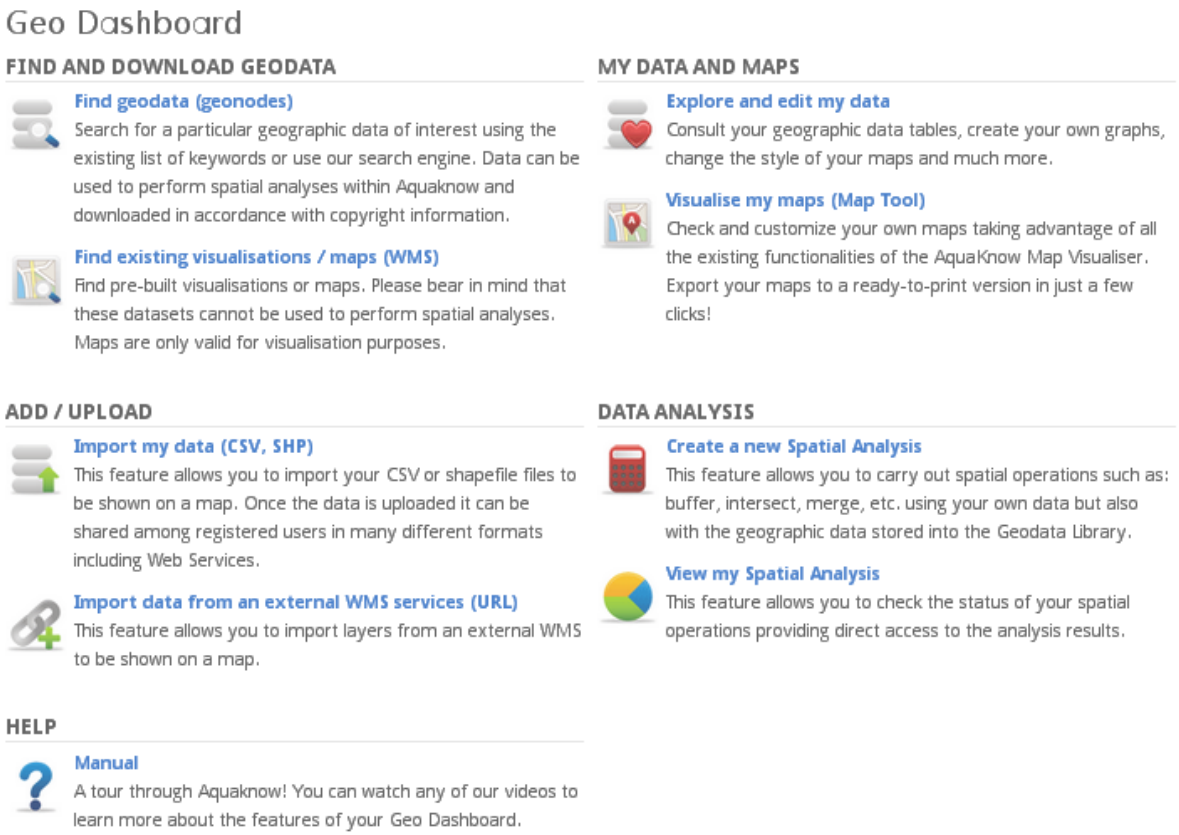


Figure 1. Overview of the AquaKnow Geo Dashboard including all the GIS tools developed as part of the GIS module.

- **The Aquaknow Geodata Library**

The AquaKnow Geodata Library is a repository of geographic data and pre-built visualizations/maps. This database includes a set of base layers such as administrative boundaries at different levels, satellite imagery and shade relief images that can be used as background imagery to produce maps (Figure 2).

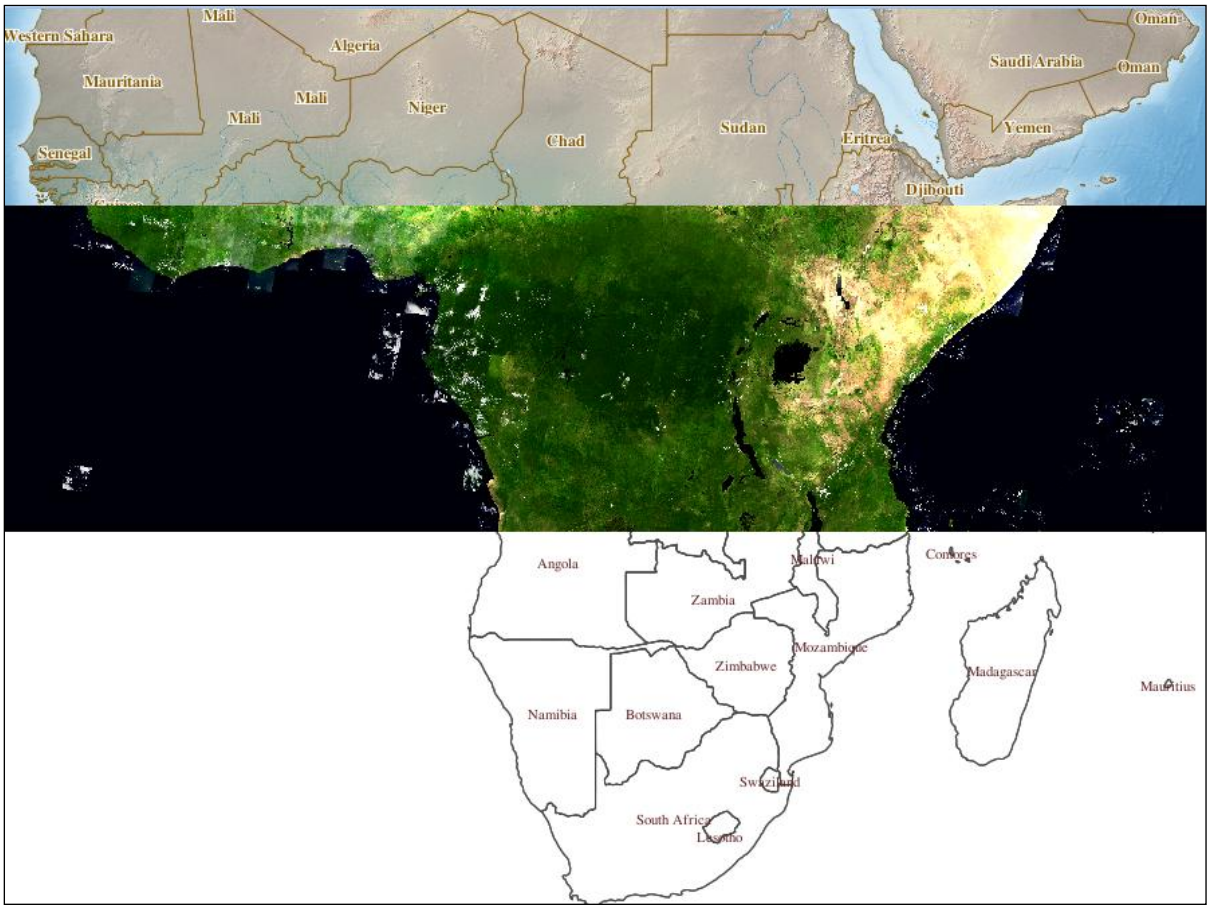


Figure 2. Background images or base layers that can be used for visualization purposes. From the top to the bottom: shade relief map, satellite imagery, and administrative boundaries map

It also includes data in the format of Web Map Services[4], coming from different organizations: Food Agriculture Organization (FAO), The Center for International Earth Science Information Network (CIESIN), United Nations Development Programme (UNDP), Programa GeoSur, Instituto de Hidrología, Meteorología y Estudios Ambientales (IDEAM) etc. Finally, it gives access to a set of indicators maps, covering environment, governance and human development topics.

Search tools are also available to find a particular geographic data or map in the library via the existing list of keywords or the search engine. In some cases data can be downloaded and used following copyrights statements.

- **Add/Upload tools:**

A number of tools were specifically developed for importing data into the system so AquaKnow users can benefit from all the existing GIS functionalities and use the data stored in the Geodata Library.

[4] *A Web Map Service (WMS) is a standard protocol for serving georeferenced map images over the Internet that are generated by a map server using data from a GIS database. Source: Wikipedia*

The different options for importing/integrating data consist of:

- Upload data in CSV format or as a shapefile. CSV tables should contained latitude and longitude columns or either the official ISO country code (ISO3), or at least a continent, region, country column name.
- Upload data from an external Web Map Service (WMS). This option allows users to import data stored and maintained from an external organization into the AquaKnow by just typing a URL.
- Add a new visualization/map (WMS). This option allows users to create maps or visualizations based on the geographic data uploaded.

Once data is uploaded it can be shared with other users in many different formats. The uploaded CSV tables and shapefiles can be used to perform some simple spatial analysis (See figure 3).

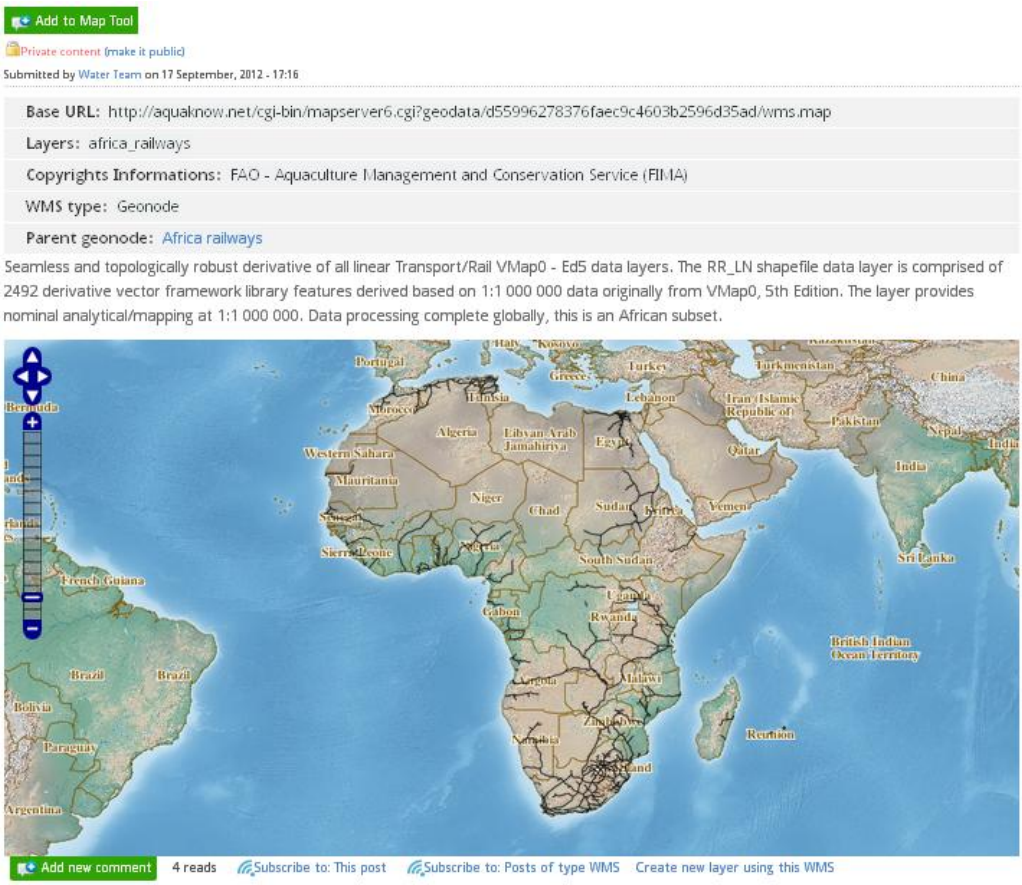


Figure 3. Data imported into the AquaKnow in a shapefile format. The map shows the African Railways network from Food and Agriculture Organization of the United Nations (FAO).

- **Explore data tool:**

Data can be explored and queried via a table explorer with the possibility to produce different types of graphs (bars, lines, points) that can be downloaded in jpg format.

- **Map tool:**

The AquaKnow Map tool offers a wide range of functionalities for customizing and creating your own maps based on existing data contained into the Geodata Library or data uploaded by the user (See Figure 4). The functionalities developed include: navigation tools such as zoom in, zoom out, zoom to maximum extent, zoom box, zoom history, move map, query information on a map, tools for measuring distances and areas, full screen mode, open a window in a print mode, export maps in pdf or jpeg formats, set the transparency of a layer, add or remove layers from the library, change the order of layers, and save map preferences.

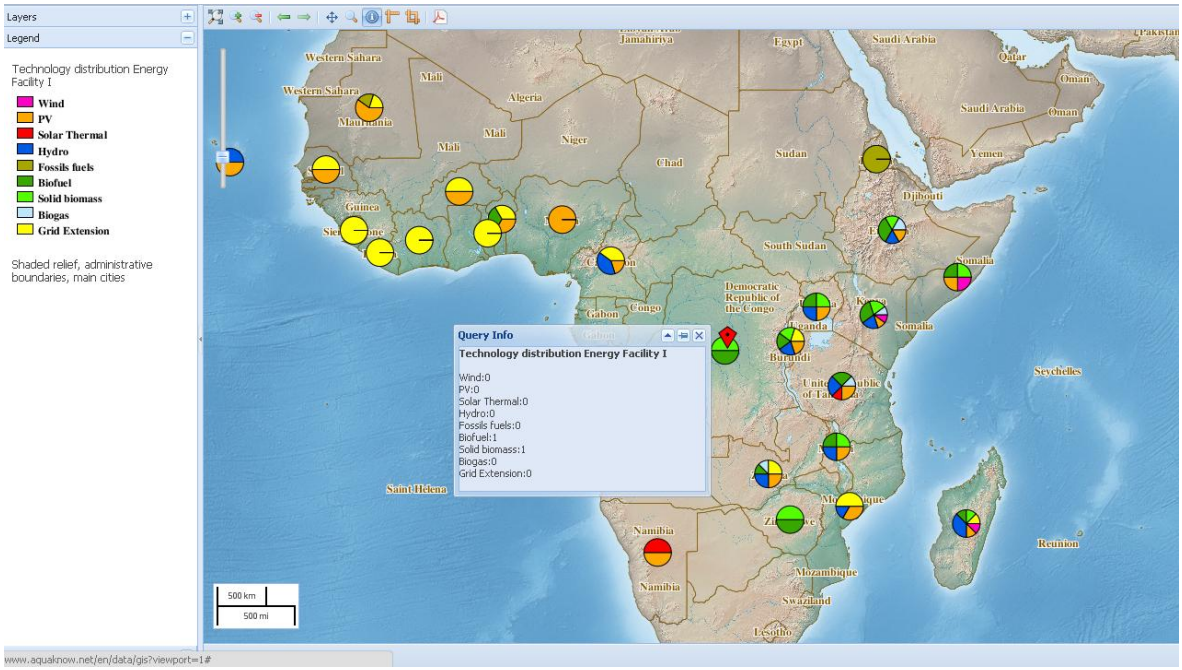


Figure 4. Overview of the Map Tool using the “query info button” for consulting information on the displayed map.

A tool for generating dynamic thematic maps is also available to registered members. Users can define a specific attribute table to be mapped, select the number of classes and choose the color palette to be shown in the map. Maps can be shared among registered users using the AquaKnow Map tool but also with other GIS software.

- **Spatial Analysis tool:**

The Spatial Analysis tool allows users to make a number of spatial operations such as: “Buffer”, “Dissolve”, “Merge”, “Intersect” and “Within” using the data stored in the Geodata Library (See Figure 5). It is important to note that spatial operations can be performed only with geographic data and not using the existing visualizations or maps. All the spatial operations are monitored by the system. AquaKnow users are duly informed by email about their analysis results, including a direct access.

Here is a short description of the spatial operations that have been implemented so far in the system:

Buffer or proximity analysis: This geo-process is used for identifying areas surrounding geographic features at a certain distance or radius. This operation is useful for instance to establish a perimeter for ensuring access to water points.

Dissolve: This geo-process works with one only input layer, whose geometry type must be polygon. Merge polygons together that have a common attribute. This operation can be used to aggregate information, for instance if we have a detailed river basin layer we can easily generate a new layer with major basins using a common attribute.

Merge: This geo-process works with two input layers. It creates a new layer which has a feature for each feature of all input layers. However the merge operation can only be applied with input layers of the same data type i.e. merge points with points; polygons with polygons. This operation can be used for instance to merge two different tables containing geo-referenced locations such as wells.

Intersect: This geo-process works with two layers: the input layer and the overlay layer. It calculates all the locations where two datasets overlap each other. This operation can be used for instance to identify wells intersecting within a certain river basin.

Within or filter by distance: This geo-process allows users to perform radius searches within a specified distance. This operation can be used for instance to allocate project points that are within a certain distance from a geographical object, such as rivers, cities, etc.

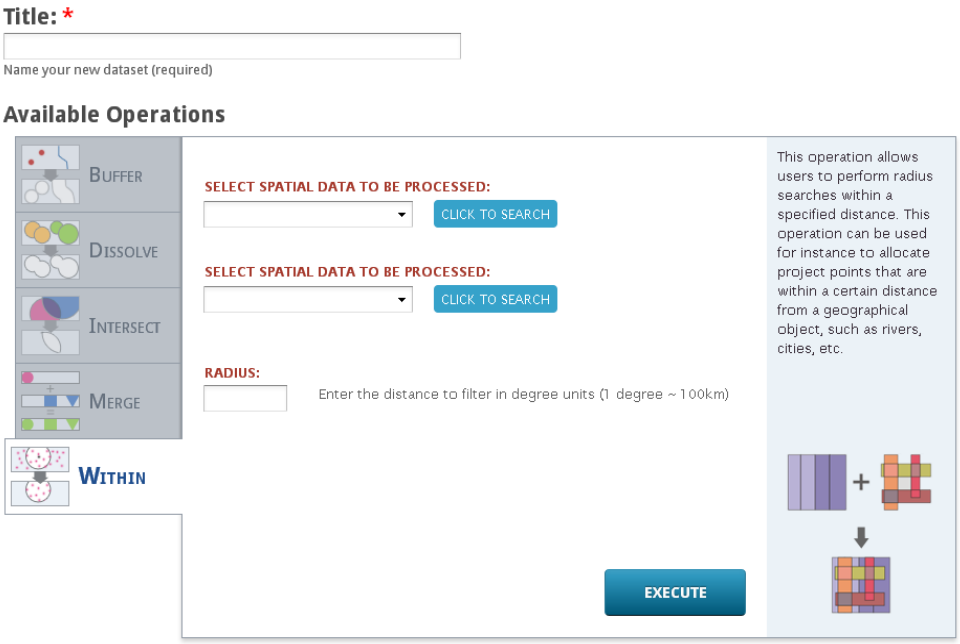


Figure 5. Spatial analysis tool within the AquaKnow platform.

D2.3– Section 2: Protocol for formulation of water management options

Authors

Lead authors:
Hans Verkerk, Elsa Varela, Nicolas Robert and Inazio Martinez de Arano- EFI

Contributing authors:
Steven Libbrecht and Roxanne Dude - PROSPEX
Anabel Sánchez and Annelies Broekman - CREAF
Elias Giannakis, Adriana Bruggeman and Christos Zoumides - CyI
Sihem Jebari, Hermassi Taoufik and Hamed Daly - INRGREF
Manca Magjar, Aleksandra Krivograd Klemenčič and Nataša Smolar-Žvanut - IzVRS
McKenna Davis, Evelyn Lukat and Josselin Rouillard – ECOLOGIC

Reviewer:
Iban Ameztoy - JRC

Reference

Hans Verkerk, Elsa Varela, Nicolas Robert and Inazio Martinez de Arano (2015). Protocol for formulation of water management options. Deliverable D2.3, BeWater, FP7 project no. 612385-SIS.2013.1.2-1 European Commission, 19 pp.

Executive summary

This protocol describes the overall approach for defining and evaluating water management options in four river basin across the Mediterranean area, being methodologically comparable and understandable. Specifically, this protocol aims to define the process to formulate water management options.

Water management options are identified and formulated based on information collected during the BeWater stakeholder workshops and additional interviews that were conducted in each basin. The information that is collected is further refined to formulate water management options, as input to the evaluation of water management options with the help of Fuzzy Cognitive Maps, a Multi Criteria Analysis and a Cost-Benefit Analysis.

In this context, guidance is provided on how to formulate options, which includes the identification and characterisation of options, clustering options, checking for completeness and refining options.

Contents

1. Introduction 3
2. Overall approach 3
3. Protocol to formulate water management options 8
References 12
Annex I 13
Annex II 14
Annex III 16
Annex IV 17

1. Introduction

Within the BeWater project, the aim of WP3 is to formulate options for future water management using an inter-comparable approach among case study river basins (CSRBs), including an environmental and socio-economic evaluation. These water management options will be defined based on a participatory process with two rounds of stakeholder workshops in each case study river basin.

This protocol describes the overall approach for defining and evaluating water management options in four river basin across the Mediterranean area, being methodologically comparable and understandable. Specifically, this protocol aims to define the process to formulate water management options and it indicates what kind of information is needed, how to process it and which indicators will be targeted.

2. Overall approach

2.1 General description

Considering the uncertainties with expected climate change, as well as uncertainty of future socio-economic conditions, water management plans need to be dynamically adjustable in response to the realised changes in driving factors. This is one of the principles of adaptive management (Lee 1999). Adaptive management lies at the core of an approach developed by Haasnoot et al. (2013) who propose a framework for decision making under uncertain global and regional changes. Their integrated approach includes: different climate scenarios representing a variety of relevant uncertainties and their development over time; different types of actions to handle vulnerabilities and opportunities; Adaptation Pathways describing sequences of promising actions; and a monitoring system with related contingency actions to keep the plan on the track of a preferred pathway.

The framework by Haasnoot et al. (2013) follows a series of steps to arrive to the design and implementation of dynamic adaptive plans for the basins, which can be used for the purposes of BeWater. However, some modifications are needed to meet the requirements of BeWater:

- the approach by Haasnoot et al (2013) will be complemented by other methodologies that will secure the stakeholder participation in the key phases of the development of these plans. In BeWater two rounds of stakeholder workshops are planned to identify water management options and more workshops are foreseen to develop the water management plans;
- Haasnoot et al. included only few indicators or criteria for which they evaluated their management options. The number of indicators or criteria in BeWater will be defined in close collaboration with stakeholders;
- Haasnoot et al. apply a modelling framework to evaluate water management options, but in BeWater (detailed) quantitative models are not available for all river basins. Instead, qualitative approaches are considered more useful.

Taking into account these considerations and the scope of WP3, the general approach consists of several steps to formulate and evaluate water management options:

- Elicit the current state and future expectations
- Formulate water management options
- Evaluate water management options

The general approach is schematically presented in Figure 1 and described in more detail in section 2.2-2.4.

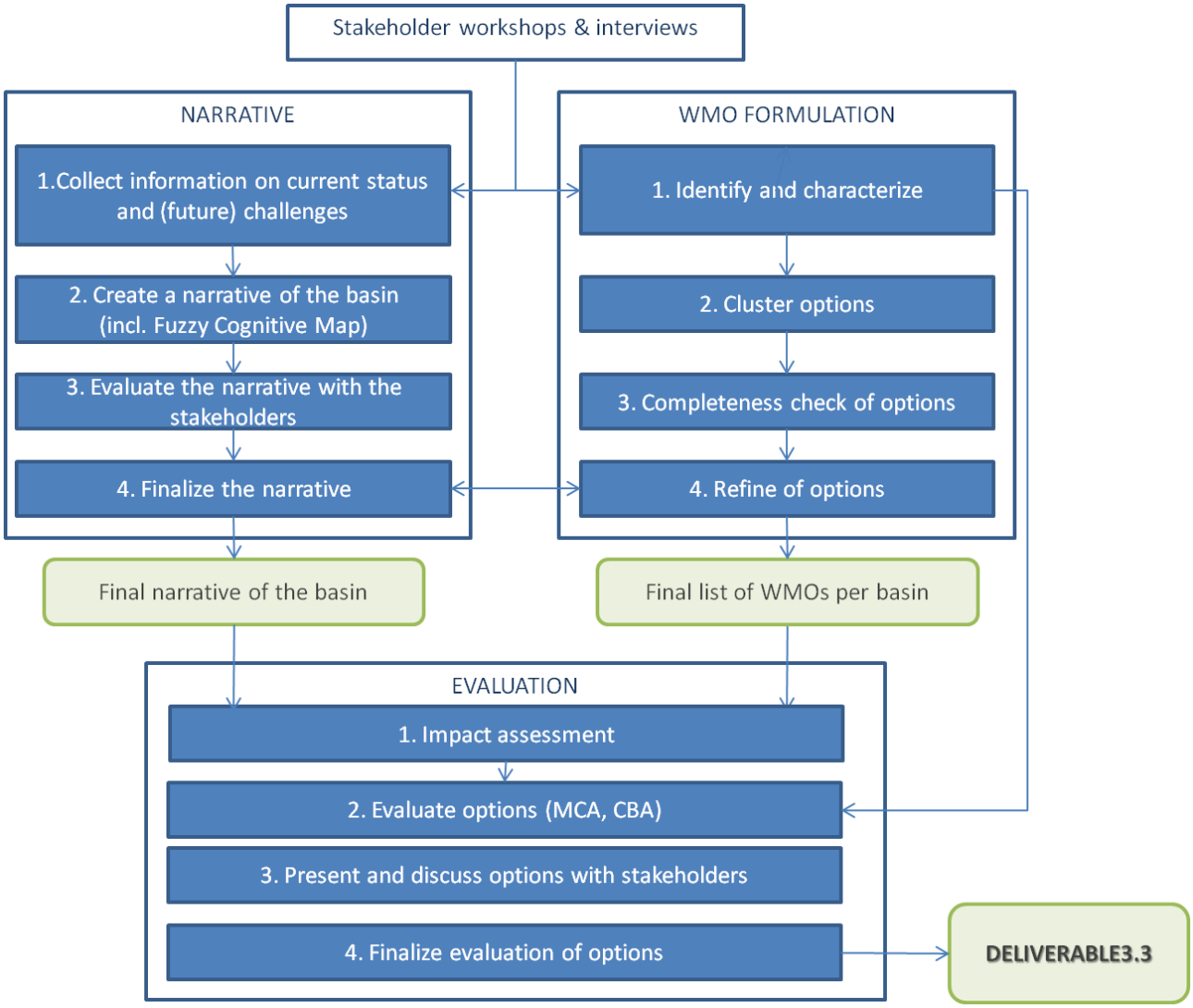


Figure 1: schematic overview of all steps to formulate and evaluate water management options for each river basin.

2.2 Eliciting the current state and future expectations

Information on the current state and future expectation has been collected in a first stakeholder workshop in each river basin (see *Protocol for performance of participatory processes*; section 3 of D2.3) and additional interviews that were carried out with stakeholders that did not attend the workshop (see guidelines in Annex I). This information needs to be organized and synthesized. This can be achieved by building a narrative of the river basin based on the beliefs and expectations of the stakeholders. The narrative structures the information collected in the stakeholder workshops and interviews into a description of the current status of the basin, the issues and the challenges at stake in each of these river basins. Such a narrative is crucial to provide a coherent framework for the formulation of water management options which are understood as ways of tackling the challenges and their causes to reach the desired future status in the river basins.

The narratives consist of a written and a graphical component (see Annex II for the template of the narratives). The written component describes the narrative of the river basin in words, while the graphical component describes the narrative in the form of a Fuzzy Cognitive Map (FCM). A FCM is the graphical representation of a system - in this case the river basins - where the components (factors) are represented as boxes and relationships as arrows. The arrows reflect the sign and strength of the relationships between the factors. The map is cognitive because it is a

representation of a belief system, i.e. it represents the dynamics in a system based on the understanding of individuals (Kok 2009; Jetter and Kok 2014). Fuzzy cognitive maps allow organizing all the information available on the basin, providing with a clear understanding of the current status in the basin: main challenges at stake, drivers that influence them and their relationships in the system. FCMs can be constructed with inputs from stakeholders and therefore represent a tool in line with the project philosophy concerning stakeholder involvement. The FCM is also a tool to facilitate communication between stakeholders from various sectors and backgrounds. Finally, the FCMs can be used to assess the impact of the water management options (WMOs) on the river basin by introducing them in the system. This allows to produce a semi-quantitative estimate of the impact of WMOs. The development of the FCMs is done in parallel to the formulation of water management options to ensure that the options can be assessed using the FCMs.

For further information on FCMs we refer to Cole et al. (2000), Jetter and Kok (2014), Kok (2009), Özesmi and Özesmi (2004), Penn et al. (2013) and van Vliet et al. (2010).

2.3 Formulating water management options

Water management options need to be formulated to address the challenges that were expressed by stakeholders. The formulation is based on information collected during a first stakeholder workshop, as well as additional interviews that were carried out in each river basin. The information that is collected is further refined to formulate water management options, as input to their evaluation. Water management options are formulated in 4 steps:

- **Identify and characterise options:** taking into account the identified challenges and the water management options suggested by stakeholders during a first workshop organised in each basin, as well as additional interviews that were carried out, a first list of water management options will be generated. Each of these options will be characterised using a fixed set of descriptors.
- **Cluster options:** Building on the previous step, clustering of options will be made based on the similarity of descriptors and challenges that they address. The aim is to reduce the potentially long list of identified WMOs to a shorter list of options.
- **Completeness check:** Building on the characterisation of the WMOs, a completeness check should be conducted to identify gaps and redundancies.
- **Refine options:** This task aims to refine identified WMOs so that they are detailed enough to be further analysed. The refinement also requires an analysis whether the physical impacts of a WMO can be estimated, as input to the WMO evaluation.

A protocol is presented in chapter 3 that describes in detail how to formulate water management options. The formulation of water management options is done in parallel to the development of the narratives to ensure that the options can be assessed using the FCMs.

2.4 Evaluating water management options

Water management options need to be assessed for their environmental and economic impacts. This will serve as input for an evaluation of water management options through key stakeholders participation in a dedicated (second) workshop in each river basin. The evaluation of water management options relies to large extent on the FCMs and WMOs created in previous steps and the approach is illustrated in Figure 2.

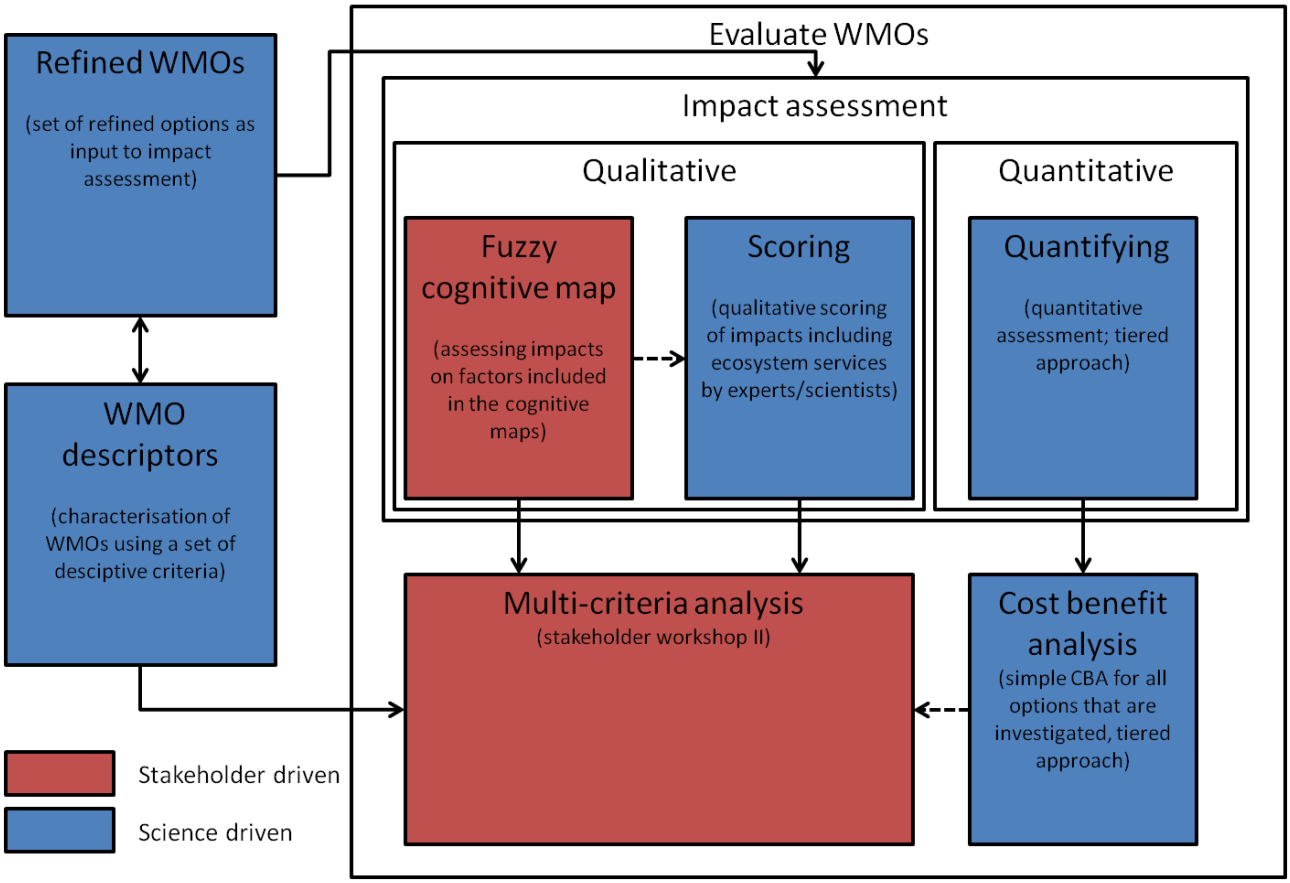


Figure 2: approach to design, characterize and evaluate water management options

After consolidating the narratives for each river basin and formulating the water management options, the water management options need to be assessed with regards to their impact on the main challenges as identified by the stakeholders in each river basin, including quantity and quality of available resources. The impact assessment builds on the FCMs that were developed for each river basin, which can be used as a semi-quantitative system dynamics model to assess the impacts of all water management options. All factors included in the FCMs (except drivers) can be considered as criteria for the multi-criteria analysis of the WMOs, hence considering how the WMOs impact on the different factors of the system, as represented in the FCM. However, the number of factors that are included in the FCMs is limited and there may be other factors that should be considered. The criteria entering the multi-criteria analysis (MCA) are therefore complemented with a set of ecosystem service indicators. The impact assessment for these ecosystem service indicators will be made by experts (case study leaders and/or other experts in each river basin) through a simple scoring of impacts, e.g. by identifying whether the impact of a WMO on an ecosystem service indicator is positive or negative and whether the impact is strong, medium or weak. This assessment is done separately from the FCM, but it is important to ensure consistency between the system dynamics according to the FCMs and the expert-based impact assessment for ecosystem service indicators. At least five ecosystem service indicators will be included in the analysis and they will be identified using the Common International Classification of Ecosystem Services (CICES; http://cices.eu/) and their relevance for the basin.

The set of descriptors that characterise the WMOs (see section 2.3), as well as the outcomes of the FCMs and the qualitative scoring of ecosystem service indicators represent the three sets of criteria that can be considered by stakeholders as input to the MCA. The MCA will be carried during a second stakeholder workshop. During the workshop the stakeholders will be asked to indicate their preferences for descriptors according to which the WMOs have been characterized, as well as preferences for the different factors included in the FCMs and the selected ecosystem

service indicators. Based on (i) the preferences by the stakeholders, (ii) the characterization of the water management options and (iii) the outcomes of the impact assessment, all WMOs can be evaluated and ranked.

In addition to a MCA, a simple cost-benefit analysis (CBA) should be performed for all WMOs. The results of the CBA could be (ideally) used as input to the MCA, but the decision to include the CBA outcomes will depend on the level of detail of the CBA. While the CBA is still being designed, it is clear that the CBA cannot fully rely on the outcomes of the impact assessment because the outcomes of the impact assessment are of qualitative nature, whereas a cost-benefit analysis requires quantitative estimates of the impacts (i.e. estimates of costs and benefits in monetary units). Hence, physical impacts have to be estimated, including units for the measurement of the flows should be defined, e.g. water quantity in cubic meters, agricultural products in tons, etc. A tiered approach is foreseen to assess the direct physical impacts of a WMO;

- **Tier 1**: Assess the impact of a WMO by reviewing literature, based on findings in the same or other river basins;
- **Tier 2**: Assess the impact of a WMO by consulting experts;
- **Tier 3**: Estimate the impact through a quantitative analysis (e.g. model simulations, GIS analyses).

The impacts need to be translated into monetary values to be able to estimate the cost and benefits. These monetary values will be collected from literature, or other existing information.

The results and interpretation of outcomes of the MCA and CBA will be presented to stakeholders in a dedicated stakeholder event.

3. Protocol to formulate water management options

3.1 Introduction

This protocol outlines in detail the procedure to formulate water management options, taking into account the challenges identified by stakeholders and the evaluation that will be conducted after the WMOs have been formulated. The formulation is based on information collected during a 1st round of stakeholder workshops and additional interviews that were conducted in each river basin. The information that is collected is further refined to formulate water management options, as input to an impact assessment and evaluation.

Water management options are here defined as measures that can be implemented to tackle one or several challenge(s) in each river basin. These measures can include technological and engineering solutions (‘grey’ actions), ecosystem-based approaches that use the multiple services of nature ('green' actions) and managerial, legal and policy approaches that alter human behaviour and styles of governance ('soft' actions) (EEA 2013). The exact definition of the water management options will be based on the needs expressed by stakeholders and available information in each of the four CSRBs.

A review of existing river basin adaptation plans (Davis et al. 2014) revealed no common standard exists that specifies the structure of river basin adaptation plans, nor the level of detail of the WMOs they include. Here a pragmatic approach is adopted requiring a WMO to address one or more challenges identified by the stakeholders and that they should be as detailed as needed to conduct the MCA and CBA. The number of WMOs to be identified depends on the number of challenges identified by stakeholders and there should be several options per challenge (see *Section on Protocol for design of river basin adaptation plans*; section 4 of D2.3). There is no maximum number of challenges, but it seems infeasible with the given resources to analyse more than 30 WMOs per basin.

3.2 Identify and characterise options

This task aims to create a first list of WMOs based on outcomes of the a stakeholder workshop and additional interviews carried out in each river basin. To identify and characterise WMOs a template is developed with a set of descriptors for each WMO. The aim of this template is to organize the information available, as well as to check for gaps and redundancies. The departure point for this process is the identification of the challenges in the river basin, so that the options should be lined with these challenges. The description of a WMO consists in the following information (see Annex III):

- identification of the challenge(s) that it addresses;
- name and overall description of the option focussing on the approach: how is the option supposed to address the challenge(s) and from which perspective;
- origin of the WMO (e.g. stakeholder workshop, interviews, literature).

Following their description, WMOs are characterised according to a list of pre-defined descriptors (see Annex IV). These descriptors mainly refer to the implementation of the option: the parts of the river basin, the sectors and land uses concerned, time frame, costs, type of approach, feasibility and acceptability. The relation to global change and to extreme events is included as well. The characterisation of WMOs is conducted using a template prepared as an excel spreadsheet (Figure 3). The template contains a section where WMOs are to be described in free format and it also contains the list of descriptors.

WMO	Water status				Water bodies		River section				Target water use sector								Target land use									
	Quantity	Chemical quality	Ecological quality	Hydrogeomorphological quality	Surface water	Groundwater	Up	Middle	Down	River as a whole	Local population	Tourism	Industry	Agriculture	Forestry	Energy	Water management	Others (please specify at the end of the row)	Arable land (rainfed)	Arable land (irrigated)	Permanent crops (rainfed)	Permanent crops (irrigated)	Grassland	Forests	Built-up	Wetlands & deltas	Beaches & salines	Other
Domestic water saving equipment	1	1			1	1				1	1						1								1			
Improved irrigation technologies	1	1			1	1		1						1			1			1		1						
Rainwater harvesting systems	1	1			1	1				1	1			1			1			1		1			1			
Borehole licences and water meters	1	1				1				1	1			1			1			1		1			1			

Figure 3: extract of the WMO characterisation

The general guidelines for completing the characterisation are:

- a WMO addresses at least one challenge;
- a WMO is targeting (character) either the demand for water, the supply of water, a better governance or an improvement of the ecological status (only one).
- the approach to adaptation relies either on green, grey or soft measures (only one).

In exceptional cases, a WMO may not comply with the above mentioned rules. Well-based reasons should be provided by the partners such that justify such exceptionality.

3.3 Cluster options

Building on the characterisation of WMOs, the clustering step aims at reducing the potentially long list of identified WMOs to a shorter list of options. Clustering will be based on the similarity of the descriptors of each of the identified options and also on the challenges they address. The similarity can be determined using the WMO classification framework that was completed in step 3.2. At the end of the clustering process, each challenge has to be addressed by at least two WMOs with different approaches (e.g. demand vs. supply, different targeted land-use, green/grey/soft measure or different costs). Note that part of the clustering may already be carried out when identifying the WMOs in step 3.2.

3.4 Completeness check

Building on the characterisation of WMOs, a completeness check should be conducted to identify gaps and redundancies in the identified WMOs. Two types of gaps can be identified:

- A check will be made to assess to what extent identified challenges are addressed by the identified WMOs. The aim is to ensure that several options tackle each challenge. This is required to allow a selection of the options when preparing the adaptation plans.
- A check will be made to assess whether different types of measures have been identified (e.g. WMOs addressing the demand and WMOs addressing the supply). This check can be made using the template prepared in step 3.2.

Based on the gap identification, a decision needs to be made whether the list of water management should be complemented with water management options derived from existing river basin plans in the basin or adaptation plans from other sectors (e.g. agriculture, forestry, etc.).

In addition to the identification of gaps, an identification of redundancies needs to be carried out. Some identified (W)MOs may already be identified in existing sectorial (adaptation) plans of relevance to the river basin. If overlap exists with (W)MOs in other plans, a decision needs to be made whether the potentially redundant option should be considered for further analysis.

3.5 Refine options

This task aims to refine identified WMOs so that they are detailed enough to be further analysed (see also Annex III). Figure 4 illustrates the refinement process.

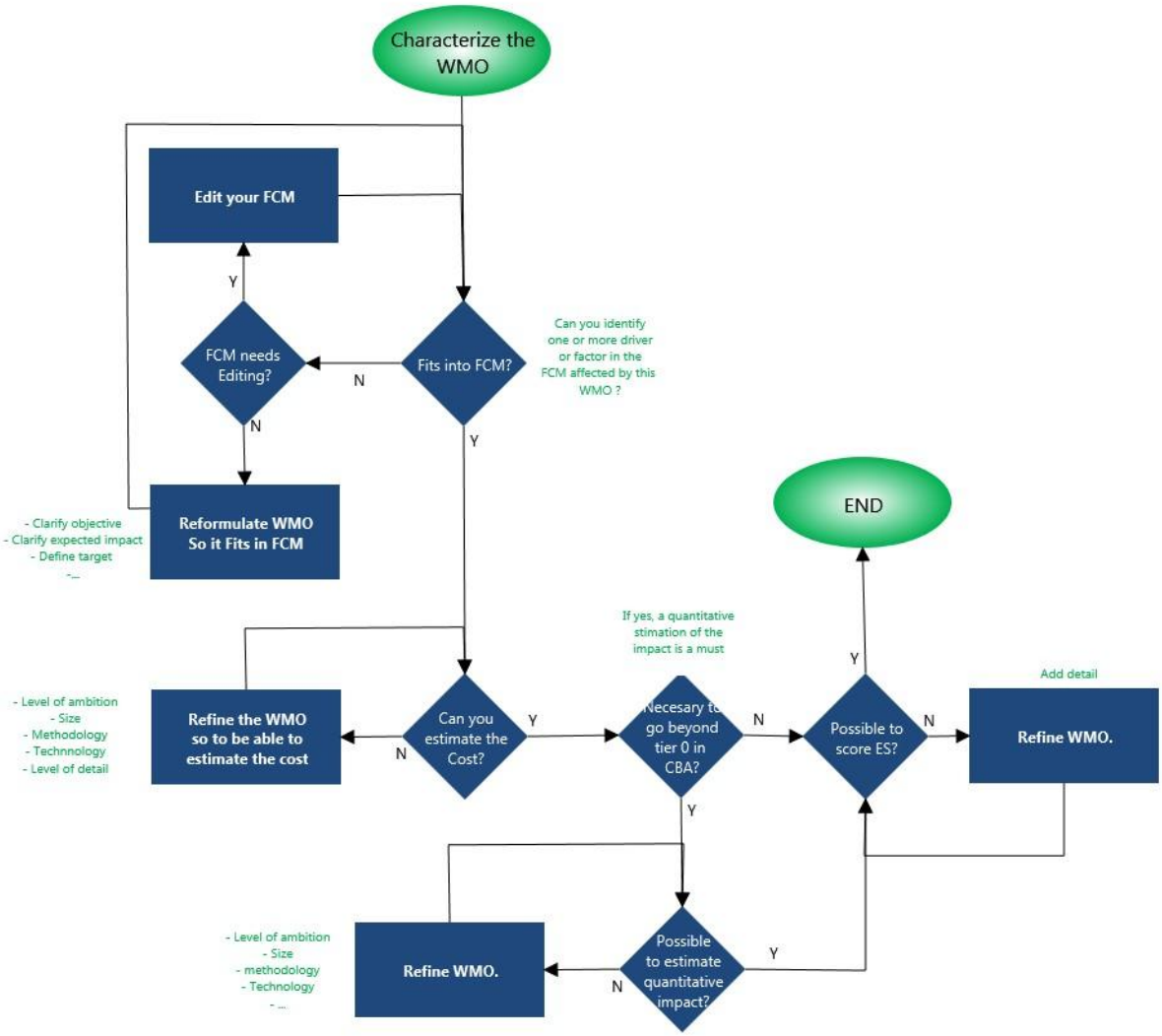


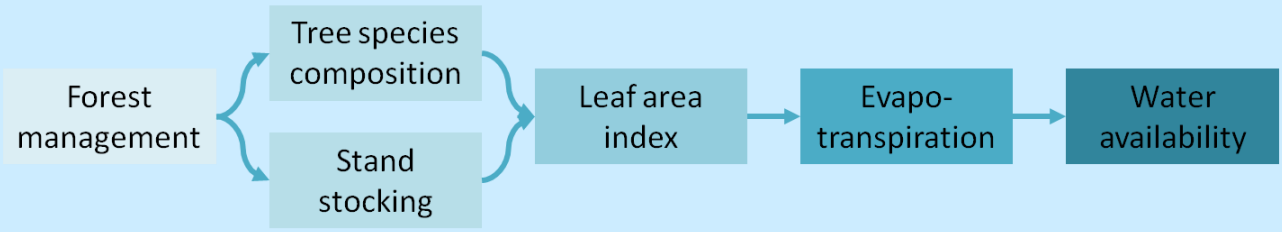
Figure 4: WMO refinement process

To be able to assess and evaluate impacts of water management options, it is important to identify which actions must be undertaken. The type of action needs to be described as detailed as possible (see Box 1). After defining which actions will be undertaken, it is important that the WMO relates to factors included in the FCM. A WMO will be introduced to the FCM by changing the map by adding a new factor (the WMO) with one or few arrows to other factors in the FCM, or a change in the intensity of one of the arrows existing in the FCM. If the interaction in the FCM is not clear, then the description of the WMO has to be refined. If the map is not capable of modelling the impact of the WMO, then either the WMO is not targeting one of the challenges identified by the stakeholders, or the map has to be updated.

Box 1: example on how to refine water management options

***Initial WMO definition**: A WMO suggested by stakeholders is to improve forest management regimes to increase water availability. It was not stated how forest management should be changed.*

***Approach**: A simple cognitive map (see also box 2 in chapter 3 for details on how to construct a cognitive map) can be created to understand how forest management could be related to water availability using expert knowledge of the system.*



Based on literature or expert knowledge, water availability is affected by evapo-transpiration. This is affected by the leaf area index (i.e. the surface area covered by tree leaves and needles per unit of area), which in turn is affected by tree species composition (deciduous tree species lead generally, depending on the species, to less evapotranspiration) or stocking level (lower stocking levels lead generally to less evapotranspiration) of a forest stand. These latter two aspects can be addressed through forest management.

***Refined WMO definition**:*

- *improve forest management regimes by changing share of deciduous tree species to increase water availability,*
- *improve forest management regimes by changing stocking levels of forest stands to increase water availability.*

A next step in the refinement is to consider whether it is possible to estimate the costs or benefits of all WMOs. To do this, it is needed to specify the physical impacts that a WMO can have, taking into account units for the measurement, e.g. water quantity in cubic meters, agricultural products in tons (see Box 2). The impact does not need to be estimated when formulating and refining the option, but it is important that it is needed as input to the CBA.

Box 2: example of a water management option needing refinement

A WMO suggested by stakeholders is to expand the irrigated agricultural area to reduce current impacts of droughts on the crop production. This is not specific enough, because it does not provide any information to what extent the irrigated area should be expanded. The option should be refined by estimating to what extent the irrigated area should be increased to significantly reduce the expected drought impacts. If it is not feasible to define one percentage, the WMO could be split in two options so they together cover a plausible range.

Finally, when refining the options it is important to list stakeholders with main roles: Who takes the decision concerning the implementation of the option? Who will pay? Who will be responsible for the implementation? This information is needed as input for the river basin adaptation plan that will be developed using the WMOs as input.

References

Cole, J.R. and Perichitte, K.A. (2000) Fuzzy Cognitive Mapping: applications in education. International Journal of Intelligent Systems 15, 1-25.

Davis, M; Rouillard, J; Lukat, E; Stein, U; Tröltzsch, J; Vidaurre, R. (2014). Compilation of best practice examples and experiences of adaptation plans. Deliverable D4.1, BeWater, FP7 project no. 612385 - SIS.2013.1.21 European Commission, 67 pp.

EEA 2013. Adaptation in Europe - Addressing risks and opportunities from climate change in the context of socio-economic developments (Publication No. 3/2013), EEA Report. European Environment Agency.

Haasnoot, M., Kwakkel, J.H., Walker, W.E., ter Maat, J. 2013. Dynamic adaptive policy pathways: A method for crafting robust decisions for a deeply uncertain world. Global Environmental Change 23, 485-498.

Jetter, A.J., Kok, K., 2014. Fuzzy Cognitive Maps for futures studies—A methodological assessment of concepts and methods. Futures 61, 45-57.

Kok, K. 2009. The potential of Fuzzy Cognitive Maps for semi-quantitative scenario development, with an example from Brazil. Global Environmental Change 19: 122-133

Lee, K. N. 1999. Appraising adaptive management. Conservation Ecology 3(2): 3. http://www.consecol.org/vol3/iss2/art3/

Özesmi, U., Özesmi, S.L., 2004. Ecological models based on people's knowledge: a multi-step fuzzy cognitive mapping approach. Ecological Modelling 176, 43-64.

Penn, A.S., Knight, C.J.K., Lloyd, D.J.B., Avitabile, D., Kok, K., Schiller, F., Woodward, A., Druckman, A., Basson, L., 2013. Participatory Development and Analysis of a Fuzzy Cognitive Map of the Establishment of a Bio-Based Economy in the Humber Region. PLoS ONE 8, e78319.

van Vliet, M., Kok, K., Veldkamp, T., 2010. Linking stakeholders and modellers in scenario studies: The use of Fuzzy Cognitive Maps as a communication and learning tool. Futures 42, 1-14.

Annex I

Box I.1: excerpt of guidelines for conducting 'Telephone interviews with key stakeholders'

Current water use challenges in the basin

(questions for those actors who DID NOT ATTEND the 1st workshop)

The objective with this section is to collect the views and opinions of these people that were not able to participate in the 1st stakeholder workshop, but which are important stakeholders according to the CSRB. The information collected in this interview aims to complement the information already available from the 1st round of workshops

1.1 During the first stakeholder workshop that was held in {Name of the RB}, the participants identified several challenges that the basin will face in the medium-long term as a result of climate change.

- From your perspective, what are the biggest challenges in the medium-long term for the {Name of RB}?

NOTE: To get the interview started and in cases where the interviewee is not freely coming up with answers, it would be helpful to refer back to some of the outcomes of the 1st workshop to spark conversation about the basin. The interviewee can confirm or contest some of the findings of the workshop, in addition to providing insights of their own {list 2-3 main challenges}.

- Do you agree with the challenges listed by the workshop participants? Or do you consider that there are some other important issues to be tackled with in the medium-long term in the basin?
- Are those general challenges for the whole basin, or are they specific to only a certain area of the basin?
- Do you think these challenges are also perceived as such by other relevant actors in the basin? If not, why?

1.2 During the workshop, a second question related to the participants desired future state of the basin.

- What would you like water management to achieve by 2030 in the river basin?
- What would be your desired future status for the river basin?
- Does your vision apply for the whole river basin or were you rather thinking of a specific section of it?

NOTE: if the respondent is not freely coming up with answers, it would be helpful to refer back to some of the outcomes of the 1st workshop to spark conversation about the basin. The interviewee can confirm or contest some of the findings of the workshop, in addition to providing insights of their own {list 2-3 main stated desired futures}.

1.3 Finally, during the workshop, participants were asked about some ways to achieve the future desired state.

NOTE: It would be helpful to refer back to some of the outcomes of the 1st workshop and provide examples of what is meant by 'options' and 'measures' after asking each question.

- What options do you see that will help you achieve that desired state by 2030 and why?
- Are there any specific measures that would need to be implemented to achieve this desired state? Would they need to be implemented in the whole basin or only in a specific section of it?
- Why are the measures important?

Annex II

Basin: *[write name of your basin here]*
Author(s): *[write your name here]*
Date/version: *[add information here on date or version]*

Narrative

Instructions:

- *This section will serve as an introduction to the basin to be used (at least) in Deliverable 3.3*
- *The structure given below is a suggested structure. More (sub)chapters may be added*
- *The narrative for your basin should identify the key challenges for which water management options need to be defined in subsequent steps. It contains information on the current status and challenges in the basin as perceived by the stakeholders.*
- *The main sources of information are the outcomes from the first stakeholder workshops and the interviews with key stakeholders. Other relevant material may be used as well.*
- *The intended audience are the stakeholders in your basin. Please keep this in mind when writing the text. Keep the use of technical terms to a minimum.*
- *Suggested length of the whole document (excl annexes): 4-6 pages. Note: depending on the number of challenges (and the factors in your cognitive map) it may not be possible to comply with this suggestion. All text should be as concise as possible.*

Description of the basin

Instructions:

- *This section should highlight the basin's most important features of the basin (i.e. social, economical and ecological key characteristics). You should not present the challenges here.*
- *All basins have been described already when responding to the request for qualitative information. The text can be completely re-used (i.e. new text is not required, please recycle)*
- *Suggested length: 1 page*

Global change

Instructions:

- *In this section information on global change and its impacts should be shortly presented, which are relevance for your basin. As a minimum, it should contain information on climate change. This section can be to large extent a summary of the presentation given in the 1st round of stakeholder workshops.*
- *Suggested length: 0.5-1 page*

Challenges

Instructions:

- *This section should contain the main, overarching challenges in the basin as perceived by the stakeholders. The challenges indicate what issues need to be tackled to reach the desired future state as expressed by the stakeholders.*
- *It is suggested to describe all challenges in separate sections*
- *Suggested total length: 1-2 pages*

Challenge 1

Instructions:

- *Give a name to each challenge*
- *Describe each challenge*
- *Explain why it is a challenge*

Challenge 2

Challenge …

Current status

Instructions:

- *In this section the cognitive map for your basin should be introduced and this is the main (only) section that needs to be updated when a change is made to the cognitive map.*

- *Please describe briefly the main factors, the direction you're the relationships and the strength of the relationships. You may limit the description to the strongest relationships and provide more details in the annex*
- *Maps can be created in e.g. mental modeler (http://www.mentalmodeler.org)*
- *Suggested length: 1-2 pages*

Tables

Table II.1: documentation of the factors in the cognitive maps

Please describe the factors that have been included in the final map, as well as their definition. Feel free to add any comment you consider relevant.
Restrict the number of factors to not more than about 20 factors

Number	Name of factor	Definition	Comment
f1			
f2			
f3			
f...			

Table II.2: documentation of the relationships in the cognitive maps

- *This table shows the relationships that were drawn.*
- *The table will be generated with the Mental Modeler once the congnitive map is finalized.*

Table II.3: documentation of the reasoning behind the relationships in the cognitive maps

- *Please justify (to the extent possible) the reason for defining the type of relationships that were drawn.*
- *The table should contain at least one row for each relationship (arrow) that you included in your map. You may include more rows if you wish to explain why a certain relationship has not been included in your map*
- *The codes f1, f2,…,f20 should refer to the factors described in Table I.1*

From	To	Justification	Comment
f1	f1		
f2	f1		
f3	…		
f...			

Annex III

Table III.1: required information for each WMO

Parameter	Explanation
Name of WMO	A short name of the WMO
Description of the WMO	Brief description of the WMO
Reference / source	Reference to the source of the WMO
How is the WMO implemented in the FCM?	Description what factors and/or arrows are added to the FCMs, or which arrows are modified
Actions to be implemented	Main specific actions that would be necessary for the implementation of the option. These actions are listed to prepare the CBA. NB: The actual implementation can differ.
Implementing body	List of main stakeholders responsible for the implementation. NB: This information is needed for WP4 and should include in particular “Relevant stakeholders” defined in the RBAP appendix 1.
Specific target of the WMO	Indicators of the successfulness of the option (mainly needed for the CBA). The indicators should be as close as possible to the defined actions (measurable direct consequence) and quantitative if possible.
Implementation examples	List of literature or case study practical examples

Annex IV

Table IV.1: list of descriptors to classify WMOs

Attribute	Classes	Description
Water status	Quantity	Option targeting the availability of water
	Chemical quality	Option targeting the chemical properties of water
	Ecological quality	Option targeting biological quality of surface water
	Hydrogeomorphological quality	Option targeting hydromorphological quality of the fluvial system
Water bodies	Surface water	Option targeting surface water
	Groundwater	Option targeting groundwater
River section	Up	Option targets the upper section of the river basin
	Middle	Option targets the middle section of the river basin
	Down	Option targets the down section of the river basin
	River as a whole	Option targets the whole river basin
Target water use sector	Local population	Option targets the water needed or used by residents within the basin
	Tourism	Option targets the water needed or used by the touristic/recreation sector within the basin
	Industry	Option targets the water needed or used by industry within the basin
	Agriculture	Option targets the water needed or used by farmers within the basin
	Forestry	Option targets the water needed or used by trees within the basin
	Energy	Option targets the water needed or used by the energy sector within the basin
	Water management	Option targets authorities responsible for water quantity and quality (e.g. waste treatment, issuing water permits)
	Others	Option targets water use sectors different from the previous *(please specify at the end of the row the specific sector)*
Target land use	Arable land (rainfed)	Land that is being farmed with crops that are sown and harvested within the same agricultural year, relying exclusively or rain water
	Arable land (irrigated)	Land that is being farmed with crops that are sown and harvested within the same agricultural year, relying exclusively irrigation water
	Permanent crops (rainfed)	Land that is being farmed with crops which last for many seasons, rather than being replanted after each harvest, relying exclusively or rain water
	Permanent crops (irrigated)	Land that is being farmed with crops which last for many seasons, rather than being replanted after each harvest, relying exclusively irrigation water
	Grassland	Land that is dominated by grasses or shrubs for grazing or fodder purposes
	Forests	Land that is predominantly covered by trees
	Built-up	Land that is used for housing, industry (incl urban fabric, industrial/commercial areas, transport networks, mineral extraction sites, dump sites, construction sites, etc.)
	Wetlands & deltas	Swamps and marshes, estuaries, deltas and tidal flats, near-shore marine areas and human-made sites such as reservoirs
	Beaches and dunes	Sands and muds from the coasts of the oceans not covered by sea water at low tide
	Other	Land that is used for other purposes

Attribute	Classes	Description
Extreme events	Drought	Option targets droughts
	Flooding	Option targets floodings
	Storm	Option targets storms
	Fire	Option targets wildfires
	Not related	Option does not target an extreme event
Implementation scale	National	Option is to be implemented at national level
	Regional	Option is to be implemented at regional level
	Basin	Option is to be implemented at basin level
	Municipal	Option is to be implemented at municipal level
Implementation time horizon	Short	Option can be functioning on short term (<5yrs)
	Medium	Option can be functioning on medium term (5-20 yrs)
	Long	Option can be functioning on long term (>20 yrs)
Expected lifetime	Short (< 5 years)	Expected time for which the option is operational without major rehabilitation is short (less than 5 years)
	Medium (5 -20 years)	Expected time for which the option is operational without major rehabilitation is medium (5 - 20 years)
	Long (> 20 years)	Expected time for which the option is operational without major rehabilitation is long (more than 20 years)
Timelag between implementation and effectiveness	Short (< 5 years)	Expected time since the option is implemented until it starts to have the desired effect is short (less than 5 years)
	Medium (5 -20 years)	Expected time since the option is implemented until it starts to have the desired effect is short (less than 5 years)
	Long (> 20 years)	Expected time since the option is implemented until it starts to have the desired effect is long (more than 20 years)
Character	Demand	Option targeting the need for water
	Supply	Option targeting the availability of water
	Support	Option targeting improved governance (incl. awareness raising, monitoring, stakeholder involvement)
	Environmental conservation	Option targeting the recovery of the ecological status
Implementation costs *(one-time set up cost of implementing the measure, after which there will only be recurring operational or running costs)*	< 10,000 €	Direct capital costs of implementing the option are below 10,000 €
	10,000 - 100,000 €	Direct capital costs of implementing the option are in the range 10,000-100,000 €
	100,000 - 1,000,000 €	Direct capital costs of implementing the option are in the range 100,000-1,000,000 €
	> 1,000,000 €	Direct capital costs of implementing the option are over 1,000,000 €
Operational costs *(costs incurred annually to maintain the measure operating)*	< 10,000 € / yr	Total annual running costs for this option are below 10,000 €
	10,000 - 100,000 € / yr	Total annual running costs for this option are in the range 10,000-100,000 €
	100,000 - 1,000,000 € / yr	Total annual running costs for this option are in the range 100,000-1,000,000 €
	> 1,000,000 € / yr	Total annual running costs for this option are over 1,000,000 €
Effectiveness (capacity to tackle the specified challenge)	High	Option is highly effective in tackling the specified challenge
	Medium	Option is medium effective in tackling the specified challenge
	Low	Option is low effective in tackling the specified challenge
	Uncertain	Uncertainty about how the option may tackle the specified challenge
Approach to adaptation	Green	Ecosystem-based approaches that use services of nature
	Grey	Technological and engineering solutions
	Soft	Managerial, legal and policy approaches that change human behaviour and styles of governance

Attribute	Classes	Description
Nature of approach	Bear the loss	Occurs when those affected have no capacity to respond in any other ways
	Share the loss	Occurs when the losses are shares among a wider community (either extended family or village-level in traditional societies or through public relief, rehabilitation and reconstruction or insurance)
	Modify the threat	Occurs when the measure exercises a degree of control over the environmental threat itself (e.g. flood control measures such as dikes)
	Prevent effects	Occurs when the option involves steps to prevent the effects of climate change and variability (e.g. modification in crop management practices)
	Change use	Occurs when the continuation of an economic activity is changed due to the difficulty of continuing it (e.g. agricultural use changed into forest use)
	Research	Occurs when the option means use of new technologies and new methods of adaptation
	Educate, inform and encourage behavioural change	Occurs when the option is based on dissemination of knowledge through education, public campaigns leading to behavioural change
Potential to address climate change	Robustness	An option is considered robust to uncertainties if it can maintain its effectiveness under different climatic and socioeconomic development scenarios.
	Flexibility	An option is considered flexible when it can be adjusted/ complemented or reversed when it turns out to be inadequate or inappropriate in practice.
Feasibility	No major obstacle	No barriers for the implementation
	Minor obstacles	Physical, technical or organizational obstacles that can easily be overcome
	Serious obstacles	Physical, technical, regulatory or organizational obstacles that would be difficult to overcome within the time horizon of the project
Acceptability (a priori)	High	There is not significant reason a priori for anyone to reject the option.
	Low	There are obvious signs that one or several actors of the RB will reject the option because of its design.

D2.3– Section 3: Protocol for performance of participatory processes

Authors

Dr. Steven Libbrecht, Prospex bvba

Roxana-Emanuela Dude, Prospex bvba

Dr. Marc Gramberger, Prospex bvba

Martin Watson, Prospex bvba

Reference

Libbrecht, S., Dude, R. E., Gramberger, M. and Watson, W. (2015). *Protocol for performance of participatory processes*, part of Deliverable D2.3 Guideline report on the BeWater approach outlining principles, methodology, concepts and protocols of the project. FP7 project no. 612385 - SIS.2013.1.2-1European Commission, 40 pp.

Executive summary

BeWater has chosen to adopt a participatory and integrative approach as an intrinsic part of its objectives to prepare water adaptation management plans in the four selected river basins, in which a crucial role is given to the participation and engagement of a wide group of stakeholders.

Following a short introduction contextualising the deliverable in the project's description of work, the general framework for participatory processes within the BeWater project is explained, including the definition of relevant terms and definitions. At the core of the BeWater approach lies the integration of science-based work and society's participation, and the successive iterations of this integrative approach. Therefore, learning outcomes of the scientific work are continuously fed into the participatory processes, while the outcome of the participatory processes feeds into the scientific work.

There are five protocols describing in detail the approaches and guidelines for performance of participatory processes in the BeWater project. The *Protocol for stakeholder identification* lays down the criteria underpinning stakeholder identification, which reflects a careful search for balance across societal perspectives, geographical origins and scope, gender and age of participants. While the input of all consortium partners regarding the identification and selection of stakeholders is taken on board, this process relies mainly on the contributions and joint work of the Case Study River basin partners and the Prospex team.

Building on the previous, the *Protocol for stakeholder selection* underlines the general aim of reflecting diverse sensitivities, points of view and sectorial perspectives in a balanced setting. For this purpose, the Prospex-CQI method is used, as part of the Stakeholder Integrated Research (STIR) approach. This method was tested and documented by Prospex in previous climate change and adaptation research projects. Inherent project limitations related to process design and budget restrict the number of participants to each stakeholder workshop, introducing a key methodological challenge for stakeholder selection. In order to ensure the inclusion of different views and

perspectives, systematic and consistent sets of minimum quotas of participants from each stakeholder category are established, which are indicatively fulfilled in the selection process for each workshop.

The Protocol for the design of participatory processes is concerned with the core moments of interaction with and between stakeholders within BeWater. It outlines the main objectives, constraints, and stages in the design of workshop processes. Firstly, the scope of a specific participatory event is identified, with input from the BeWater scientific partners regarding specific scientific objectives and CSRB-related goals and constraints. This is followed by the step-by-step design of the workshop, taking into account the format and desired quality of the expected outcomes, various operational and logistical concerns, and related required facilitation, interpretation and reporting services. As detailed in the previous protocol, the process of identifying, selecting and inviting stakeholders is run in parallel.

The Protocol for the evaluation of participatory processes within BeWater outlines the methods of evaluation to be used related to stakeholder engagement events. They mainly include questionnaire-based stakeholder surveys, distributed to stakeholders participating in the BeWater engagement processes, and meeting minutes and reports. Indicators used for the evaluation include the analysis of the qualitative feedback provided in the above-mentioned surveys, the number of people participating, and the extent to which criteria and quotas set in the Protocol on stakeholder selection have been met.

Finally, the *Protocol regarding the use of the BeWater stakeholder database* explores in depth the functionalities of the stakeholder management tool set up for the purposes of BeWater, and the various related procedures and shared responsibilities of the Prospex team and of the CSRB partners involved in its use. The stakeholder management tool allows for flexibility and ease of use in the cooperative work undertaken by Prospex and the CSRBs.

Its functionalities include: an easy overview of stakeholders; their profiling based on the criteria detailed in the protocol for stakeholder identification; easy filtering and setting up of lists for the process of stakeholder selection; building up a history of contacts between the various project partners and stakeholders; mass emailing in order to distribute event invitations and project newsletters; and finally, integration with social networks, which gives BeWater project partners insight into the stakeholders' activity on social media with regard to water management and adaptation.

Contents

1. Introduction....4
2. General Framework for Participatory processes within BeWater....5
3. Protocols....13
4. BeWater Stakeholder Management Tool....20
5. References....40

1. Introduction

The present document outlines the guidelines and protocols with respect to the performance of participatory processes in the BeWater project. As such, it is part of Deliverable 2.3, which relates to the following task of Work Package 2:

> Task 2.2: Building the BeWater common approach.

More specifically, this document is part of the four guidelines that together constitute the BeWater deliverable:

> Deliverable 2.3: Guidelines report on the BeWater approach outlining principles, methodology, concepts and protocols of the project.

The set of guidelines that together constitute Deliverable 2.3 include guidelines for the following four protocols:

1. Data compilation and harmonization to guarantee spatial and temporal homogeneity;
2. Formulation of water management options;
3. Performance of participatory processes;
4. Design of river adaptation plans.

The present document relates to the third protocol i.e. to the performance of participatory processes.

The purpose of this protocol is to guide and homogenise the participatory activities among the Case Study River Basins (CSRBs).

As stated in the description of Work (DOW):

> *It will define the requirements, structure and development of activities, ensuring a common a comparative methodology among CSRB and including a methodology for stakeholder selection. Thus, the protocol will ensure an effective and representative selection of participants for the participatory workshops, based on a methodological approach for stakeholder identification and selection...*

Furthermore, the DOW specifically mentions the importance of:

- Stakeholder identification criteria;
  - Structure of the BeWater stakeholder database;
  - Articulation of minimum quota for stakeholder selection.

Firstly, with respect to Stakeholder identification criteria, the DOW mentions:

> ***Stakeholder identification criteria****: The elaboration of criteria for stakeholder identification reflects a careful search for balance across societal perspectives, geographical origins and scope, gender and age of participants. Stakeholder identification is driven by a search for participants who can provide insightful, original and credible input regarding water management. Furthermore, identification and mapping has to take into account the need of incorporating men and women in the process as well as more marginalised communities / water user actors. Also, a satisfactory representation of the various age categories will be sought. The stakeholder identification framework is built on a number of structural elements. At present, the following structural elements for identification and selection are identified: 1) societal sectors and perspectives, covering amongst others government and public authorities, economic actors, research/academia, civil society, practitioners, media, opinion leaders; 2) scope of activity of the participant and respective organisation; this geographic criterion is relevant in the sense that important participatory activities will be run within the four CSRBs, where a proper balance between national/regional and local will be sought. Other participatory processes will require a balance between European, national, regional*

> *(and perhaps even local) level; 3) age and gender balance. Each of the above categories will be further subdivided in order to represent a number of well-specified and relevant stakeholder groups.*

Secondly, regarding the Structure of the BeWater stakeholder database, the DOW states:

> ***Structure of the BEWATER stakeholder database**: Based on the stakeholder identification criteria, a stakeholder database will be built. This database achieves three objectives: 1) to enable an effective, efficient and methodologically sound selection of stakeholders to act as participants for the participatory processes (WP3 and WP4) in a transparent, easy and reliable process; 2) to constitute a pragmatic tool for registering, monitoring and following-up of stakeholder involvement, throughout the project; 3) to provide BEWATER with a large network of potential stakeholders to be involved in the project activities as well as in the broader dissemination activities. Indeed, the group of stakeholders collected in the database can be continuously involved in a process of knowledge sharing and communication regarding the BEWATER project. This database will be built based on the suggestion of consortium partners and of the AB (e.g. by referring to or contacting their networks). The resulting list of potential stakeholders/participants will subsequently be completed (in the sense of: covering all categories) by targeted search and contacting.*

Finally, as far as the Articulation of minimum quota for stakeholder selection is concerned, the DOW lists:

> ***The articulation of minimum quota for stakeholder selection.** For reasons related to the design of the participatory processes as well as to the budget, the number of workshop participants is always going to be limited. This restriction introduces a key methodological challenge for stakeholder selection. In order to achieve the inclusion of the variety of perspectives, experiences and insights sought, a systematic and consistent set of minimum quota of participants from each stakeholder category will be established. This way, the biases and distortions that could derive from over-representation of certain categories of stakeholders, or the under-representation of certain typologies of participants or societal sectors, can be minimized. This minimum quota will be defined with respect to: 1) the selection of participants representing different societal sectors (government and public authorities, economy, civil society, media...); 2) achieving due balances with respect to gender, geographical representations; and 3) the inclusion of more marginalised communities / water use actors.*

The structure of this document is as follows:

In the first section, the general framework for participatory processes within the BeWater project will be explained, including the definition of relevant terms and definitions, more specifically: stakeholder, key stakeholder and stakeholder participation. Furthermore, the general BeWater approach regarding stakeholder participation will be described.

In the second section, the following protocols will be presented:

- Protocol for stakeholder identification;
- Protocol for stakeholder selection;
- Protocol for the design of participatory processes within BeWater;
- Protocol for the evaluation of participatory processes within BeWater.

In the third and final section, the main BeWater tool to support the management of stakeholder participation – the BeWater stakeholder database – will be discussed in detail, together with the Protocol regarding the use of the BeWater stakeholder database.

2. General Framework for Participatory processes within BeWater

2.1 Participatory processes within BeWater

As an integral part of its objectives to prepare water adaptation management plans in the four selected river basins, BeWater has chosen to adopt a participatory and integrative approach, in which a crucial role is given to the participation and engagement of a wide group of stakeholders including civil society, scientists, public administrators (policy makers and implementers, institutional administrations and local governments), water sector actors (e.g. service providers) and other related sectors (e.g. energy).

Therefore, and in order to reach its objectives, BeWater builds on:

- Science-based work;
- Participation of society;
- The iteration between science-based work and societal participation.

Indeed, while science-based work and the participation of society are valuable on their own merits, it is their integration and the successive iterations between science-based work and society, that is the fundamental concept of the BeWater approach – see Figure 1 below:

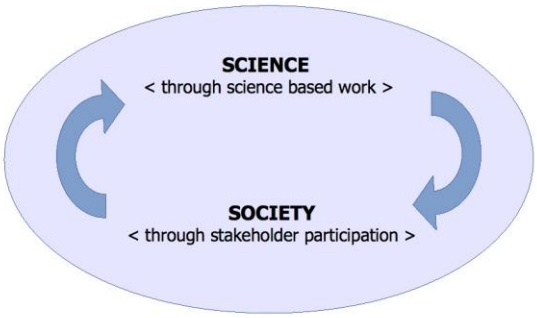


Figure 1. Iterative process of BeWater approach

As explained in the DOW, the rationale behind the iteration exercise is that the exchange of information, knowledge and experience between the scientific community (contributing data compiled from the river basins) and society (contributing local knowledge, perceptions, needs and concerns), results in learning processes at three levels: at the local level, at the level of the project, as well as at a European level. Learning outcomes from the scientific work will be fed into the participatory processes, while the outcome of the participatory processes will feed into the scientific work.

This iteration between science and society will be applied as the project progresses towards its objectives – more specifically throughout the 2 work packages that constitute the core of BeWater – WP3 and WP4 – see Figure 2.

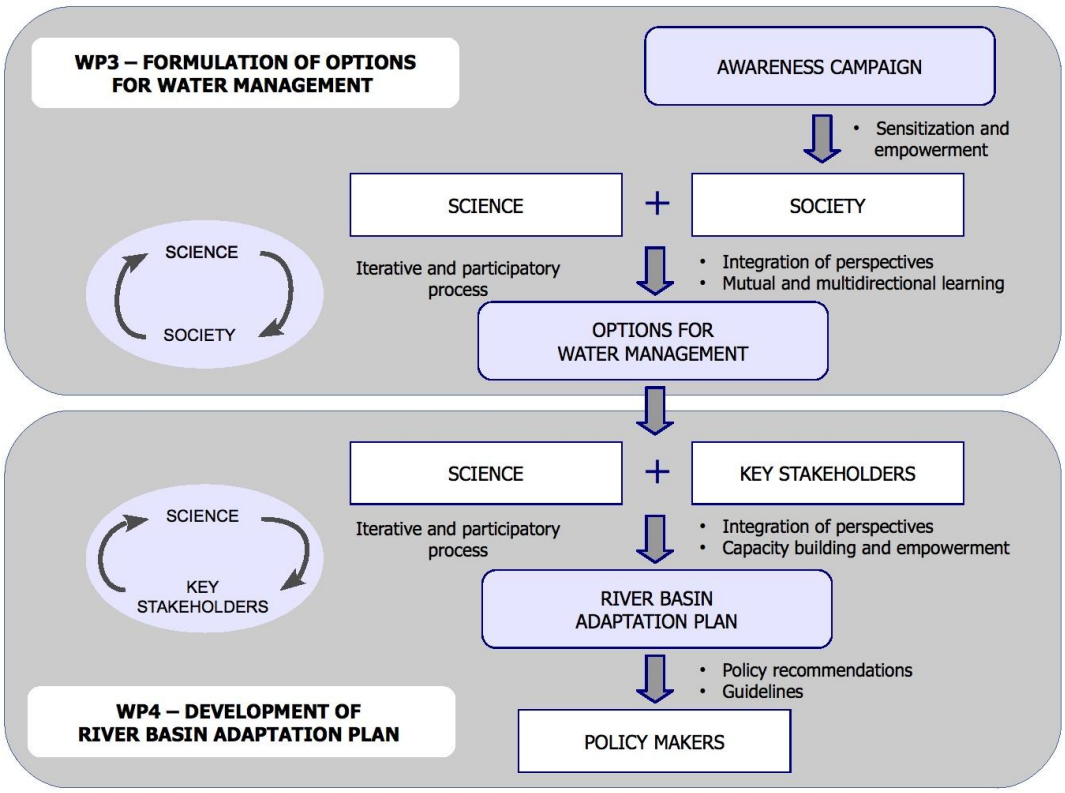


Figure 2. WP3 and WP4 approach

The implementation of the iterative approach will be achieved as follows:

- science based work developed by the CSLs (in each of the river basins) and other expert parties (such as EFI, ECOLOGIC etc.);
- participatory events (workshops, other events) organised with the specific aim to collect the experience and viewpoints of the stakeholders and to discuss the outcome of the science based work;
- science based work to further build on the outcomes of the participatory events;
- interviews with selected stakeholders to review and test the outcome of the science based work;
- further science based work;
- next round of participatory events;
- etc.

Through this succession of science based work alternated with participatory events and interviews with stakeholders, different iterations of the cycle between Science and Society depicted in Figure 1 are made. This approach will be applied to both work package WP3 as well as WP4.

In practice, the “Society” part in the cycles depicted in Figures 1 will constitute of:

- at least two larger participatory events (per CSRB) (in both WP3 and WP4), organised as workshops with professional facilitation and interpretation services (the formal workshops mentioned in the DOW);
- several other participatory events organised locally (in each of the CSRB);
- several interviews with (key) stakeholders.

This approach will lead to a stakeholder-driven planning and management process that enables a proactive response to emerging climatic changes and related impacts.

The integration and iteration of the scientific and participatory approach, brings the following challenges – as presented in the Figure 3:

- The challenge related to insuring consistency of adaptation plan methodology across the four Case Study River Basins (CSRB);
- The challenge related to insuring consistency of participatory processes across CSRB;
- Balancing this consistency, required to ensure comparability and standardisation, with the flexibility needed to cope with very different settings- from a point of view of geographical context, culture, history, etc.

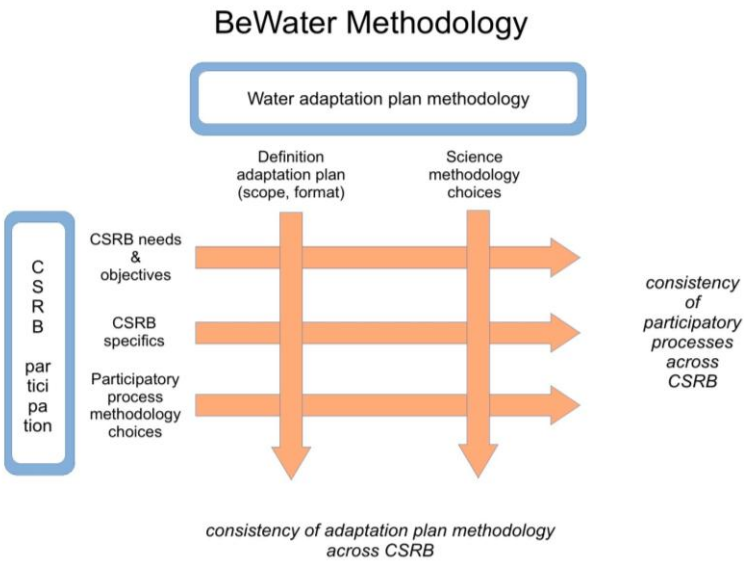


Figure 3. BeWater methodology

As pointed out in Deliverable 2.2 – Framework Report on the BeWater Approach:

> *Maintaining consistency of adaptation plan methodology across CSRB requires the articulation and application of a common (to all CSRB) definition of the term water adaptation plan, of its scope and format. It also requires making methodology choices and applying them consistently in all CSRB (e.g. regarding the framework used to analyse the current situation, or the methodology to identify and assess water management options etc.).*
>
> *Maintaining consistency of participatory processes across CSRB, requires finding a balance between: making methodology choices on the participatory processes and applying them consistently in all CSRB; acknowledging the specifics of each CSRB, the needs and objectives as well as the feasibility of option in each of the CSRB. Moreover, the needs and expectations of the stakeholders might significantly differ, as well as the fields of tensions between them, which might influence the (political) feasibility of the water management options.*

Within BeWater, distinction is made between the following types of participation:

- Participation of Consortium Partners through the interactions between them, resulting in exchange of experience and learning. Some of these interactions are a result of the project planning such as the formal project meetings, but apart from this there will be frequent interactions through the activities (preparation, execution) of the BeWater work packages;
- Participation of Science and Society. In first instance, this cover the structural participation

of the science partners to the project through the scientific work as well as the structural participation of Society through the participatory approach. In addition, it also refers to the integration of the dialogue between Science and Society in the project

- Participatory events.

This document focuses on the guidelines for the participatory events, though aspects may apply to the other types of participation.

2.2 Terms and definitions

2.2.1 Stakeholder

The most quoted definition of a stakeholder in literature is that given by Freeman (1984) in his book, *Strategic Management: A Stakeholder Approach.* Freeman puts forth that a stakeholder is "any group or individual who is affected by or can affect the achievement of an organization's objectives" (Freeman, 1984). In earlier writings, this definition is what Freeman refers to as the 'wide sense' of a stakeholder. However, he also spoke of the 'narrow sense' of a stakeholder, describing it as "any identifiable group or individual on which the organization is dependent for its continued survival" (Freeman & Reed, 1983).

In general, narrow views of stakeholders attempt to define relevant groups in terms of their direct relevance to a firm's core economic interests. Several scholars define stakeholders in terms of their necessity for the firm's survival (Bowie, 1988; Freeman & Reed, 1983; Näsi, 1995); Clarkson (1995) defines stakeholders as those who have placed something at risk in relationship with the firm, whereas Freeman and Evan (1990), Hill and Jones (1992), and Cornell and Shapiro (1987) speak of stakeholders as contractors or participants in exchange relationships. Mitchell, Agle and Wood (1997) offer a detailed chronological overview of the evolution in the definition and understanding of the stakeholder concept.

For the purpose of the BeWater project, Prospex uses Freeman's 1984 definition: "any group or individual who is affected by or can affect the achievement of an organization's objectives". Applied to BeWater, the definition becomes:

Any group or individual who is affected by or can affect the achievement of the objectives of BeWater.

This definition infuses the Prospex stakeholder identification, selection and engagement methodology.

2.2.2 Key stakeholders

The BeWater Description of Work specifically mentions the engagement of "key stakeholders" in the project, referred to as "a group of 10-15 representatives of broad society in each CSRB that will contribute with knowledge, experience and opinions to the development of the BeWater project".

In the project framework, Prospex has defined key stakeholders as stakeholders that have:

- a key **stake** in the project;
- key **expertise/**knowledge relevant for the Project;
- key **influence,**

and who are willing to **engage**/take initiative (see Figure 4 below).

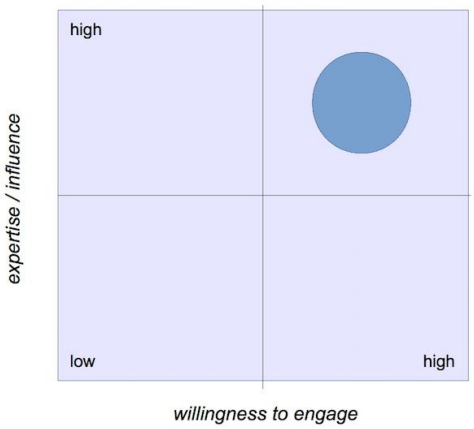


Figure 4. Key stakeholders

As the above definition relates the notion of key stakeholder to the objectives as well as to the willingness to engage, the identification of key stakeholders is bound to evolve during the project, from a more unspecific group of persons at the beginning of the project (when water management options have not been identified yet) to a more specific group of stakeholders (when water management options have been identified and prioritised).

2.3 Stakeholder participation within BeWater

BeWater is based on iterative cycles of science-based work integrated with society participation through stakeholder involvement, and as the objective is to apply this approach to the four CSRBs, the methodologies used for the science work as well as the stakeholder participation need to aim for consistency and comparability.

Therefore, the approach will be based on the Stakeholder Integrated Research (STIR) approach, tested and documented in previous climate change and adaptation research projects (Gramberger et al., 2014), and presented in Figure 5:

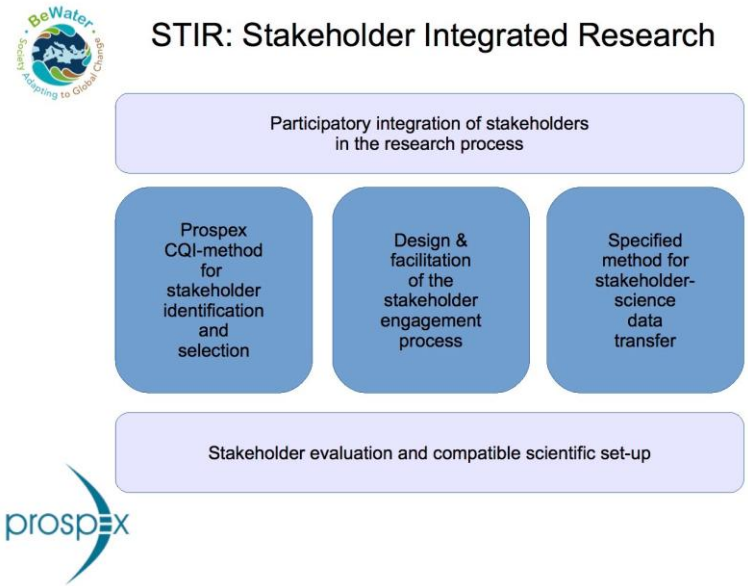


Figure 5. Components of STIR – Stakeholder Integrated Research

As Figure 5 shows, the main components of STIR are:

- Stakeholder evaluation and compatible scientific set-up;
- Participatory integration of stakeholders in the research process;
- Prospex-CQI method for stakeholder identification and selection;

- Design and facilitation of the stakeholder engagement process;
- Specified method for stakeholder-science data translation.

Stakeholder evaluation and compatible scientific set-up

Stakeholder evaluation enables direct, measurable feedback by stakeholders on the engagement on inputs provided and on results achieved by the project. Within BeWater, this is ensured through the evaluation conducted at the end of every participatory event, according to evaluation practices designed in Work Package WP8 (Evaluation).

A compatible scientific set-up of the stakeholder engagement itself is a prerequisite for integration with other parts of the project. Within BeWater, this will be achieved by:

- Applying essentially the same participatory approach across the four CSRBs– as to create comparability and consistency. This has to be balanced with the need to address the specifics of each setting;

- Involving the science partners in the articulation of the objectives, as well as in the desired formats and quality of the outcome to be created during the participatory events;

- Involving the Case Study Leaders in the preparation of the participatory events, in order to ensure the local specifics have been sufficiently integrated;

- Involving Work Package WP8 leaders in the evaluation of the participatory events.

Participatory integration of stakeholders in the research process

Within the STIR approach, stakeholder engagement is not positioned as an adjunct to an otherwise stakeholder-remote project. Instead, the involvement of stakeholders is an intrinsic part of the scientific project. The framework and basic concepts of BeWater, as explained in Deliverable 2.2 (Framework report on the BeWater approach) and the above sections confirm this.

Prospex-CQI method for stakeholder identification and selection

Realising the potential of any stakeholder engagement process highly depends on the identification and selection of stakeholders. These activities should also deal with the challenge of representativeness, a key question for any public engagement process that foresees a selection of participants. Any group of participants (which by definition will be limited) can hardly be representative of society, and any claim to that effect could hence not be upheld. At the same time, a thoughtful selection is important, as the composition of the group of stakeholders will influence the outcome. Within BeWater, for the identification and selection of stakeholders, the Prospex-CQI method (Gramberger et al., 2014) will be applied. In essence, Prospex-CQI stands for:

C = Criteria: Defining a set of criteria and categories for SH groups that are either affecting or affected by the project;

Q = Quota: Setting specific minimum quotas for all categories;

I = Individuals: Identifying key institutional positions, and subsequently individuals that fit the categories, with the overall selection fitting the quotas set.

Design and facilitation of the stakeholder engagement process

The STIR approach allows participants to contribute to the project and make informed choices by applying detailed process design and professional process facilitation.

- ***Detailed process design***. This involves methodically designing the components of the participatory process interactions before the start of the engagement process itself. The design is purposefully attuned to meeting the set objectives and includes tailored process

plans specifying the type of interaction, activities and goals for each element of each process step; thus, it constitutes a plan for implementation. Within BeWater, the challenges related to the specifics of each CSRB– in terms of language, culture and habits, historical sensitivities need to be integrated in the detailed process design.

- ***Professional process facilitation***. A major challenge in participatory science-stakeholder processes is the different levels of knowledge, and differing values, assumptions and terminologies among scientists and stakeholders. These may render communication between and within the groups difficult, and may derail the process. Skilled facilitation of a participatory process actively deals with this challenge and, moreover, ensures that the process takes up the range of stakeholder perspectives, rather than being dominated by some of them. Within BeWater, a specific challenge will be related to the use of the local languages of the CSRB. In order to have local stakeholders participating to the workshops, the workshops will be conducted in the local languages (Arabic, Catalan, Greek, Slovenian). However, for reasons of consistency and comparability, the workshops need to be designed and facilitated by the same party. Consequently, next to professional facilitation services, professional interpretation services need to be present and be fully integrated in the workshop design and facilitation practices.

Specified method for stakeholder-science data translation

Outcome, data and conclusions created by stakeholders during participatory processes are not necessarily directly fit for scientific analysis, as they can be rather qualitative of nature. Hence, there is a need to:

- Design the participatory processes as to make the outcome fit for the science work to the best extent possible). In BeWater, this will be handled by having close collaboration between the partner responsible for stakeholder engagement and the other science-related partners in designing the process for the participatory event;

- Translate the outcome of the participatory processes, to make it applicable in the further science work. In BeWater, this de facto entails the translation of the outcome of the participatory events– which are held in the local language of the CSRB (hence Arabic, Catalan, Greek, Slovenian)– into the English language. This operation needs to be handled with care in order to respect the meaning of statements made by the stakeholders (including the subtext). In addition to the translation challenge, care needs to be taken to display but not interpret the outcome. Supporting this, the Case Study Leaders are to be directly involved in this translation process;

- Select scientific methods (as the basis for the science-based work) that can cope with the qualitative nature of outcome of the participatory processes. In BeWater, the selection of the scientific methods within Work Packages WP3 and WP4 is made as to reflect this.

3. Protocols

3.1 Protocol for stakeholder identification

3.1.1 General introduction

Active societal involvement in the development of water adaptation options and plans is at the very heart of the BeWater Project. It follows that the identification of relevant stakeholders for the project in its entirety is of equally great importance.

The elaboration of criteria for stakeholder identification reflects a careful search for balance across societal perspectives, geographical origins and scope, gender and age of participants. Stakeholder identification is driven by a search for participants who can provide insightful, original and credible input regarding water management. The identification and selection of stakeholders is pursued with the help and input of all consortium partners, but in the first place with the support of the case study leaders for the case study river basins, i.e. Tordera (Spain), Vipava (Slovenia), Rmel (Tunisia) and Pedieos (Cyprus). The contribution of the BeWater partners is crucial, though not exclusive. Prospex guides and supports the case study partners in structurally capturing a wider circle of potential participants that goes beyond the parties the case study leaders might immediately have in mind.

Although the capacity of a case study with a limited number of participants to offer reliable representativity of the various angles of society is inevitably limited, the methodology for stakeholder identification aims to reach a high degree of inclusiveness. A balanced inclusion of a diversity of perspectives supports the plurality of insights and backgrounds of stakeholders, thus limiting biases and improving the outcome legitimacy.

3.1.2 Main societal sectors and perspectives

The first step in the design of the stakeholder identification process is to set stakeholder selection criteria, ensuring scientific and societal relevance of stakeholder inputs. Identification and mapping has to take into account the need of incorporating a balance of genders in the process as well as of involving main and marginalized communities / water user actors. Moreover, a satisfactory representation of the various age categories is to be sought. The resulting stakeholder identification and selection framework is built on a number of structural elements:

- Main societal sectors and perspectives
- Scope of activity of participants and their respective organisation
- Organisational affiliation
- Age and gender balance

Water management encompasses a whole array of cross-sectorial activities, and as such a broad range of thematic areas and actors are linked to it. Within the BeWater project the below listed areas have been identified. As these cannot be not exhaustive, the option ‘Other’ has been added. This categorization is to be further refined as the project progresses, and possible hitherto unidentified sectors and perspectives may be added in consultation with the CSRBs. The categorization serves as the first level of taxonomy of BeWater stakeholders:

- Agriculture
- Infrastructure
- Energy
- Water
- Forest Management
- Environment
- Other

3.1.3 Organisational affiliation

Organisational affiliation has been divided into eight main categories, based on the initial identification in the DoW, and on subsequent discussions with project partners during the project kick-off meeting. These are: 1) Business and economy; 2) Government and public authority; 3) Research and academia; 4) Civil society; 5) Practitioner and self-employed; 6) Media; 7) Education and youth; 8) Tourism and recreation. The ninth category 'Other' was added, in order to offer the possibility to include stakeholders who might not fit under one of the previous categories. These categories aim at offering an exhaustive representation of the different settings of society relevant to this project and its objectives.

The further elaboration of each of these categories led to the following taxonomy:

- Business and economy
  - Enterprises (including SMEs)
  - Business organisation
  - Professional organisation
- Government and public authority
  - Executive
  - Legislature
  - Judiciary body
  - Agency
  - Authority
  - Inter-institutional network / association
- Research and academia
  - Research centre or university department
  - Technology platform (industry-led stakeholder fora for research on technological areas)
  - Think tank and research institute
- Civil society
  - NGO
  - Association
- Practitioner and self-employed
  - Farmer
  - Fisher
  - Independent researcher
  - Independent commentator, etc.
- Media
  - Newspaper
  - Newsletter
  - Web
- Education and youth
  - Primary school
  - Secondary school
  - Youth movement, etc.
- Tourism and recreation
  - Sports clubs
  - Campgrounds
  - Hotels
  - Outdoor activities
  - Heritage, etc.

3.1.4 Scope of activity of participants

The previous two taxonomies referred to the identification of stakeholder organisations. We then proceed to focus on key positions and therefore individual stakeholders within the organisations identified beforehand. This criterion addresses the scope of activity of the individual stakeholder. The following distinctions have been proposed:

- **Local**: operating within the local context with limited interest / impact in the broader picture. Can be government, business, civil society, think tank, etc.;
- **Regional**: operating at a regional (canton, department, county, province) level that links to both the national and local levels. This is primarily relevant for government, but also for business and civil society;
- **National**: operating within a country and representing the national interests or viewpoints;
- **International:** operating globally and / or present in many countries.

It is important to bear in mind that this taxonomy will be reviewed throughout the project and further developed based on discussions between project partners and interactions with the stakeholders at various stages. Moreover, while there is no separate formal **"**River Basin**"**, category most of the afore-mentioned categories of stakeholders will have the respective river basins on their agenda. This will be taken into account in the process of stakeholder selection for the engagement processes, and will be recorded as such in the stakeholder management tool, detailed in section 4 of the present protocol.

The consequence of working in a local case study structure is that most of the stakeholders involved have a clearly local perspective. This is crucial, as knowledge of the local setting, structures and sensitivities is indispensible when developing a water management adaptation plan for a specific river basin. However, it is beneficial to involve stakeholders with a broader than local perspective as well, adding otherwise potentially overlooked perspectives to the process

Within the BeWater Project, it has been proposed to focus on local stakeholders for the first workshop on Water Management Options, while engaging more decision-level stakeholders at a later stage. This approach might however not work for all case study river basins, given the difference in societal and decision-making structures, and a decision in this respect will be made at case study level.

3.1.5 Age and gender balance

Age categories have been set to include participants that broadly reflect an overall societal age balance. In the identification phase, the distinction is made to locate people into three groups, respectively representing age groups under 30, between 30 and 50, and above 50 years of age.

At the same time, as far as the gender aspect is concerned, an equal representation of both male and female stakeholders is strongly recommended.

3.1.6 Experience with stakeholder engagement in the river basin

This category was introduced in order to help CSRB partners identify stakeholders in the respective basin. The previous experience of identified stakeholders with stakeholder engagement activities serves as an initial indication of the respective stakeholders' key stake in the field of water management, and of their willingness to engage on the topic.

3.2 Protocol for stakeholder selection

The quality, saliency and representativity of the designed participatory processes depend highly on the way stakeholders are selected. Furthermore, the choice of participants should aim at reflecting in a balanced setting of diverse sensitivities, points of view and sectorial perspectives.

3.2.1.1 Articulation of minimum quotas for selection

The selection of stakeholders to be invited for participation to specific consultation workshops is important, since the composition of the group of stakeholders will influence the outcome.

As stated above, in its approach to stakeholder selection for workshops, we apply the Prospex-CQI method as part of the Stakeholder Integrated Research (STIR) approach, tested and documented in previous climate change and adaptation research projects (Gramberger et al., 2014), as explained under section 2.3 of the present protocol.

Given the process design and budget limitations, a small number of participants will attend each workshop (from 15 to 20 participants, depending on the case study and the workshop objectives). This restriction introduces a key methodological challenge for stakeholder selection. In order to be inclusive of different views and perspectives, systematic and consistent sets of minimum quotas of participants from each stakeholder category should be established..

The aim of the quotas is to reduce the biases and distortions that could derive from over-representation of certain typologies of participants or societal sectors. The selection of the invitees to each workshop will indicatively fulfil the established quota indication. This will support the selection of stakeholders driven by a concrete interest in providing, receiving and developing unique, motivated and valuable insights in the future of the four river basins. This last expedient in the framework of the overall methodology for stakeholder identification and selection is meant to contribute to and reinforce the uniqueness, relevance and innovation potential of the BeWater project outcomes.

Our suggested minimum quotas for participants are listed below, and are based on the idea of ensuring a minimum and balanced representation of the categories identified. In this sense, the aim is to have at least one to two participants for each category, which, given the estimated number of 15-20 participants for every workshop, as set in the DoW, yields the listed percentages. However, they may vary from one workshop to another, function of the nature and objectives of the respective workshop, and the consultation with the CSRBs regarding their specific needs for a specific stakeholder engagement event.

- Key sectors
  - *Agriculture: 5%*
  - *Infrastructure: 5%*
  - *Energy: 5%*
  - *Water: 10%*
  - *Forest Management: 5%*
  - *Environment: 5%*
- *Organisational affiliation:*
  - *Business and economy: 10%*
  - *Government and public authority: 10%*
  - *Research and academia: 10%*
  - *Civil society: 10%*
  - *Practitioner and self-employed: 5%*
  - *Media: 5%*
  - *Education and youth: 5%*
  - *Tourism and recreation: 5%*
- *Age:*
  - *30 and under: 5%*
  - *Between 30 and 50: 30%*
  - *50 and above: 10%*
- *Gender:*
  - *Female: 30%*
  - *Male: 30%*

3.3 Protocol for the design of stakeholder participation processes within BeWater

Participatory events organized within BeWater, and more specifically the workshops conducted within Work Packages WP3 and WP4, are core moments of interaction with and between stakeholders, during which relevant stakeholders of the CSRBs actively participate to the project. The workshop process design and facilitation should be such that:

- Stakeholders can express and discuss their concerns, priorities and expectations regarding the river basin;
- The integration of the individual stakeholders' perspectives leads to a common and shared understanding of the challenges and objectives for each river basin;
- The sequence and format of workshop assignments enable the participants to steadily work towards the objectives of the workshop.

This way, stakeholders provide concrete input to the process of defining and prioritizing management options and identifying and selecting adaptation strategies.

In order to define the objectives for a specific BeWater participatory event such as the workshops that will take place in each of the river basins as part of the activities of work package WP3 and WP4, the following expectations and constraints need to be made explicit and integrated:

- Expectations and needs from the point of view of each of the CSRBs. The clarification and articulation of these will give rise to CSRB-oriented approach that will feed the stakeholder engagement;
- Expectations and needs from the point of view of the water adaptation plan. The clarification and articulation of these (in terms of scope, content covered, format etc.) will ensure that BeWater remains focused on the project goals and outcomes.

The combination of the CSRB orientation and focus on the final adaptation plans (science driven) to be delivered will help define constraints and requirements on the methodology to be adopted and the outcome to be achieved in the workshops. This then results in the following steps that will be followed when designing a participatory process within BeWater (Figure 6):

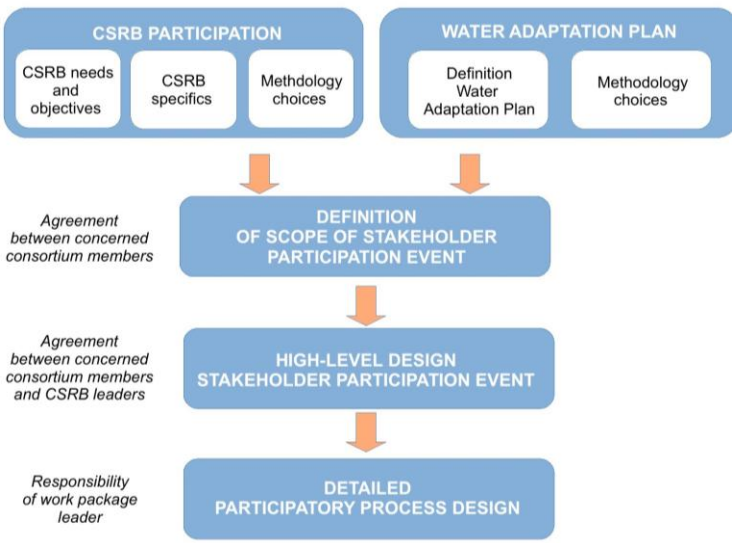


Figure 6. Steps in the design of participatory processes

- The ***definition of the scope*** of the participatory event. To this extent, input will be taken from the BeWater scientific partners, namely:
    - The project experts, with regard to the specific scientific objectives on which stakeholder input is requested:
        - water related challenges
        - objectives for the river basin
        - water management options
        - evaluation and selection of water management options
        - water adaptation plans
    - The Case Study Leaders, with regard to the contextual objectives and constraints related to specific CSRBs
- The ***high-level design*** of the participatory event. During this design, input will be considered from the BeWater scientific partners, regarding the main steps taking during the participatory event as well as the format and desired quality of the expected outcomes;
- The ***detailed process design*** of the participatory event. At this stage, much more operational matters are being sorted out, related to e.g.:
    - logistics of the setting (venue, catering, etc.)
    - interpretation and translation services
    - infrastructural set-up and hardware needs (room lay-out)
    - detailed workshop design including specifying process tools (beamer, flipcharts, post-it notes etc.)

In parallel to these activities, the process of identification and selection of stakeholders, including the process of inviting the stakeholders, will be run.

3.4 Protocol for the evaluation of stakeholder participation processes within BeWater

3.4.1 Evaluation methods

BeWater's core strategy and principal aim is to carry out the project with a participative approach. The evaluation of the participatory engagement processes under work package 3 is part of the Monitoring and Evaluation process established in the project in collaboration with all work packages and under the guidance of work package 8.

The following methods of evaluation will be used related to stakeholder engagement events:

- *Questionnaire-based stakeholder surveys*, including questions relating specifically to the engagement process, to the scientific content presented during the workshop, and more generally to the BeWater project itself;
- *Meeting minutes and reports*.

Indicators used for the evaluation are the analysis of the written evaluation sessions in the events, as well as the number of people participating and the extent to which criteria and quotas set in the Protocol on stakeholder selection have been met.

3.4.2 The project's influence on civil society and stakeholder participation

In BeWater, mainly work packages 3 and 4 deal with stakeholder participation, enabling the link between science and society. Examples of relevant objectives for those two work packages related to the project's influence on civil society and stakeholder participation are listed below – for more information see D8.2 1st Report of the Internal Observer.

Work Package 3
- To launch a sensitization campaign to **raise social awareness and** to encourage capacity building;
- Empowerment and social formation in water management challenges and adaptation;
- To facilitate the exchange of knowledge and information between **society and science** through two **stakeholder workshops** with professional facilitation services, as well as other **participatory events**, enhancing **social participation** water management;
- To review the state of the art on water impacts and vulnerabilities and water adaptation in the selected case study river basins (CSRBs) and to **enrol civil society** in the identification of challenges, problems, needs and constraints at local level.

Work Package 4
- To design adaptation plans for the implementation of adaptation strategies in the case-study river basins (CSRBs) based on the results of the **public participation process**;
- To compile the adaptation measures and activities developed in WP3 with a prioritization, cost-benefit;
- To analyse and evaluate in each CSRB as part of the adaptation plans. The drafts will be validated by the key stakeholders in a **participatory seminar;**
- To communicate recommendations on adaptation plans to **politicy makers** at local and international scale.

In order to monitor and evaluate the progress towards the above-mentioned objectives, a set of questions will be developed by Work Package 8 in collaboration with all work package leaders. These questions should tackle issues situated in the following five areas:

- Relevance
- Efficiency
- Effectiveness
- Impact prospects
- Potential sustainability

A more detailed overview of the monitoring and evaluation methodology is outlined in D8.2. This methodology deals both with the internal implementation process, as well as with the evaluation of the impact on society. Since Work Packages 3 and 4 are meant to have a clear impact on society and stakeholder, they will be very closely monitored.

For the sake of developing a pragmatic and feasible evaluation system, in this case civil society will be represented by the stakeholder groups that will be identified in these 2 work packages as representative and able to channel the civil society interests to the project. Therefore it will be very important to carefully select stakeholders also in a way that they can represent and channel civil society thinking and needs (see the Protocol on Stakeholder identification in this document).

4. BeWater Stakeholder Management Tool

4.1.1 From the Description of Work to the database

The diagram below offers a short overview of the steps taken from the provisions laid down in the project Description of Work to the current stage in the process of stakeholder engagement.

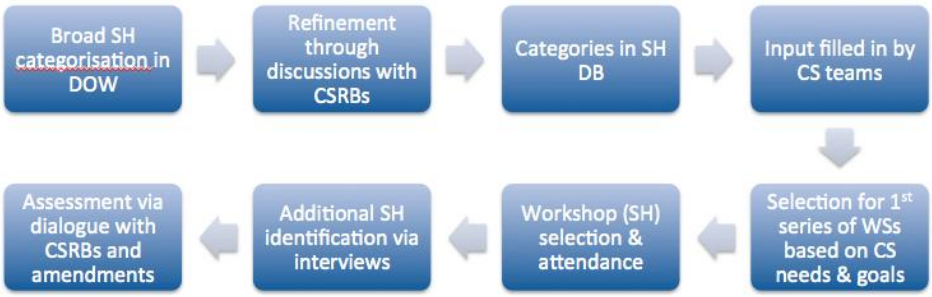


Figure 7. Stakeholder identification: from the DoW to the current status

This process is an almost circular one, as assessment in collaboration with project partners continuously leads to further refinement and the addition of new categories to the stakeholder database. The broad stakeholder categorization in the DoW (Figure 8) received further refinement through discussions and interactions with the CSRB partners during the Project kick-off meeting and subsequent discussions via Skype calls. The resulting categorization is summarised in the graphic below:

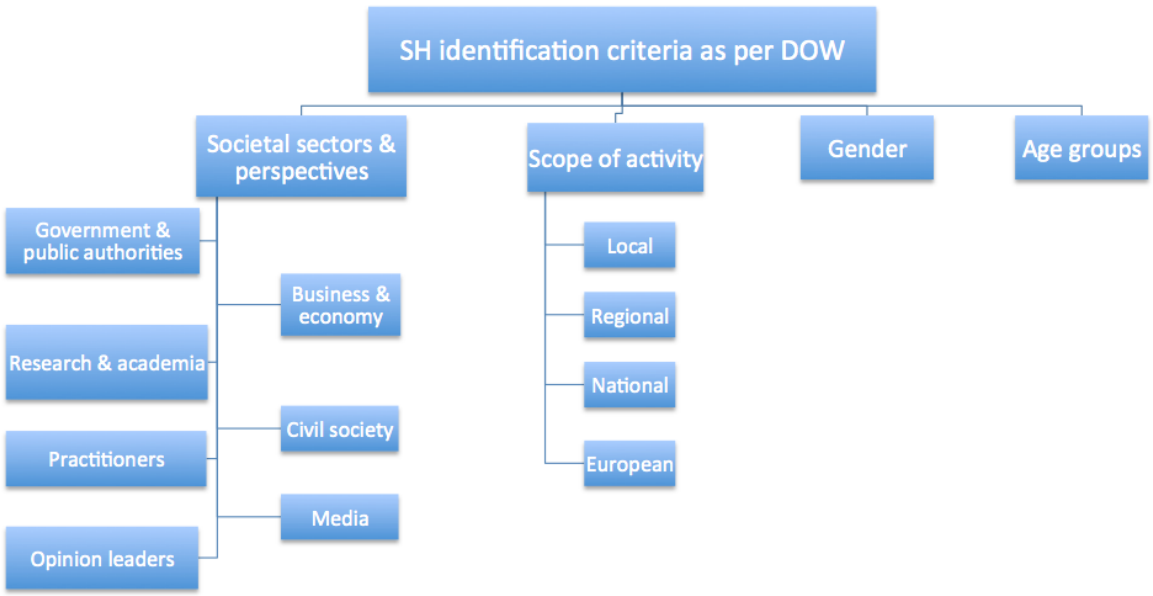


Figure 8. Stakeholder identification criteria set up in the DoW

This was translated in practice into a stakeholder management tool, in the form of a database hosted and administered by Prospex on its servers:
http://www.prospex.com/client/registration/index.php?sid=37927&lang=en

The expressed objectives of this database, as defined in the DoW, comprise:

- Enabling an effective, efficient and methodologically sound selection of stakeholders for the participatory processes;
- Providing a pragmatic tool for registering, monitoring and following-up of stakeholder involvement throughout the project;
- Providing BEWATER with a large network of potential stakeholders to be involved in the project activities as well as in the broader dissemination activities.

The outlined taxonomy is at the core of the BeWater stakeholder database. The detailed criteria for stakeholder categorisation were integrated into the database in the following structure:

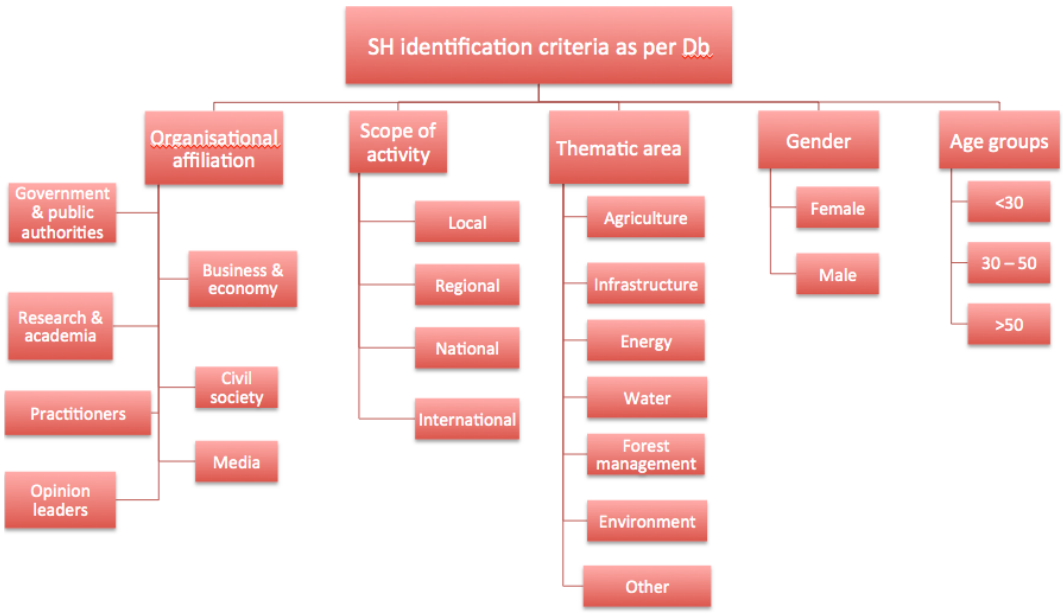


Figure 9. Stakeholder identification criteria: refined and translated into the database

This framework was subsequently filled with input from the CSRB partners, consisting of stakeholder contact data. Prospex assisted by guiding the process and administering the database, which totalled 302 complete entries as of 15.10.2014.

Following the first series of stakeholder workshops, as well as the input received from CSRB partners during the project General Meeting in Nicosia (October 2014), it was felt that further improvements could be made in terms of the stakeholder management tool provided, in order to fully fulfil its set objectives and comprehensively assist the CSRBs with their continuous stakeholder engagement efforts.

These improvements in the software option provided address better and more extended functionalities regarding:

- Easy overview of individual stakeholders and their institutions for both the Prospex administrator and the CSRB partners
- Flexibility in terms of later additions or changes to the general structure of the data base;
- Easy editing, filtering and exporting of stakeholders' data;
- Contact tracking, which would offer the possibility of recording the history of contacts made with stakeholders;
- Adding tags, notes and files to stakeholders' profiles;
- Integrated option to email stakeholders;
- Integration with social networks.

As the BeWater project provides for neither the time, nor the specific budget to develop a new in-house tool integrating these extended functionalities, Prospex has researched the array of Customer Relations Management (CRM) and collaborative work software available on the market. Taking into account both functional and budgetary requirements, as well as data protection imperatives, Prospex proposed Capsule as the new stakeholder management tool: https://capsulecrm.com. After a series of consultations and live demonstrations involving the CSRB partners, Capsule was adopted as the stakeholder management tool of the BeWater project.

In setting up the tool presented below, we have used a “zooming-in” approach in the stakeholder categorization and description, as detailed in the Protocol for stakeholder identification (section 3 of the present document). This entails starting at a high level, by identifying broad types of stakeholders (as per the DoW and discussions during the kick-off meeting). We then proceeded to zoom in on relevant specific organisations of the respective type, and further focusing on individual stakeholders working for the respective organisations. This structure reunites and reorganises the same categories detailed in Figure 6, being in addition easy to identify and follow in the database.

Figure 10. Steps in the selection of the specific individual stakeholder

4.1.2 Protocol regarding the use of the stakeholder management tool

Overall presentation

Capsule is originally an online relational software, whose features and functionalities make it suitable for use as a stakeholder management tool within the BeWater project. Its basic, free version allows two users to work on a specific contacts database at the same time, and entails no residual costs of the software company for the BeWater project. This entails that each CSRB will have its own database, whose administrator is the Prospex project coordinator, while the CSRB contact point will receive the login data for a regular account. This CSRB user will enjoy the full functionality of the tool, except for the possibility of deleting the database and its other users.

Protection of confidential data

In a project such as BeWater, often dealing with private data, prudence and discretion are crucial. In the EU Charter for Fundamental Rights the following points are taken up in relation with the protection of personal data under Title II, Article 8:

- *Everyone has the right to the protection of personal data concerning him or her.*
- *Such data must be processed fairly for specified purposes and on the basis of the consent of the person concerned or some other legitimate basis laid down by law. Everyone has the right of access to data that has been collected concerning him or her and the right to have it rectified.*
- *Compliance with these rules shall be subject to control by an independent authority.*

Within the BeWater project, personal data are being entered and kept in the BeWater for the entire project period. All the partners involved have been informed that the database can only be used for purposes related to the BeWater project and its dissemination. Stakeholders have the option of indicating they no longer wish to receive BeWater-related correspondence.

At the beginning of all stakeholder workshops participants are asked to sign a disclaimer stating the following:

“Any information provided to the BeWater project will be considered as strictly confidential. Data are collected for the specific objective of the event itself and the BeWater project. I agree that, in the context of this meeting, video and/or audio recordings and pictures can be taken of me. These can be place on the BeWater website or used in BeWater publications.’

This approach also serves to build stakeholders' trust and confidence in the project team members and the project itself. BeWater project partners take the confidentiality of their contacts' personal data very seriously, and Prospex recognizes and shares this concern. The Capsule servers and the personal data stored by users in the database are hosted on Amazon's data centres in the United States. All data transferred between users' computers and the servers are encrypted by use of the Secure Sockets Layer (SSL) technology.

No one has access to a user account unless by invitation by the user. The Prospex contact person and the CSRB partners responsible for the data base management are to set a strong password for user profiles, and to change it at regular intervals. Amazon adheres to the U.S.-EU Safe Harbor Framework developed by the Department of Commerce in coordination with the European Commission. The U.S.-EU Safe Harbor Framework provides guidance for U.S. organizations on how to provide adequate protection for personal data from the EU as required by the European Union's Directive on Data Protection.

For more information about the safe Harbour Framework, please consult their web site.
For additional questions regarding data protection, please refer to the Capsule support page.

Post-project period

The BeWater project is mindful of the importance of post-project period heritage. The close involvement and engagement of such a wide variety of stakeholders is to serve this purpose by putting in place stakeholder networks into which the case study teams would continue to operate and with which they would engage even after the end of the project. Moreover, given the strongly cross-sectorial nature of water management and adaptation, which forms the core of BeWater, the project also implicitly encourages dialogue and cooperation between the various categories of stakeholders in the BeWater network.

Therefore, the rationale behind using the Capsule data bases in the current structure and in the free mode is to support this cooperation effort by allowing the CSRB free access to their stakeholder data and engagement overview both throughout the lifetime of the project and after its conclusion.

Structure and functionalities of the database

The BeWater stakeholder management tool provides a whole array of functionalities covering the stakeholder management needs that arise from the DoW and that have additionally been identified by the CSRBs and Prospex in further discussions and interactions:

- ✓ Easy overview of individual stakeholders and their institutions for both the Prospex administrator and the CSRB partners – both by use of default lists and by setting up custom list function of selected fields or tags;
- ✓ Flexibility in terms of later additions or changes to the general structure of the data base – by adding custom fields or tags;
- ✓ Easy editing, filtering and exporting of stakeholders' data – via contact forms and filtering through tagging or fields; contacts can be exported as .CSV or vCard files;
- ✓ Integrated option to email individual stakeholders – available in every contact profile;
- ✓ Integrated mass emailing to a selected list of participants – to help invite stakeholders to events, distribute newsletters or any documentation relevant to the CSRB activity;
- ✓ Contact tracking, which would offer the possibility of recording the history of contacts made with stakeholders – via notes in the contact profile;
- ✓ Tags, notes and files can be easily added to stakeholders' profiles;
- ✓ Integration with social networks - keep an eye out on your stakeholders activity on Twitter and Facebook.

4.1.2.1 Login data

Four separate stakeholder databases have already been set up (one for each river basin), and will be used by both the CS team and the Prospex project coordinator. Each contains all the contacts previously shared with Prospex via the old tool.

The language used for the data base entries is English, and will be considered standard, in order to allow for the collaboration and joint work of both the CSRBs and the Prospex Project coordinator. It is nevertheless possible to add information in other languages or use an alphabet other than the Latin one, as detailed under “Information in other languages” in section ***4.1.2.4.2 Add new contacts***.

There are two users for each CSRB database: one is assigned to Prospex, who administers the databases via its project coordinator, and the second one to the respective case study river basin team member responsible for stakeholder engagement activities.

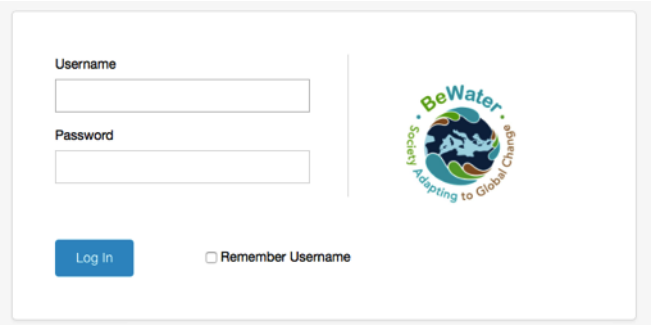
A specific user name has been created for the latter, and they have been invited to join the database. The CSRB user accounts were set up during this registration process, complete with confidential passwords set by the members themselves. They were notified to keep in mind all usual security concerns when setting their password, and to change it regularly. Prospex does not have these passwords and does not have any access to the CSRB user accounts.

Each CSRB data base is separate and comes with its own link:

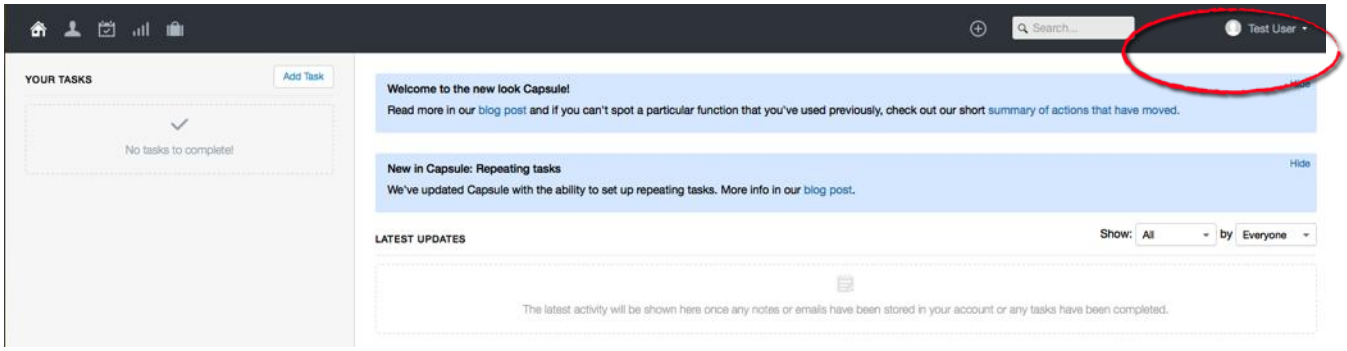
- **La Tordera CSRB:** https://bewatertordera.capsulecrm.com/login
- **Vipava CSRB:** https://bewatervipava.capsulecrm.com/login
- **Rmel CSRB:** https://bewaterrmel.capsulecrm.com/login
- **Pedieos CSRB:** https://bewaterpedieos.capsulecrm.com/login

This document explores the functionalities of the Capsule tool relevant for the project stakeholder databases, and excludes a small section of functions exclusively relevant for sales activities.

In order to gain access to any of the four databases, users need to type in their login data in the welcome screen:



After logging in, they will gain access to the main page, which can be seen in the screenshot below:

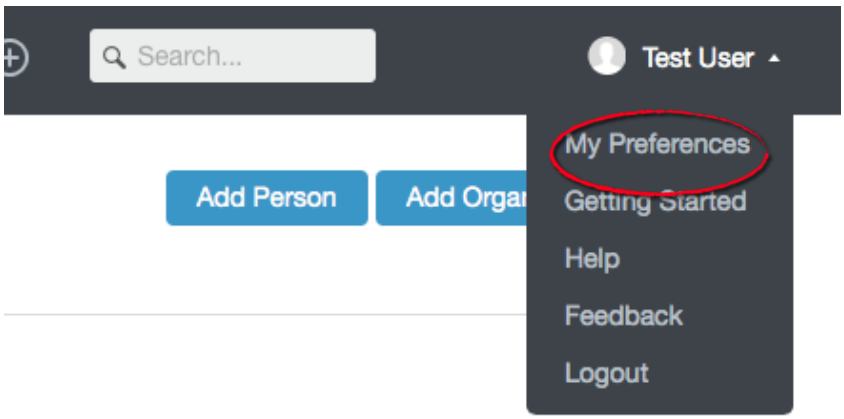


Any user has equal administrative rights on their database, and can check and edit their user settings by clicking their profile's name in the upper right-hand corner of the welcome screen (encircled in red above).

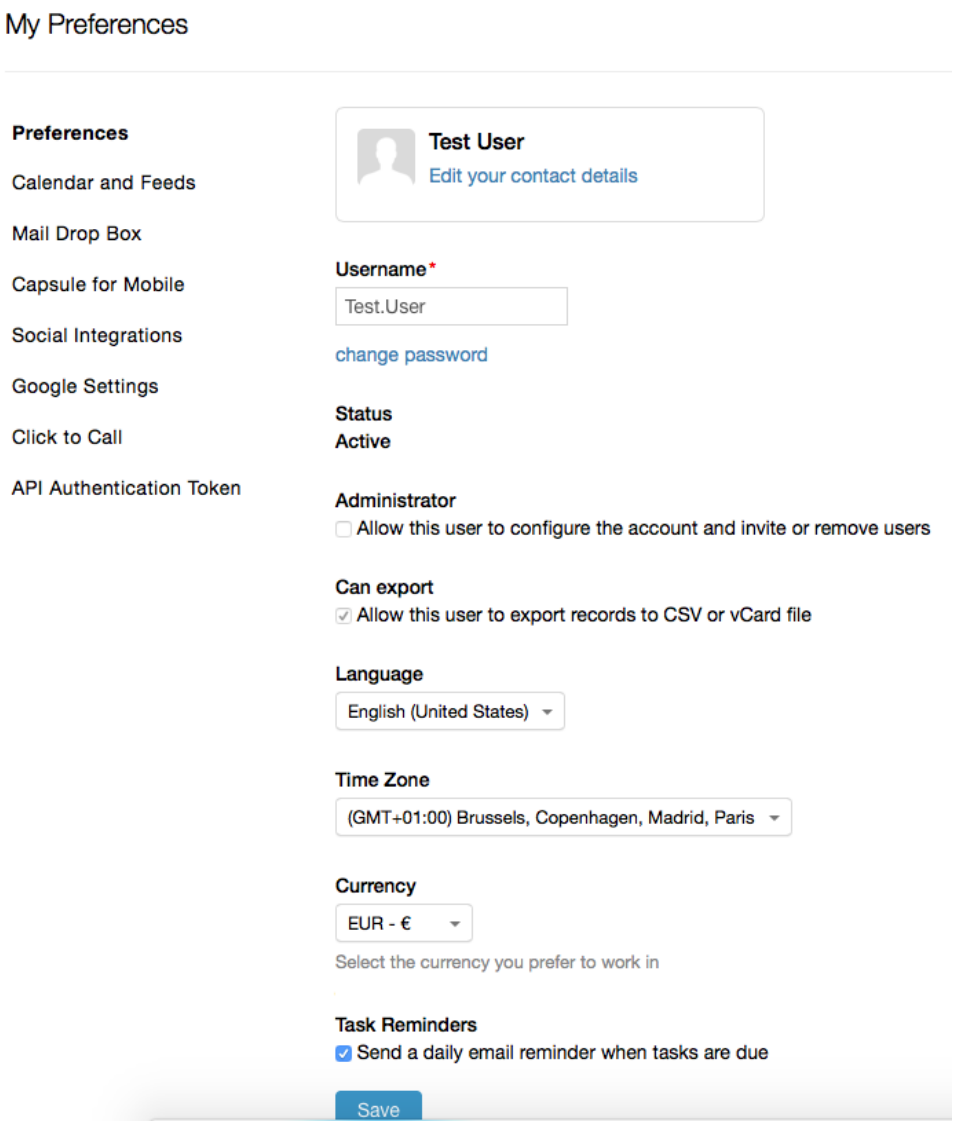
4.1.2.2 User profile settings

They will thus be able to access several fields of interest, among which:

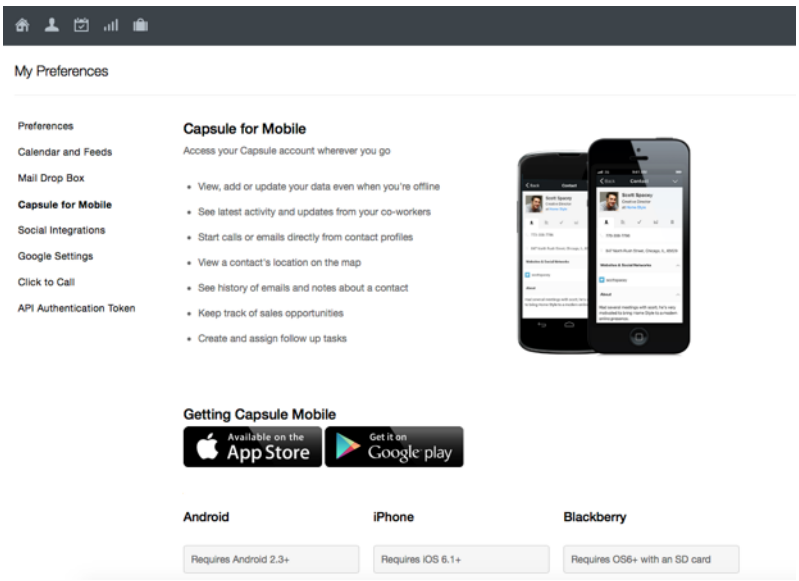
- Guidance for first-time users ("Getting started");
- FAQ section and contact data for the Capsule Support service ("Help");
- Feedback sharing to the support service ("Feedback");
- And most importantly, their personal account settings ("My Preferences").



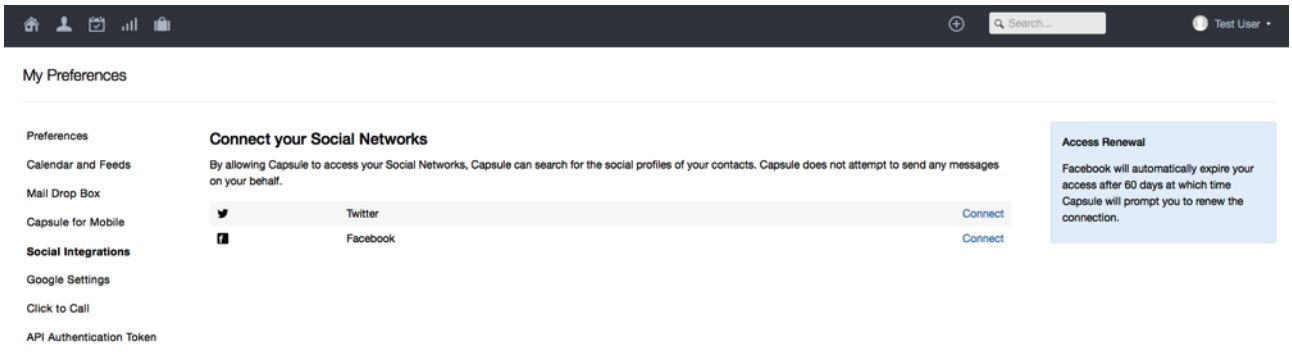
By clicking the "My Preferences" tab, CSRB users will have access to an array of settings that can be customized, including contact details, password, calendar & feeds, etc., as can be seen in the screenshot below:



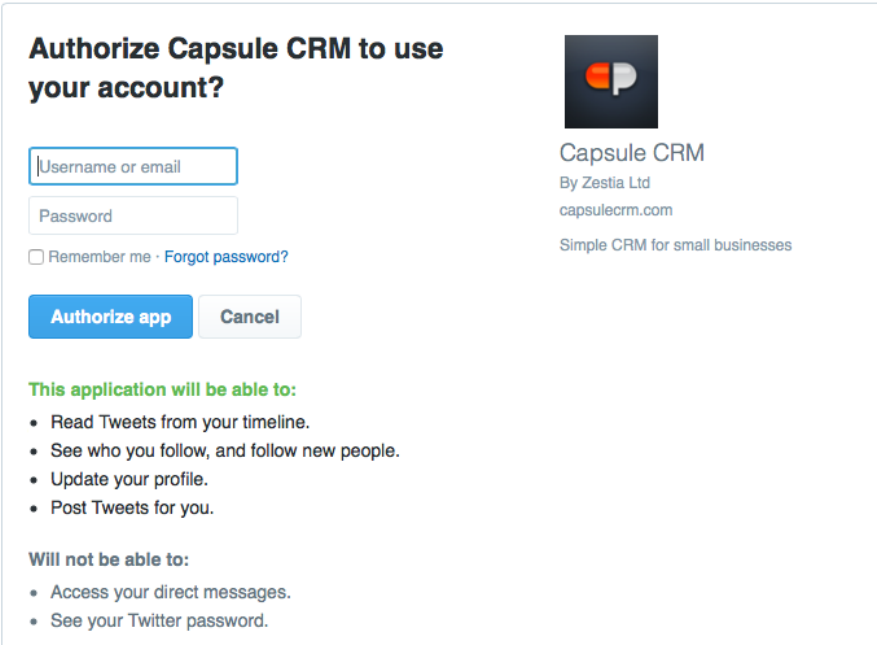
It is possible to access the BeWater databases on mobile devices as well, by downloading the respective Capsule Mobile applications for either Mac or Android users, and following the same login instructions as above. These are free of charge, but their functionalities are somewhat limited and users would need to bear data protection concerns in mind when accessing the database on their mobile phone or tablet.



Moreover, under “Social Integrations” in the preferences tab, CSRB users have the possibility of engaging with their stakeholders on social media (only Twitter and Facebook are currently supported). Giving Capsule access to one’s social networking will allow it to search for the social profiles of the contacts in the database, which CSRBs can then engage at their will.



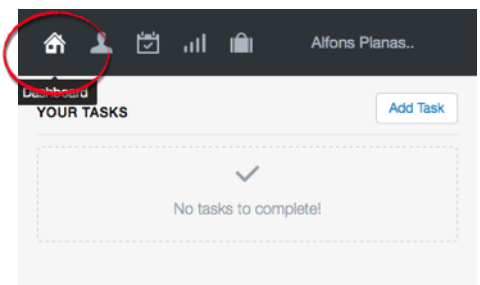
Capsule expresses that it does not attempt to send any messages on the users' behalf; it merely scans the feeds or post when allowed to, as seen in the access screen for Twitter below:



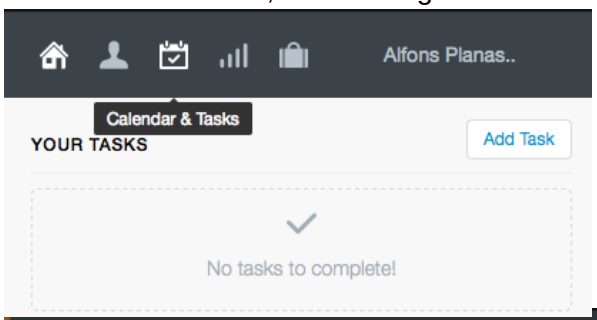
Important note: Social media integration will allow CSRBs to identify the most active stakeholders in their network, follow their activity, join debates and engage with them beyond the scheduled workshops, and the interviews and e-mails exchanged. However, it is advisable that all BeWater management tool users act mindful of their privacy settings on social media, and employ a no-risk or low-risk approach to data protection. Moreover, social media integration and the Capsule mobile app are features that CSRBs **can** use if they so wish, but there is no obligation to do so.

4.1.2.3 Dashboard

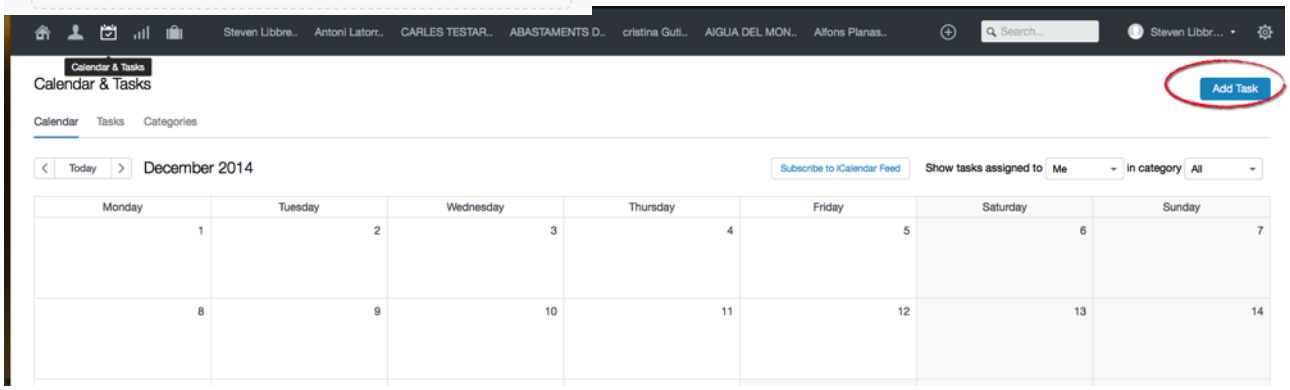
Users can always gain access back to their Dashboard view by clicking the house icon on the top left-hand corner:



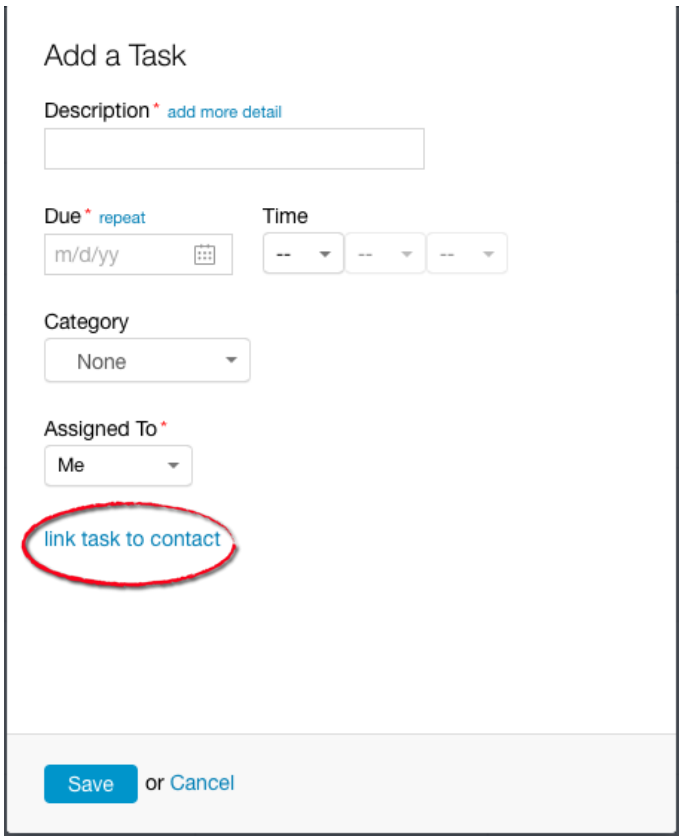
On the Dashboard one can view tasks, which CSRB users can assign themselves or can be assigned by the data base administrator. This can include following up by e-mail or phone with certain stakeholders, or selecting stakeholders for a specific event or series of interviews.



Additionally, tasks and deadlines can be viewed by clicking the “Calendar & tasks” icon on the top left-hand corner of the dashboard. The calendar overview is shown in the screenshot below.



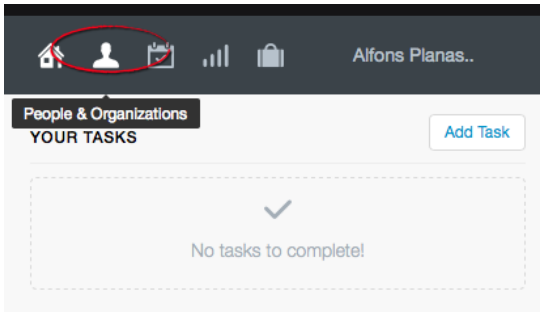
Tasks can be added to specific dates by clicking the “Add task” button encircled in red above. In addition, for a better overview and planning, one can select the category of task (meeting, email, phone call, milestone, etc.) and link it to a specific contact in the database.



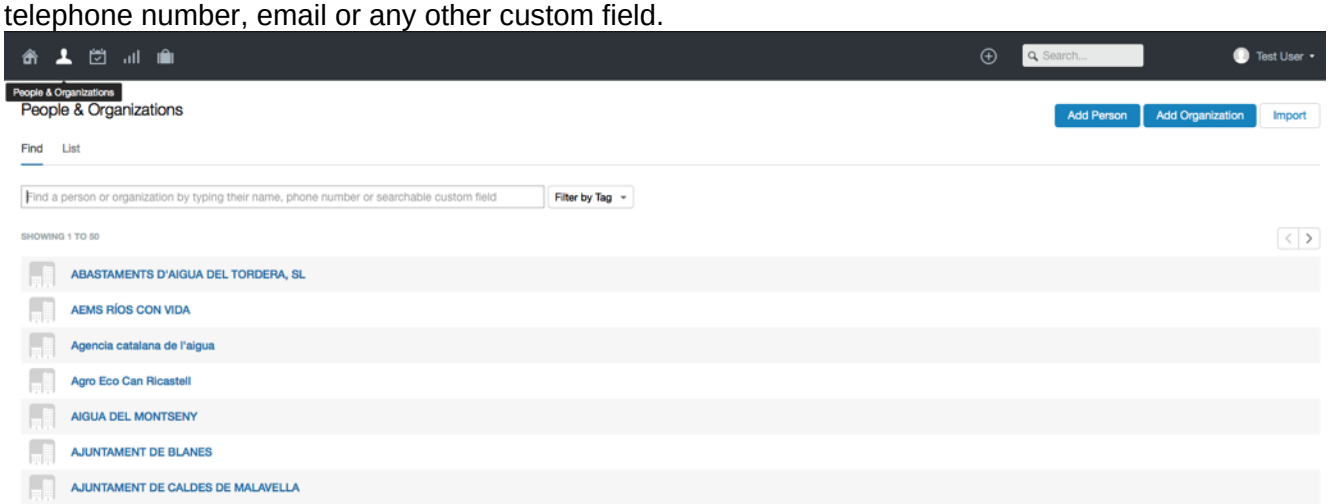
4.1.2.4 Stakeholder organisations

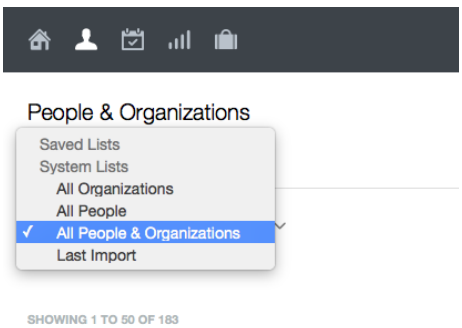
4.1.2.4.1 Overview of contacts

Clicking the silhouette icon next to the dashboard home icon will lead the data base user to an overview of their stakeholder contacts in the database:

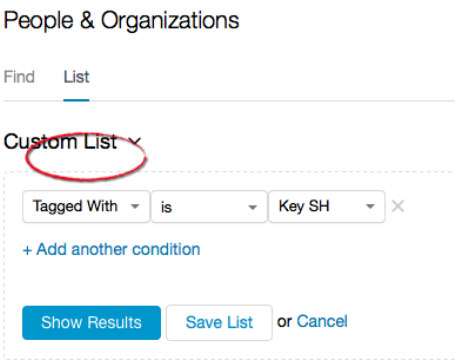


The overview screen allows users to see all contacts in the database, both people and organisations. Moreover, in the search bar, it allows them to find any key terms, such as: name, telephone number, email or any other custom field.

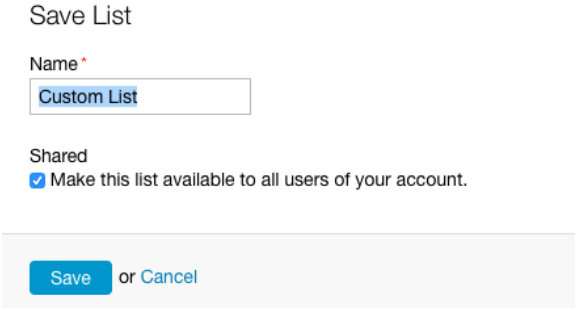




It is possible to switch between lists of contacts by clicking the “List” button. It currently has three lists available: “All People”, “All Organisations” and the default “All People & organisations”.

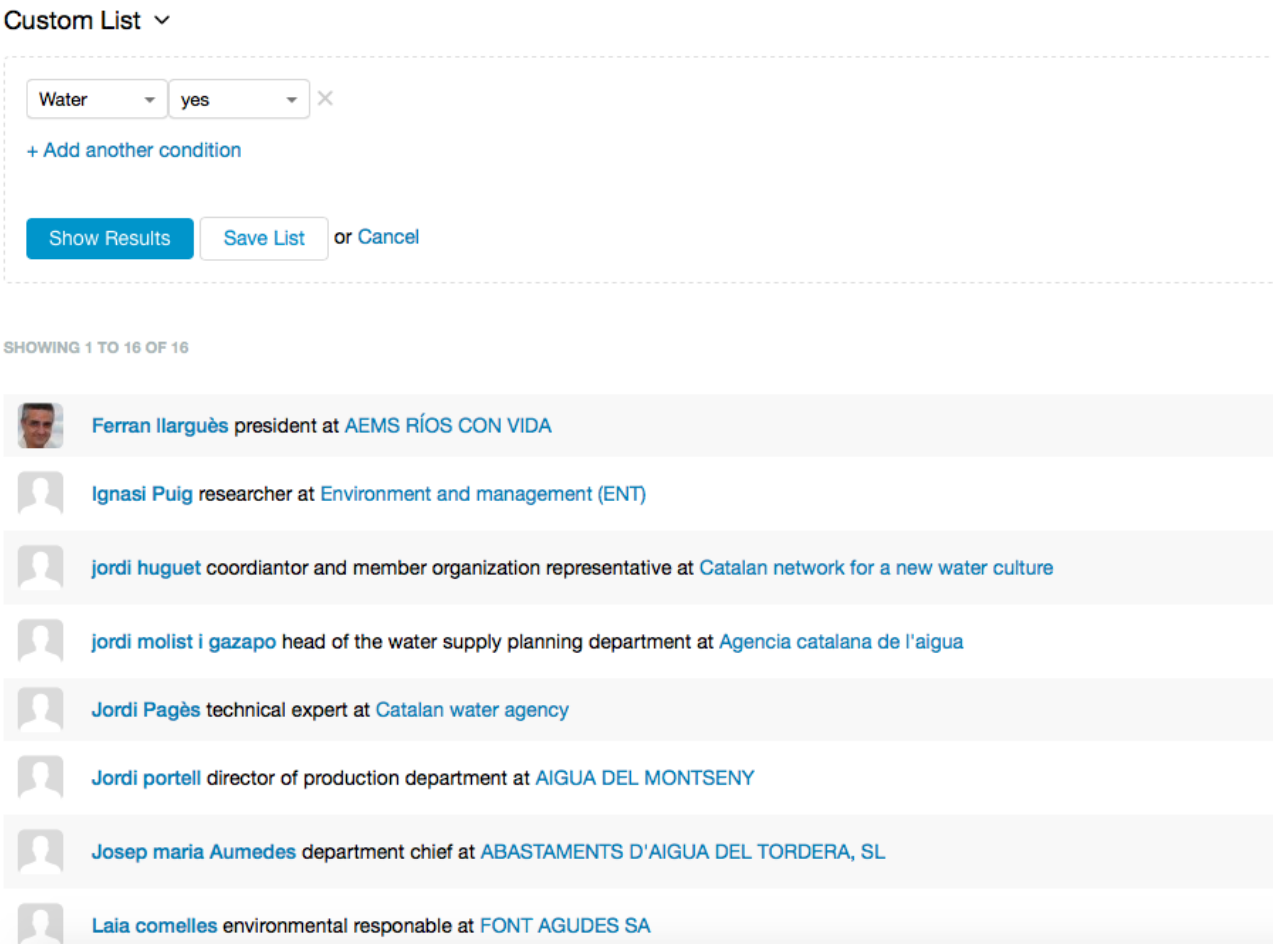


However, all CSRB users are encouraged to create any custom list to serve their own needs, by clicking “Create new list” in the “List” tab. It will lead to the adjoined sub-menu allowing them to customise a new list. By clicking “Tagged with”, one can choose for instance to select only contacts active in the sector labelled “Water” or “Tourism”.

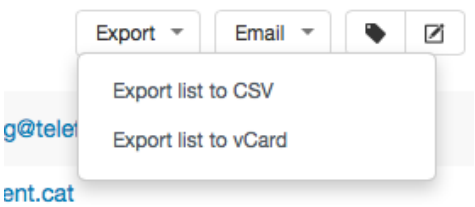


The new list can be viewed by clicking “Show results”, and subsequently save it (“Save List”). Users can also choose to add more than one

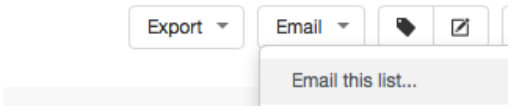
condition to a list. An example of a custom list is shown below.



The free version of Capsule currently supports a **maximum total amount of 250 contacts (organisations and individuals)**. In case CSRBs decide that their needs exceed this threshold, they are requested to contact the Prospex data base administrator in order to examine alternative solutions. In order to avoid exceeding this number of contacts, CSRB users are encouraged to periodically clean up their CSRB database and eliminate double entries, obsolete or irrelevant contacts. Prospex will send a reminder on a quarterly basis.

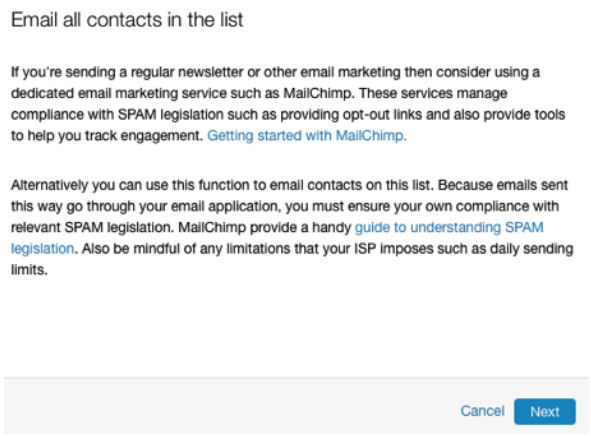


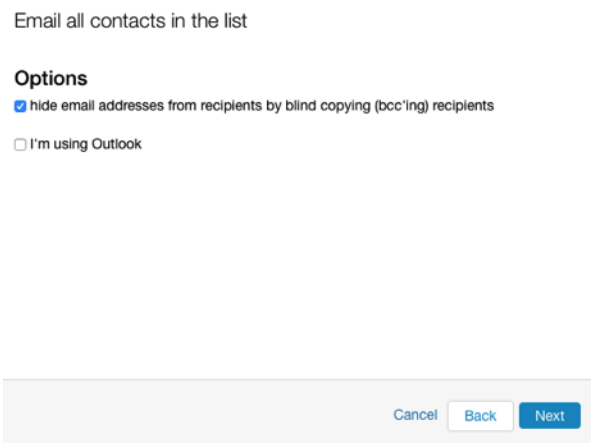
Any list of contacts can be exported by simply clicking the list, then the “Export” tab to the right of the list, and choose the output file type, CSV of vCard.



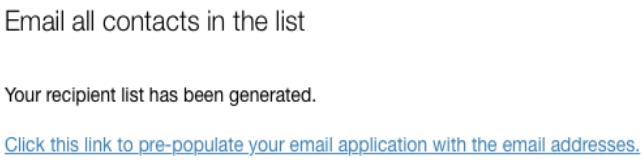
Moreover, the CSRB users can send mass e-mails to all their contacts, or to contacts in a specific list, in order to distribute a specific newsletter, document or to invite them to a stakeholder engagement session. They can do so by clicking the “Email” button as show in the attached screenshot.

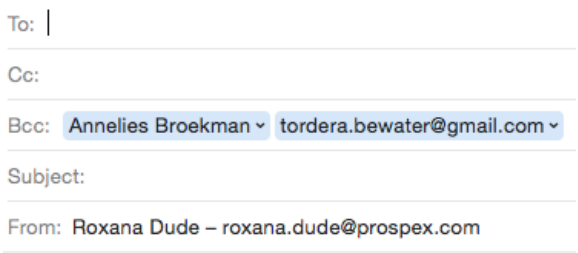
A mass email assistant will open to quickly guide them through the process, shown below. It is important that all CSRB users doing so keep in mind and ensure their compliance with relevant SPAM legislation.





When sending a mass e-mail, users can ensure the protection of their contacts' details by selecting "hide email addresses from recipients", and they will automatically be added to the BCC field in the email message.





By clicking "Next", a recipient list will have been generated. Clicking the highlighted link pre-populates the e-mail message with the addresses in the respective list.

Once the user completes and closes the mass e-mail assistant, an email message containing all e-mail addresses in the list will pop up, and they will be able to customize their message and add any attachments.

4.1.2.4.2 Add new contacts

Each CSRB database already includes the contacts previously filled in the old data base tool. CSRB users can always add new contacts by following the easy steps below. It is advisable to always start by deciding what type of contact they'd like to add (organisation or person), and consequently follow the steps for adding either type. This section outlines the steps needed to add an organisation contact, while section ***4.1.2.5.2*** deals with individual contacts.

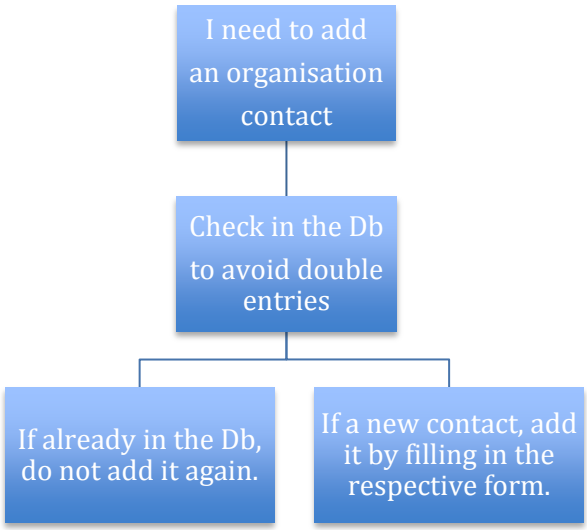
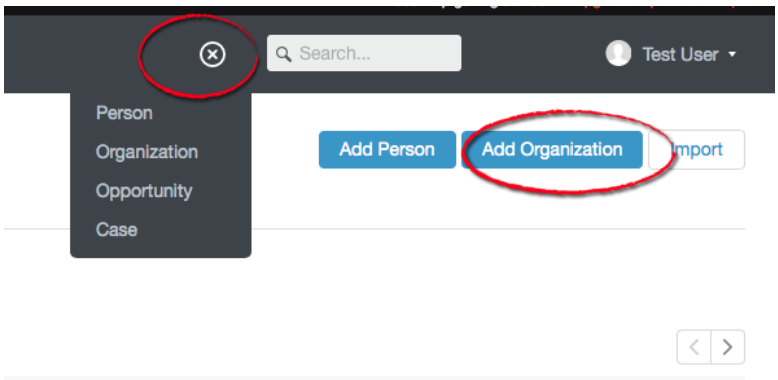
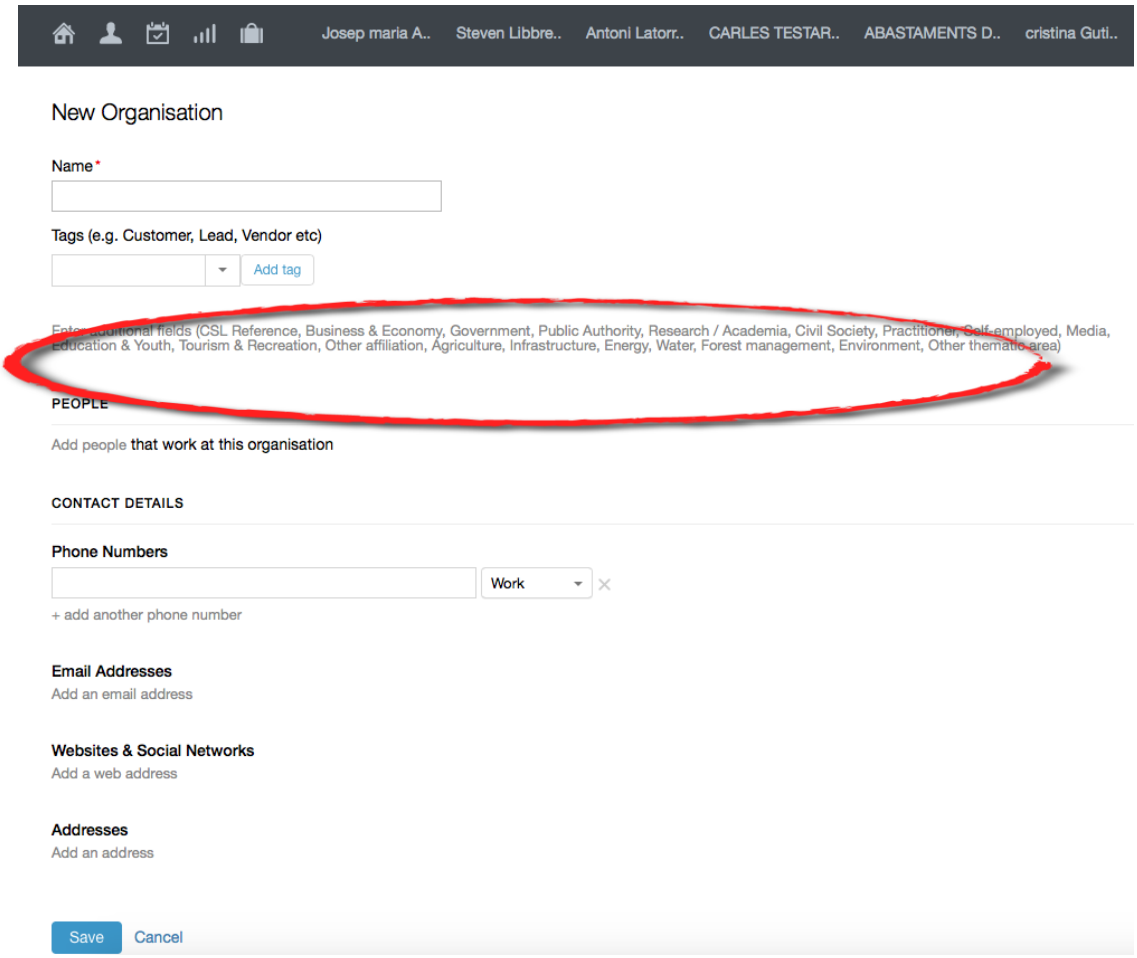


Figure 11. Steps to add an organisation contact on each database

Data base users can add a contact by clicking either the ⊕ sign on the top ribbon of the dashboard, or the "Add organisation" blue tab in the "People & Organisations" section.

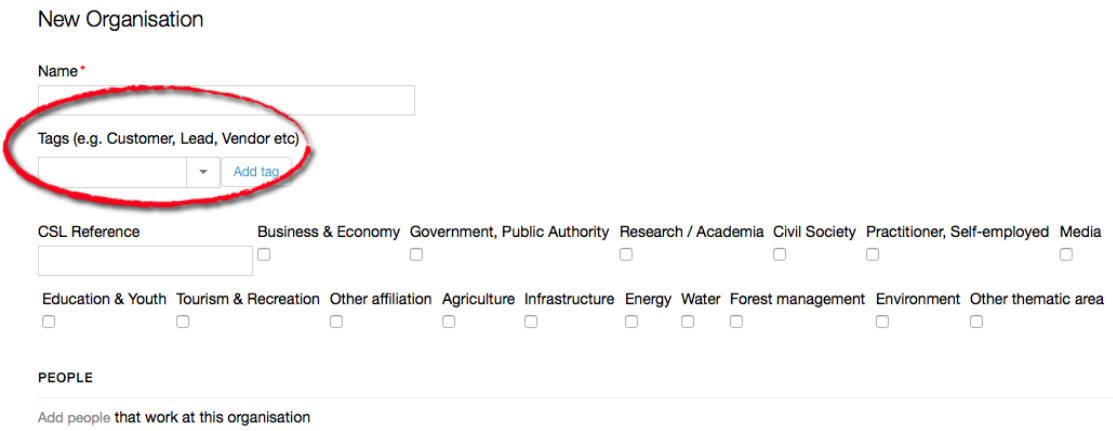


They can therefore proceed to filling in all known details in the form below. In addition to the general contact information, they can access a specific list of additional fields (encircled in red) that were customised and added for the purpose of the BeWater stakeholder database.



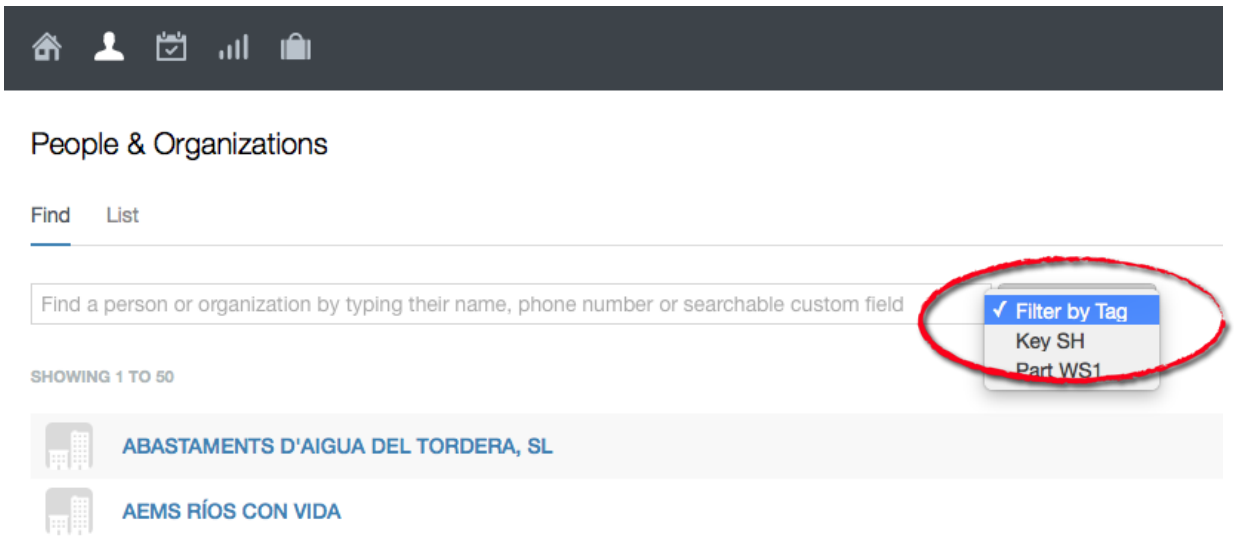
When clicking that section of the form, it will become populated with a series of options one can select from, as can be seen in the detailed snapshot below. CSRB users then simply need to check all fields that apply to the respective stakeholder organisation. **Important note**: more fields can be further refined and added through discussion between the CSRB partners and Prospex (e.g. downstream; upstream, whole basin, etc.).

Moreover, tags (encircled in red in the screenshot) are a very useful function, as they allow users to further subcategorize their list of contacts, be they organisations or people. There are currently two defined tags: “Key SH” (designating a key stakeholder) and “Part WS1” (participant to the stakeholder workshop 1), but CSRB users can always add more relevant ones, such as: “Interviewed” or “Dissemination event”.

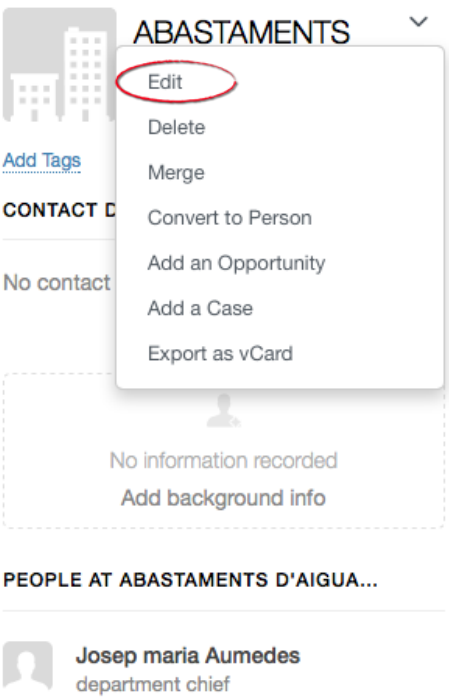


The tags come in very handy when filtering contacts in any given list. In order to do so, users need to go to the “People & Organisations” tab, click “Filter by Tag” (encircled in red below), and simply select the tag by which they’d like to filter their contacts. For example, clicking “Part WS1” will only display the participants to the1st stakeholder workshop.

Note: It is imperative that contacts should be correctly and consistently tagged, in order to provide the data base users with accurate filters and lists at any given time. Tags also show in exported CSV or vCard files.

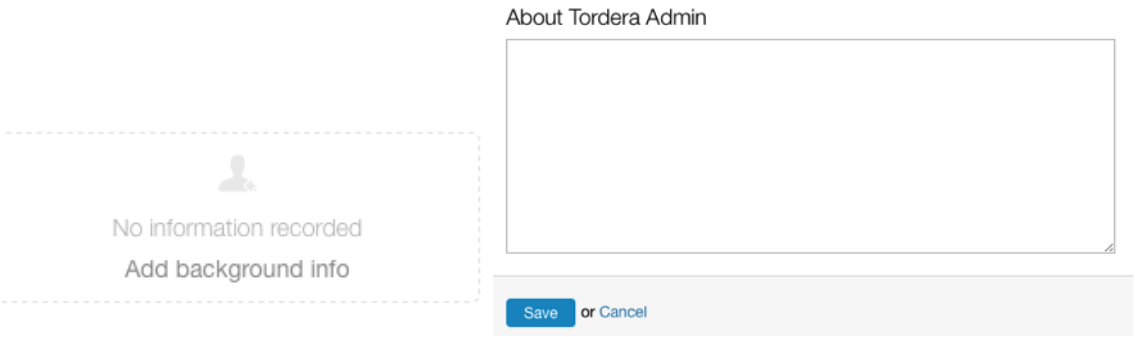


In addition, by clicking the name of an organisation in any list, one can edit its details in the respective data form, in a similar way to adding a new contact, by clicking “Edit” and modifying or adding information in the contact’s data form.



Information in other languages: In order to add the names of organizations in languages other than English to their profile, database users are advised to click the “Add background info” tab in the stakeholder’s profile, as shown in the screenshot below. A new “About contact” window will pop

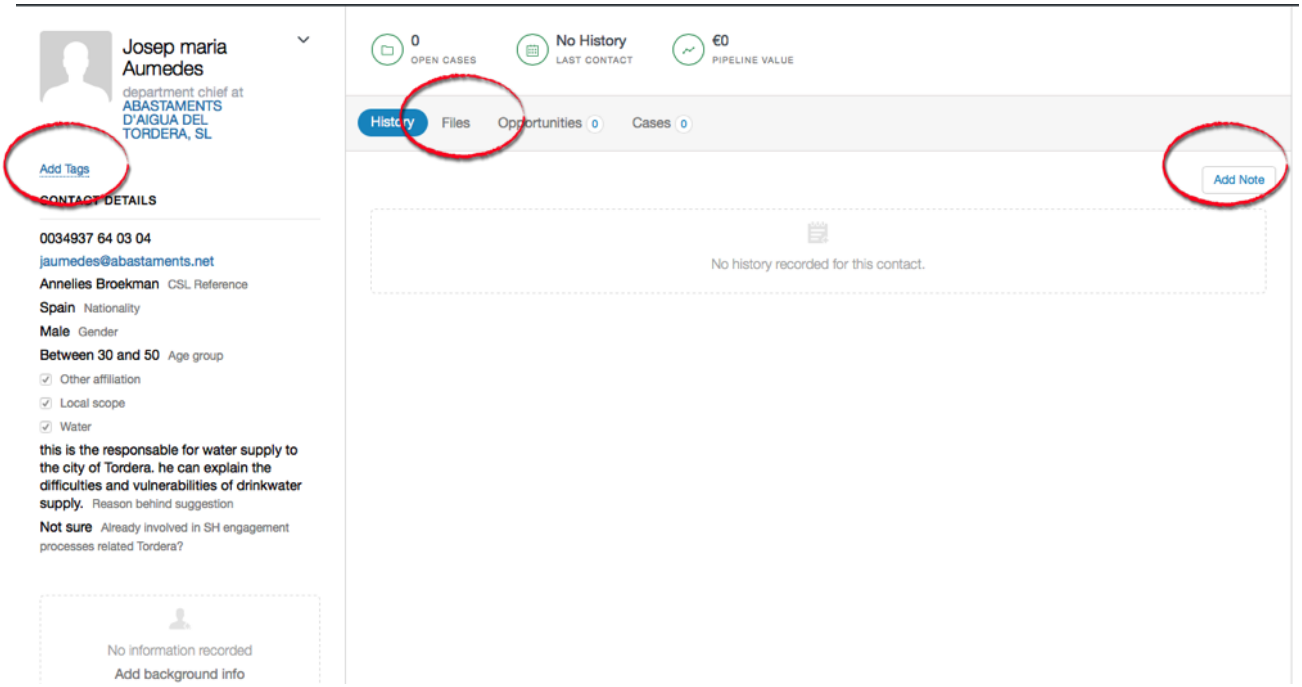
up, in which they can enter the respective contact's name in non-Latin script or the name of the respective organization in the original language, as well as any relevant description or information e.g. the fact that a stakeholder who is a researcher and works for a university also belongs to a civil society organization. Users should remember to click "Save" before closing this window.

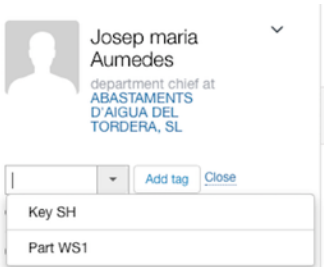


4.1.2.5 Individual stakeholders

4.1.2.5.1 Overview of contacts

Any person (individual contact) can be viewed by clicking their name in the respective list of contacts. This will provide data base users with a detailed overview of their contact details and the stakeholder categories it belongs to, as well as a few useful functions, encircled in red in the snapshot below.





- **Add tags:** as already shown, this allows users to add any relevant tags to the respective contact, in a similar manner to organisations (see image on the right).
- **Files:** It allows users to upload any type of file they may have shared or would like to share with the respective stakeholder: invitation to an event; poster; leaflet; project brochure; article; case study data; map; river basin narrative, etc.
- **Add note:** Users can add a note detailing the history of contact with this stakeholder, or a reminder to contact the respective person for a specific

type of input. In addition, they can simply state in the note the documents shared with this stakeholder, in order to prevent uploading the respective file every time for every contact.

If accurately and consistently used, these three options can therefore provide both CSRB and Prospex users of the BeWater stakeholder data bases with an accurate and easy to update overview of the project's stakeholder engagement process at any given time.

4.1.2.5.2 Add new contacts

If accurately and consistently used, these three options can therefore provide both CSRB and Prospex users of the BeWater stakeholder data bases with an accurate and easy to update overview of the project's stakeholder engagement process at any given time.

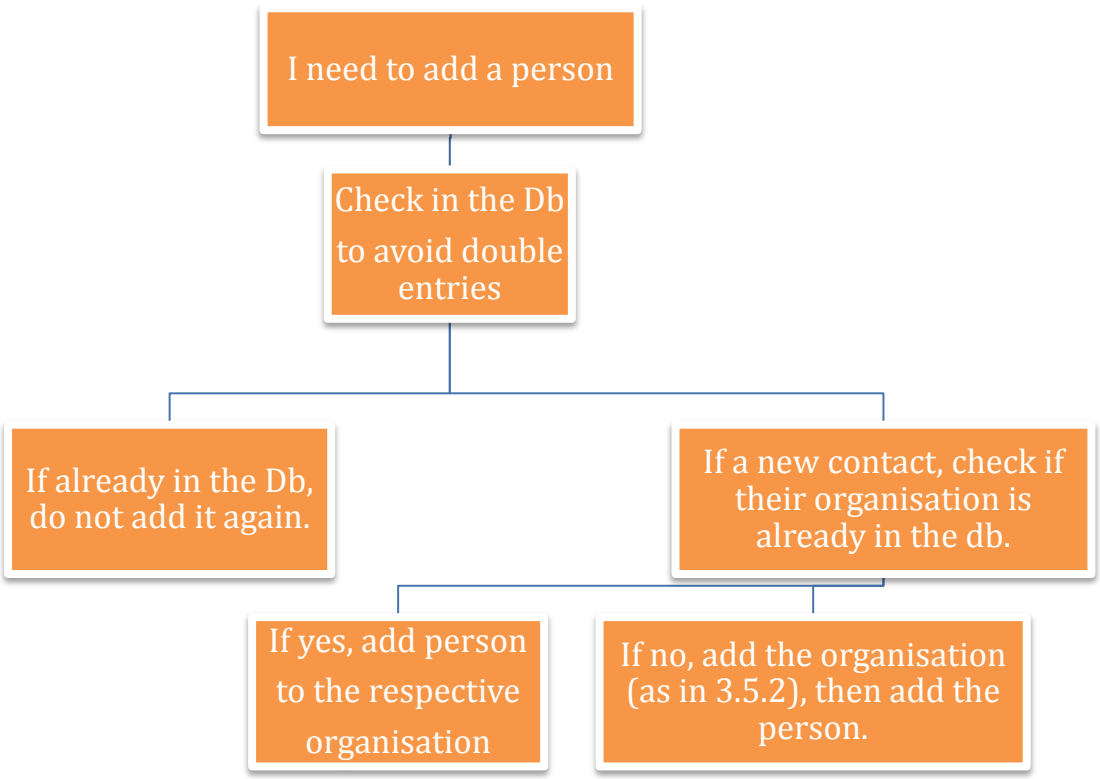
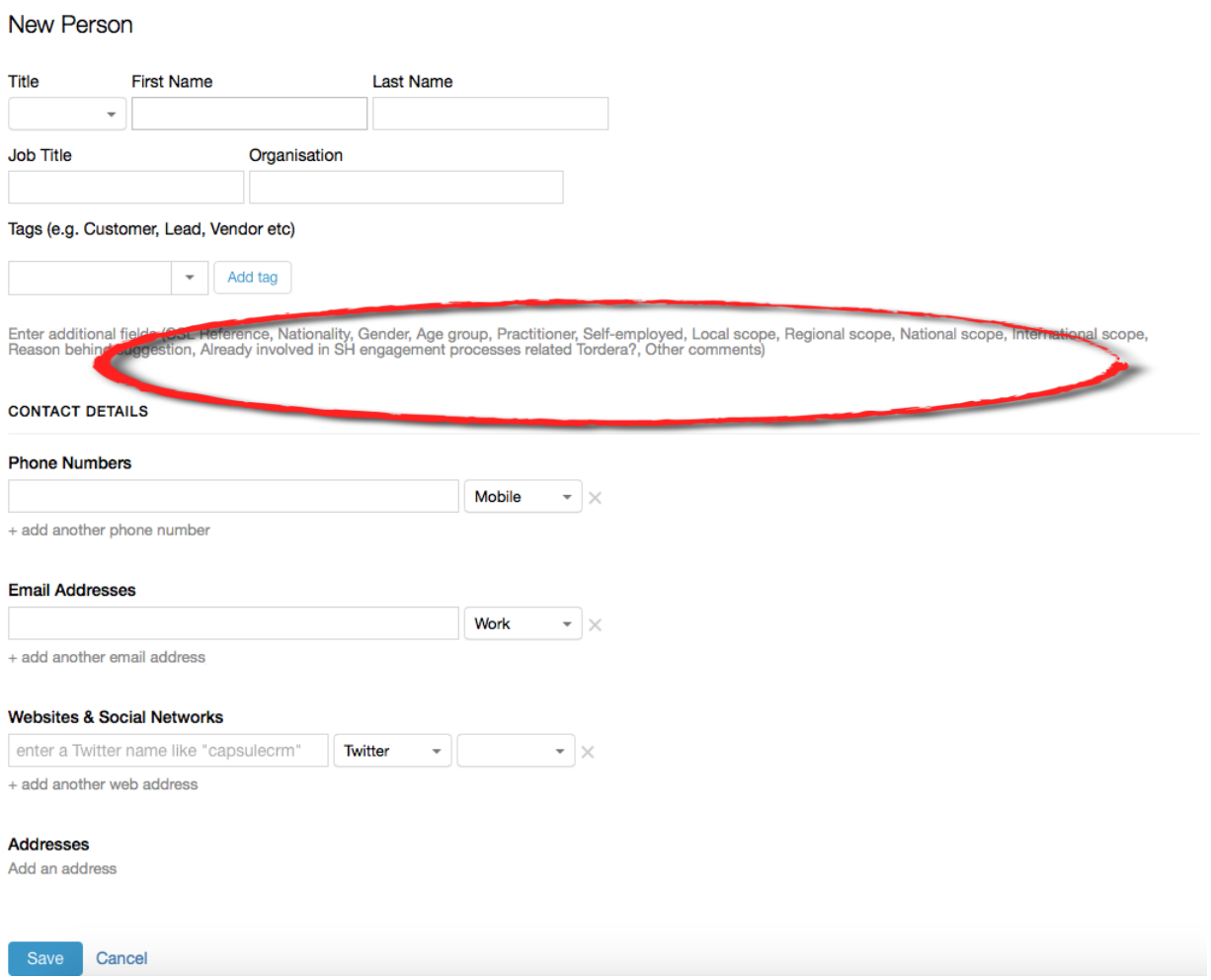
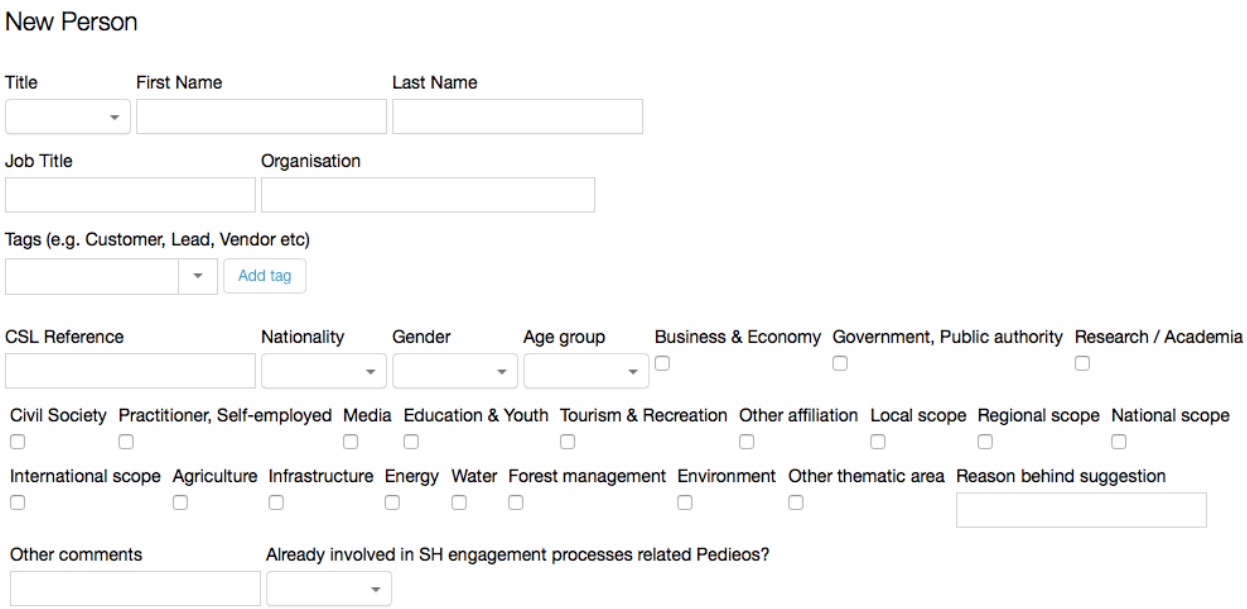


Figure 12. Process to add new contacts

Users can add a contact by clicking either the + sign on the top ribbon of the dashboard, or the "Add person" blue button in the "People & Organisations" section. Alternatively, they can click "Add person" in an existing organisation's form.



As in the case of the organisation detail form, when clicking the section of the form encircled in red, it will become populated with a series of options from which users can select (see the detailed snapshot below). These include different fields from the ones used in the case of organisations, such as the personal scope of activity (local, regional, national, etc.). Users then need to simply check all fields that apply to the respective individual stakeholder.



Again as is the case with organisations, CSRB users are encouraged to make use of the “Add tag” function, which is handy for filtering lists of stakeholders. It is important to remember that some tags can apply to both organisations and people (“Key SH”), while others are more specific to people (“Interviewed”, “Part WS1).

4.1.3 Data base management procedures

4.1.3.1 Roles and responsibilities

Responsibilities for the management of the stakeholder database are divided along the specifications in the DoW and the subsequent discussions and agreements during the project kick-off meeting and in continuous consultation with the CSRB partners. These are subject to later adaptation based on the needs identified along the way.

4.1.3.1.1 Case study leaders

The BeWater project team members responsible for the CSRB databases are:

- *La Tordera*: Annelies Broekman
- *Vipava*: Manca Magjar
- *Rmel*: Ines Saidi, assisted by Doha Zamel
- *Pedieos*: Elias Giannakis

Their tasks include:

- Adding relevant stakeholder organisations and individuals to their data base;
- Contacting stakeholders for specific objectives. In agreement with the CSRBs, **Prospex will not attempt to contact the respective stakeholder directly, nor will any other team members from any work packages**. Should they wish to do so, **they need to first consult the CSRBs in this respect**. This is to allow a good rapport to be developed between the CSRBs and their stakeholders, to avoid confusion among the latter related to the contact points in their area in relation with the BeWater project, and to prevent any misunderstandings stemming from language barriers or cultural differences.
- Recording updates of the CSRB stakeholder engagement activity by adding notes, files and tags to relevant stakeholders, detailing the history of contacts, the type and objective of engagement with the respective stakeholders, and any other relevant information;
- Exporting periodic backups (every two months) of their respective database, upon reminder by the Prospex data base administrator.

Setting up specific lists of stakeholders for specific instances of stakeholder engagement co-organized with Prospex (the stakeholder workshops). These lists will then be finalised upon consultation with Prospex, based on the latter’s methodology of stakeholder engagement.

4.1.3.2 Prospex project coordinator

On behalf of Prospex, the BeWater project coordinator Roxana Dude is the designated person responsible for all four BeWater databases. Her tasks include the following:

- Setting up the databases and migrating data from the old stakeholder management tool;
- Training the CSRB contact points regarding the use of the Capsule data base;

- Addressing general and specific queries related to stakeholder management & engagement, as well as technical queries as first point of contact for Capsule troubleshooting;

- Sending periodic reminders to CSRB contact points to update and back up their data bases;

- Exporting periodic backups (every two months) of all databases and uploading them to the BeWater Extranet folder;

- Discussing the list of stakeholders selected by the CSRBs for a specific instance of stakeholder engagement, function of the set objectives and keeping in mind the overall balanced approach detailed in the Prospex stakeholder selection methodology;

- Overseeing the updating, maintenance and general management of the data bases as data base administrator, so that they reflect an accurate overview of all relevant stakeholders and a complete history of their engagement.

4.1.4 Clean-up and maintenance

Prospex gave access to the new databases to the CSRB responsible contacts at the end of January 2015. Based on consultations with the CS leaders and their workload in the coming months, it was agreed that they would perform an initial clean-up and update of the database by the end of March 2015, under the supervision and with the support of the Prospex project coordinator.

The update of the history of contacts with stakeholders is a continuous activity, function of the intensity of the stakeholder engagement activities in the river basin. CSRB users have been encouraged to embark on this as soon as possible, given the ongoing engagement activities in the river basins.

4.1.5 Exporting and back-up

Both the Prospex project coordinator and the four database users will export their respective databases every two months, upon reminder by the Prospex project coordinator, and will keep these databases in a secure environment. This is in order to prevent complete loss of data in case of severe technical malfunctioning of the databases.

The Prospex project coordinator will also upload the respective backups to the BeWater EFI Extranet, which would allow other interested work packages to get an idea of the stakeholder engagement activities in progress in the CSRBs.

4.1.6 Tagging

The CSRB users of the BeWater data bases are encouraged to make use of the helpful and versatile tagging function of Capsule CRM, detailed under section 3.6.1 Overview of contacts in this document. Please remember to use short, descriptive and clear tags that should be relevant for more than just a handful of stakeholders.

Several tags were suggested in order to assist the CSRBs in their effort and to ensure homogeneity across the four case studies:

- WS1 (= participant in the 1st stakeholder workshop);
- WS2 (= participant in the 2nd stakeholder workshop);
- Input_FCM (= was consulted on the RB cognitive maps by various means of engagement);
- Key SH (= is a key stakeholder for the respective CSRB);
- WP4 (= is considered relevant for further engagements in work package 4 activities);
- WP6 (= is considered relevant for the BeWater work package 6).

5. References

Bowie, N. (1988). *The moral obligations of multinational corporation*s. In S. Luper-Foy (Ed.), ***Problems of international justice***: 97-113. Boulder, CO: Westview Press.

Clarkson, M. B. E. (1995). *A stakeholder framework for analysing and evaluating corporate social performance*. ***Academy of Management Review***, 20:92-117.

Cornell, B., Shapiro, A. C. (1987). *Corporate stakeholders and corporate finance*. ***Financial Management***, 16: 5-14.

Freeman, R. E. (1984). *Strategic Management: A Stakeholder Approach*, Boston: Pitman Publishing.

Freeman, R. E., Evan, W. M. (1990). *Corporate governance: a stakeholder interpretation.* ***Journal of Behavioral Economics***, 19:337-359.

Freeman, R. E., Reed, D.L. (1983). "Stockholders and stakeholders: A new perspective on corporate governance." *California Management Review*, 25(3): 88-106.

Gramberger, M., Zellmer, K., Kok, K., Metzger, M. J. (2014). *Stakeholder integrated research (STIR): a new approach tested in climate change adaptation research.* ***Climate Change***, DOI 10.1007/s10584-014-1225-x.

Hill, C. W. L., Jones, T. M. (1992). *Stakeholder-agency theory*. ***Journal of Management Studies***, 29(2): 131-154.

Mitchell, R.K, Agle, B. R., Wood , D. J. (1997). *Toward a Theory of Stakeholder Identification and Salience: Defining the Principle of Who and What Really Counts*. ***The Academy of Management Review***, 22(4): 853-886.

Näsi, J. (1995). *What is stakeholder thinking? A snapshot of a social theory of the firm*. In J. Näsi (Ed.), ***Understanding stakeholder thinking***: 19-32. Helsinki: LSR-Julkaisut Oy.

D2.3– Section 4: Protocol for design of river basin adaptation plans

Authors

ECOLOGIC INSTITUTE
Rouillard, Josselin
Tröltzsch, Jenny
Davis, McKenna
Lukat, Evelyn
Stein, Ulf
Vidaurre, Rodrigo

Reference

Rouillard, J.J., Tröltzsch, J., Davis, M., Lukat, E., Stein, U., Vidaurre, R. (2014). D2.3 – Section on Protocol for Developing RBAPs. BeWater, FP7 project no. 612385 -SIS.2013.1.2-1 European Commission, 38 pp.

Executive summary

This document presents the protocol for the preparation of River Basin Adaptation Plans (RBAPs) to be prepared within the scope of Task 2.2 of the FP7 BeWater Project “Making society an active participant in water adaptation to global change”.

The protocol is divided into two main parts:

- Part A: a step-by-step guidance on how to prepare the RBAPs.
- Part B: a (draft) outline and brief content descriptions of the final BeWater RBAPs (Deliverable 4.2).

Contents

Objectives 3

Part A Step-by-step guide to preparing RBAPs 5
Step 1: Preparing the first draft RBAP 8
Step 2: Policy and implementation assessment 9
Step 3: The WP4 workshop 19
Step 4: Preparing the adaptive management approach 21
Step 5: Reviewing the RBAP 25

Part B. Draft outline of BeWater River Basin Adaptation Plans 26
Foreword 27
1. Introduction 28
2. The development of the river basin adaptation plan 29
3. The {name of river basin} 32
4. Water management options 34
5. Monitoring progress and adapting to change 36

Annex 1 Detailed presentation of water management options 38

Objectives

This document presents the draft protocol for the preparation of River Basin Adaptation Plans (RBAPs) to be prepared within the scope of the FP7 BeWater Project "Making society an active participant in water adaptation to global change". This document is one of several protocols which are to be compiled into a cohesive document and finalised in D2.3 by M18. Other protocols include 1) stakeholder identification and selection, 2) data collection and harmonisation, and 3) formulation of water management options. The DoW presents the protocol on adaptation planning as a document to guide the process of developing RBAPs, mainly by homogenising information and activities within and across RBAPs.

Extract from DoW (Task 2.2)

Protocol for design of river basin adaptation plans (WP4, ECOLOGIC, CBlue). The protocol will guide the process to generate an adaptation plan per river basin, homogenising the considerations, information and activities included in the plan.

The protocol on adaptation planning therefore must present the type of information to be included in RBAP and the steps and procedures needed to bring this information together in a useful, standardized format.

The content of the RBAPs, as required by the DoW, is presented in the table below. The protocol should present how to collect and exploit information collected or generated by various Tasks in WP3, WP4 and WP6 in order to write the RBAP.

Content of RBAPs (based on outline presented in Task 4.1 of the DoW)

Content required In RBAPs (as in the DoW)	Type of information delivered through other task(s)	Delivery date
Main climate change impacts for water resources	Task 3.2 and 3.3 "A database of information"	M6
Problems and needs of population and key policy makers	Task 6.1-6.3 "Policy background through policy watch"	M6, M12, etc
	Task 3.3 "1) current water use problems, 2) social needs, concerns, perceptions and beliefs and 3) expected climate change impacts"	M21
	Task 4.1 "Views of policy-makers through interviews on the current situation of adaptation in the region, their experience with public participation in the design of policies and potential conflicts that may appear"	M10-13
A set of best practice activities and measures to strengthen the adaptation capacity of the river basins;	Task 3. 5 "a) an identification of current water management solutions and assessment of their environmental and economic cost; b) a compilation of feasible technical measurements accompanied with their possible environmental and economic impact; c) a first proposal of adaptation measures; and d) a negotiation and agreement process among actors and sectors, in order to define adaptation priorities and weigh up options."	M21

A prioritization of the adaptation measures, based on different evaluation criteria The costs of implementation	Task 3.4/3.6 “1) water challenges under global change conditions, 2) quantity and quality of available resources, 3) water allocation considering multiple uses, 4) water management innovations, 5) environmental evaluation (qualitative scoring of ecosystems services), and economic evaluation (multicriteria tools and simplified cost-benefit analysis based on secondary data and use of value transfer techniques)” Task 4.1 “Co-benefits with other measures or synergies/conflicts with other policy objectives, and possible sources of funding for the prioritized measures”	M24

This document also presents preliminary guidance for conducting the remaining activities foreseen under Tasks 4.1 and 4.2, which will be complemented as needed with freestanding, in-depth guidance documents at a later stage of the project. The current draft is based on the DoW and structured to resemble the protocol on Water Management Options Formulation (section 2 of D2.3). Additional research activities are planned for Tasks 4.3 and 4.4, but they relate to drawing lessons learned from the development of the RBAPs and are therefore not addressed within this document.

Links between WP3 and WP4

WP4 will prepare bundles of Water Management Options (WMOs) based on the assessment of individual options. WP4 will also need to provide a timeline of implementation following the idea that some options can be implemented now, others can or should only be implemented later, and others are only effective for a limited time and will need to be phased out at some stage in the future.

In order to reach these goals, WP4 depends on the following information from WP3:

- The nature of the WMO (technical, green, soft, supply, demand, etc), its scale and location of implementation in the river basin, the target water use, and technical feasibility
- Effectiveness of the WMO against its main objective (climate risk tackled, water issue tackled) over time (e.g. expected lifetime without major rehabilitation, timelag between implementation and optimal effectiveness)
- Their capacity to deal with uncertainties and change, including robustness across scenarios of future socio-economic-environment (climate) futures
- The range of economic, social and environmental criteria considered in the impact assessment, as defined by stakeholders and used for the prioritisation of WMOs. This includes costs, short-term capital and operational (long-term) components.

The protocol is divided into two main parts:

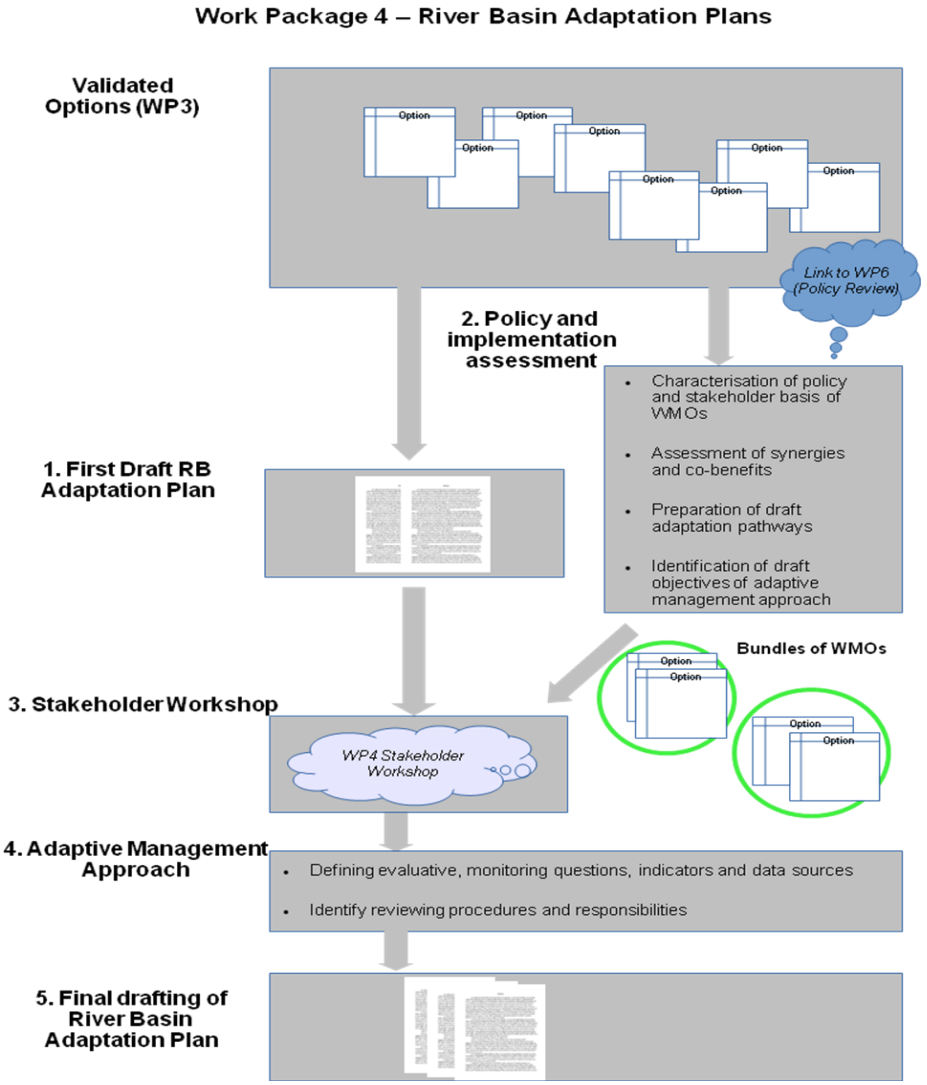
- Part A presents a step-by-step guidance on how to prepare and finalise the RBAP.
- Part B presents an outline of the final BeWater RBAPs (Deliverable 4.2), including a brief description of the expected chapters, sections and content of the RBAP.

Part A Step-by-step guide to preparing RBAPs

	The protocol presented here is a general methodological approach. It is likely that some of the methods will need to be adapted to fit the data availability and stakeholder context of the BeWater research case-studies. Lessons learned on the application of these methods, their strength and limitations, and potential modifications for future application in real planning process, will be compiled and presented as part of deliverable 4.4.

Five steps are proposed, as follows, and outlined in the subsequent chapters in more detail:

- Step 1: Preparing the first RBAP draft
- Step 2: The policy assessment, and the assessment of co-benefits and implementation pathways
- Step 3: The WP4 stakeholder workshop
- Step 4: Developing an adaptive management approach
- Step 5: Reviewing the draft RBAP



Overview of the steps presented in this protocol –for more detailed information, refer to the specific sections in this document

Step	Sub-step	Output	Start date	End date	Estimated man-month required per basin	Linkages with other tasks
Step1: Preparing the first draft RBAP		A first draft of RBAP to present at the WP4 Stakeholder Workshop	June 2015	December 2015	1PM	
Step 2: Policy and implementation assessment	Step 2.1: Characterising the policy and stakeholder basis of WMOs	Relevant policies and policy instruments that support implementation of WMOs, relevant policy actors and stakeholders, potential responsibilities for WMO implementation	July 2015	August 2015	1PM	Tasks 3.4-3.5: list of WMOs and prioritised list Task 6.1-6.3: Policy background through policy watch
	Step 2.2: Assessing synergies and co-benefits	First bundling based on co-benefits and synergies/conflicts with other policies	July 2015	September 2015	1,5PMs	Tasks 3.4-3.5: list of WMOs and prioritised list, criteria and results for impact assessment, CBA and MCA
	Step 2.3: Preparing draft adaptation pathways	Second bundles of WMOs based on sequencing of implementation	September 2015	December 2015	2PMs	Tasks 3.4-3.5: list of WMOs and prioritised list, criteria and results for impact assessment, CBA and MCA
	Step 2.4: Identifying draft objectives of adaptive management approach	To characterise the ambition and options for future monitoring, evaluation and reporting activities	December 2015	December 2015	0,5PMs	Task 3.2 and 3.3: a database of information Task 4.1, Steps 2.1, 2.2, 2.3
Step 3: The WP4 workshop	Step 3.1 Preparing material to be presented	To prepare presentable information for the workshop and organise the meeting (invitation, room booking etc)	November 2015	January 2016	0,5PMs	Task 4.1, Step1: Draft RBAP Task 4.1: Step 2: Bundles of WMOs, draft responsibilities, draft objectives for adaptive management approach

Step	Sub-step	Output	Start date	End date	Estimated man-month required per basin	Linkages with other tasks
	Step 3.2 The stakeholder workshop	One workshop held in each case-study	January 2016	March 2016	0,5PMs	
	Step 3.3 Post workshop processing	Prepare workshop feedback report; Include results of workshops discussions in the RBAP; Follow up key issues with stakeholders: targeted interviews/meetings	January 2016	March 2016	1PM	Task 4.1, Step1: Draft RBAP Task 4.1: Step 2: Bundles of WMOs, draft responsibilities, draft objectives for adaptive management approach Task 4.2: Step 3.2: Workshop results
Step 4: Preparing the adaptive management approach	Step 4.1: Defining the evaluative questions	To define evaluative questions that enables to monitor implementation of RBAP and respond to emerging issues	March 2016	April 2016	0,5PMs	Task 4.1, Step 3.3: revised draft objectives for future monitoring, evaluation and reviewing procedures
	Step 4.2: Identifying monitoring questions, indicators and data sources	To define monitoring questions that enables to collect data to answer evaluative questions	March 2016	April2016	0,5PMs	Task 4.2, Step 4.1: evaluative questions
	Step 4.3: Identify possible involvement in monitoring, including reporting procedures	To define identify who can contribute to data collection, analysis and reporting	April 2016	May 2016	1PM	Task 3.2 and 3.3: a database of information Task 4.1, Step 2.1: policy and stakeholder basis Task 4.2, Step 4.2: monitoring questions, indicators and data sources
Step 5: Reviewing the RBAP	Step 5.1: Second draft	To prepare a second draft of the RBAP and send it to stakeholders for revision	May 2016	June 2016	1PM	Task 4.2, Step 3.3: revisions based on input of WP4 workshop Task 4.2, Step 4: adaptive management approach
	Step 5.2: WP4 draft	To prepare a final draft of the RBAP and submit it to the EC	June 2016	July 2016	1PM	Task 4.2, Step 5.1: stakeholder feedback

Step 1: Preparing the first draft RBAP

Step 1 at a glance...

Objective	To prepare a first draft of the RBAP
Activities required	Pulling together elements from different BeWater activities and deliverables into RBAP
Output	A first draft of RBAP to present at the WP4 Stakeholder Workshop
Resources expected required per CS partners	1PMs
Timescale	June (after second workshop of WP3) - December 2015 (leaving 1 month for internal review and before WP4 workshop)

The first step involves following the agreed RBAP outline (see Part B) and pulling together elements from the different activities and deliverables of different WPs. This step should start soon as after the second workshop of WP3, but will continue until the first workshop of WP4.

Part B presents the information needed for each section in detail and identifies where it can be found and/or how it can be produced.

Step 2: Policy and implementation assessment

Step 2 at a glance...

Objective	Identifying practical options to implement WMOs
Activities required	Step 2.1: Characterising policy and stakeholder basis of WMOs Step 2.2: Assessing synergies and co-benefits Step 2.3: Preparing draft adaptation pathways Step 2.4: Identifying draft objectives of adaptive management approach
Output	Draft adaptation pathways (bundles of WMOs) and implementation arrangements to be validated during the WP4 Stakeholder Workshop
Resources expected required per CS partners	5PMs
Timescale	July 2015 (after second workshop) – December 2015 (before WP4 workshop)

Step 2.1: Characterising the policy and stakeholder basis of WMOs

The objective of this step is to identify 1) relevant policies and policy instruments that can support implementation of WMOs, 2) relevant policy actors and stakeholders, and 3) the interest of stakeholders to implement WMOs and potential commitments/responsibilities.

This step will prepare material for the other steps below, as well as for the WP4 Workshop, so that stakeholders can have a constructive discussion on the potential implementability of WMOs proposed (voluntarily) in the BeWater RBAPs.

The resources necessary for CS partners are estimated at 1PM.

The first assessment involves mapping existing policies against the WMO following Table 1. Policies should be understood in a wide sense to include governmental programmes that use regulatory, financial, or information-based mechanisms and instruments to influence society. Examples include: development programmes (World Bank funds, Europeaid, Global Environmental Fund, etc), European regional and structural programmes (LIFE, Common Agricultural Policy, etc) as well as national and local ones (by specific ministries, environmental agencies, local authorities, etc).

Table 1. Matching WMOs with the policy basis

WMO	**Main relevant policy**			**Other policy**		
	Name	**Opportunities**	**Barriers**	**Name**	**Opportunities**	**Barriers**
Example: drip irrigation	EU Common Agricultural Policy/Rural Development Programmes	Funding for upgrading irrigation systems	Funding for new groundwater wells	EU Water Framework Directive, River basin management plans	Requires the use of drip irrigation in priority catchments	Lack of coordination with agricultural /rural development policies
...						
...						

For each WMO, the main relevant and other related policies should be identified (e.g. a more efficient irrigation WMO would primarily be linked to agricultural/rural development policy than to water policies). The analysis should start at the level of the WMOs and may be limited to the most relevant and immediate policies at the local level. In addition:

- Opportunities for the implementation of the WMO provided by these policies should be examined. Taking the same example in Table 1, rural development policies may fund the upgrading of irrigation systems, while the local water policy may require the use of drip irrigation in priority catchments.
- Barriers based on the policies for the implementation of the WMO should also be identified. Rural development policies, for example, may provide funding for digging new groundwater wells, thereby providing an incentive to farmers not to invest in drip irrigation. Other barriers may include lack of coordination between water policy and agricultural policies, for example, when implementers do not coordinate and send conflictual messages to farmers regarding water use.

The level of detail in information is left to the CS partners depending on information available, cycles of policy reform, level of interest of stakeholder on specific WMOs, etc. For example, where rural development policies fund the upgrading irrigation systems, one may want to record the specific rates of funding, eligibility criteria, etc. Task 6.1-6.3 “Policy background through policy watch” may provide an idea of relevant policies for a particular WMO. Additional screening may be required nevertheless to screen how a policy offers opportunities or barriers to a WMO.

The second assessment involves mapping stakeholder interests against WMOs following Table 2. For each WMO, the most relevant stakeholders that should be involved in the adoption of the WMO should be identified. Potential ones include amongst other: public authorities, businesses, households, farmers, civil society organisations, interest group representatives, etc. In addition:

- Attitudes to adopt or promote the WMO should be assessed for relevant stakeholder. It should be clear why a stakeholder is open to adopt or promote the WMO (“opportunities” in Table 2) or why the stakeholder would not be willing to adopt or promote the WMO (“barriers” in Table 2). For example, local farmers may have expressed interest in installing drip irrigation on their farm (e.g. to prevent drought impacts, to save money), but they lack the financial resources to do so.
- While “attitude” in Table 2 reports the reason why stakeholders are interested or not in a WMO, “possible involvement” in Table 2 reports what stakeholders could do. For example, the assessment here concludes that farmers would adopt drip irrigation voluntarily, but this would require financial incentives to support that adoption. The Ministry of Agriculture needs strong political support for taking pro-active action, while local environmental NGOs could be actively engaged in promoting water efficient agriculture amongst farmers and politicians.

The information for filling this table may be available through Task 6.1-6.3 “Policy background through policy watch”, Task 4.1 “Policy actor interview results”, and/or as part of the refinement process of WMOs being conducted in WP3. It may require additional interviews to be conducted before the WP4 Workshop. The information will be used at the WP4 Workshop to foster discussion between stakeholders on opportunities, barriers and possible future involvement in taking forward WMOs presented in BeWater RBAPs.

Table 2. Identifying stakeholder willingness and possible commitments for implementing WMOs.

WMOs	Relevant stakeholders	Stakeholder attitude on WMO Opportunities	Barriers	Possible involvement
Example: drip irrigation	Farmers, Agricultural Ministry, Environmental NGOs	Farmers willing to save water Ministry of Agriculture & environmental NGOs supportive	Farmers have limited financial capacities No legal requirement for the Ministry of Agriculture to support water efficient agriculture	Farmers: voluntary participation, but probably need financial incentives Ministry of Agriculture: need strong political support/back-up Environmental NGOs: can raise awareness amongst farmers/politicians
...				
...				

Step 2.2: First bundling of WMOs: assessing co-benefits between WMOs

The objective of this step is to perform a first bundling of WMOs based on their co-benefits and conflicts.

The resources to perform this task for CS partners are estimated at 1,5 PMs.

The first bundling of WMOs relies on two successive assessments:

- Assessment of impacts, area used and costs co-benefits and conflicts between WMOs
- Bundling of WMOs against challenges based on assessed co-benefits/conflicts

Each of these assessments is described below.

Assessment of impact, area and cost-related co-benefits/conflicts between WMOs

Table 3 presents one approach to performing the assessment of impacts, area-used and costs co-benefits/conflicts between WMOs.

The following questions guide these assessments:

- Do the options show co-benefits or conflicts on their impacts/benefits with each other? (category: impacts)
- Do the options need to be implemented one before the other to realize co-benefits on their impacts/benefits? (category: impacts)
- Are options overlapping on the land/ground in which they are occupying for their implementation? (category: used area)
- If there is a maximum budget, can WMOs be implemented together or are the WMOs excluding each other because they are exceeding the maximum budget? (category: costs)
- Are options cheaper or more expensive if they are implemented in parallel or one before the other? (category: costs)

For simplicity, impacts-related co-benefits and conflicts between WMOs follow a simple three score scale: existence of co-benefits (+), neutral options (0) and conflicts between WMOs (-). The list of relevant impacts, used area, and costs for each WMO should be available from WP3 (e.g. WMO tables, MCA, CBA results).

Table 3. Evaluation of impact, area and cost-related co-benefits/conflicts between WMOs.

Example WMO: Use of drip irrigation against other WMOs

Other WMOs	Impacts					Used area*	Costs (any type of cost)	
	Reduced use of water	Reduced energy use	Reduced labour costs	Increased crop yields	How does the WMO need to be implemented in time that the co-benefits on their impacts can be realized?	Conflicts with used area?	Conflicts with maximum budget?	Cheaper/more expensive if they are done one before the other or in parallel?
Awareness compaign on water supply problems	+	+	+	+	Awareness compaign before drip irrigation	no	Yes	no
River restoration	0	0	0	0	Neutral	no	Yes	no
Installation of water efficient equipment in houses	0	0	0	0	Neutral	no	Yes	no
Further groundwater wells	-	-	-	-	Conflict	no	Yes	no
Dike for flood protection	0	0	0	0	Neutral	no	Yes	no
Improving of farming advices	+	+	+	+	Improving of farming advices before drip irrigation	no	Yes	Cheaper, farm advise before drip irrigation Costs could decrease because use of suitable solution
…	…	…	…	…	…	…	…	…

*Used area: overlapping on the land/ground in which they are occupying for their implementation. The evaluation of this criterion will depend on the level of detail achieved in WP3.

Where, relevant and possible, the impacts of bundles could be cross-checked using the Fuzzy Cognitive Maps (FCM). This may help in identifying unforeseen responses, e.g. actions that may cancel out each other, or they reinforce each other.

These assessments can be carried out internally by the CS partners, or by involving 5-6 local experts and/or stakeholders (e.g. using results from previous/new interviews, or through face-to-face exchange). The results should in all cases be presented at the WP4 Workshop, and stakeholders should agree on the evaluation.

Bundling of WMOs against challenges and based on co-benefits/conflicts

The bundling of WMOs is to be done for each identified challenge (challenges were identified in WP3).

The bundling is based on the tables prepared for each WMO integrating their impacts, area used, and costs co-benefits/conflicts prepared in the previous step. Table 4 presents one way to summarise the information. In addition, the overall co-benefit/conflict potential of each WMO with other WMO for the specific challenge examined should then be summarized (colour coding could be used).

The bundling presented in Table 4 can be reviewed by stakeholders (e.g. same as those involved in the previous step). The review can be done by e-mail or by short telephone interviews. In any case, the results will be presented at the WP4 Workshop and stakeholders should agree on the evaluation.

Table 4. Bundling of WMOs for each challenge

Example challenge: Water quantity

	WMO has co-benefits with WMO for this challenge	WMO has conflicts with WMO for this challenge	General WMO evaluation (co-benefits/conflicts)
Increased drip irrigation	Awareness compaign, farm advice	Further groundwater dwellings	Neutral
Awareness campaign on water supply problems	Drip irrigation, farm advice, Installation of water efficient equipment in houses		*(co-benefits)*
Installation of water efficient equipment in houses	awareness compaign		Neutral
Further groundwater wells		drip irrigation	*(conflict)*
Improving of farming advices	Drip irrigation, Installation of water efficient equipment in houses, Awareness compaign		*(co-benefits)*

Step 2.3: Second bundling of WMOs: preparing draft adaptation pathways

The objective of this task is to perform a second bundling of WMOs which accounts for changes in time. For each challenge, a separate "adaptation pathway" will be developed. These pathways will be discussed at the WP4 workshop. The necessary resources for CS partners are estimated at 2PMs.

The methodology as follows is a simplified approach of Haasnoot et al. (2013)[1]. The adaptation pathways are built on the logic that certain options should be implemented short-term or immediately, or mid-term or long-term. In the discussion, the differentiation in time is done based on the modelling of climate change and impacts of the options. This approach is not suitable for BeWater case studies. It is proposed that the prioritization in time can be done with different criteria.

Criteria that will be considered for the second bundling of WMOs

Criteria	Description
Flexibility	The degree to which a WMO can be adjusted or reversed if it turns out to be inappropriate in practice or inadequate given new environmental, social or economic conditions
Robustness	The degree to which a WMO maintains effectiveness under different climatic and socio-economic scenarios
Feasibility	The degree to which a WMO can be implemented given technical and scientific capacities
Acceptability	The degree to which a WMO is not strongly opposed by one or several actors in the river basin; the degree to which a WMO is strongly supported by one or several actors in the river basin
Synergies with policies	The degree to which a WMO is in line with the policy framework

NOTE: This table might need to be fully adjusted according to the criteria used in WP3

The approach of Haasnoot et al. (2013) will also be simplified in the following way:

- Time-frame is short-term, mid-term, long-term, and no concrete years are included
- Parallel pathways are possible, if options should be implemented in parallel.
- There is not necessarily a concrete connection between the options. From short-term to mid-term and from mid-term to long-term, options come together and start then in the new time frame.

The criteria used for the bundling in time are "Implementation time horizon" with "Timelag between implementation and effectiveness", which are included in the WP3 assessments (impact assessment, MCA) and WP4 (Step 2.1 and 2.2).

The second bundling of WMOs is based on two assessments:

- Assessment of implementation timeline *based on WMO effectiveness over time and local preferences (called "phasing")"*
- Assessment of implementation timeline based on the other criteria (called "cross-check")," resulting in an "adjusted phasing"

Table 5 presents the proposed approach to the first assessments (phasing, cross-check, adjusted phasing). The phasing and cross-check can be prepared based on existing information available from WP3 and WP4 Step 2.1 and 2.2. Stakeholders can also be involved (e.g. via telephone interviews) if needed. Results will be discussed and validated at the stakeholder workshop in combination with the adaptation pathways.

[1] Haasnoot et al. (2013): Dynamic adaptive policy pathways: A method for crafting robust decisions for a deeply uncertain world. In: Global Environmental Change, 23, 485-498.

Table 5. Phasing, cross-check and adjusted phasing of WMOs against each challenge

Please note that further guidelines can be provided on how to adjust phasing based on criteria once the general approach is agreed.

Example challenge: Water quantity

	Phasing			Cross-check							Adjusted phasing		
WMOs	**Short-term**	**Mid-term**	**Long-term**	**Flexible**	**Robust**	**Feasible**	**Acceptable**	**Policy synergies**	**Result of MCA**	**Leave WMO out?**	**Short-term**	**Mid-term**	**Long-term**
Increased drip irrigation	x	x	x	no	yes	medium	neutral	synergies	5			x	x
Awareness campaign on water supply problems	x			neutral	yes	yes	co-benefits	neutral	1		x		
Installation of water efficient equipment in houses	x	x		neutral	yes	medium	co-benefits	synergies	15		x	x	x
Further groundwater wells	x	x	x	no	no	yes	conflict	conflict	14	X			
Improving of farming advices	x			yes	yes	yes	co-benefits	synergies	8		x		

Assessment of implementation timeline based on WMO effectiveness over time and local preferences: "phasing"

The phasing assessment aims to identify when each WMO would best be implemented. Phasing is, for example, done in the Climate Change Impact and Adaptation Study for the Lower Mekong Basin[2]. Information on each WMO from the WP3 excel file on WMO should be used, in particular the following criteria: "Implementation time horizon", "expected lifetime" and "Timelag between implementation and effectiveness".

Using this information, the following should be performed for each WMO:

- Compare "Implementation time horizon" with "Timelag between implementation and effectiveness" to identify if the WMO should be implemented in the short, medium or long term. For example, WMO with a long timelag probably should be established early.
- Consider "Expected lifetime" to identify if the WMO can be used for a limited timescale or the long-term.

Assessment of implementation timeline based on the other criteria: "cross-check"

The next assessment involves cross-checking the proposed timeline of each WMO against key criteria that may affect the implementability of the WMO over time. These cross-checking questions are presented in Table 6.

Table 6. Cross-checking questions (see table in text box above for definition of criteria)

Cross-checking question	Impact on timeline: option 1
Is the WMO flexible (use info from WP3)?	Flexible: can be implemented early Not flexible: should be implemented later
Is the WMO robust (use info from WP3)?	Robust: can be implemented early Not robust: should be implemented later
Is the WMO feasible (use info from WP3)?	Feasible: can be implemented early Not feasible: should be implemented later
Is the WMO acceptable (use info from Step 2.1)?	Acceptable: can be implemented early Not acceptable: should be implemented later
Are there synergies with existing policies (use info from Step 2.1)?	Synergies with policies: can be implemented early Conflicts with policies: should be implemented later
How prioritised in the WMO in the MCA (use info from WP3)?	High priority: can be implemented earlier Low prioritiy: can be implemented later

According to the answers to cross-checking questions, the WMO may be left out (not considered anymore in the RBAP) or its phasing should be adjusted.

Development of adaptation pathway figures

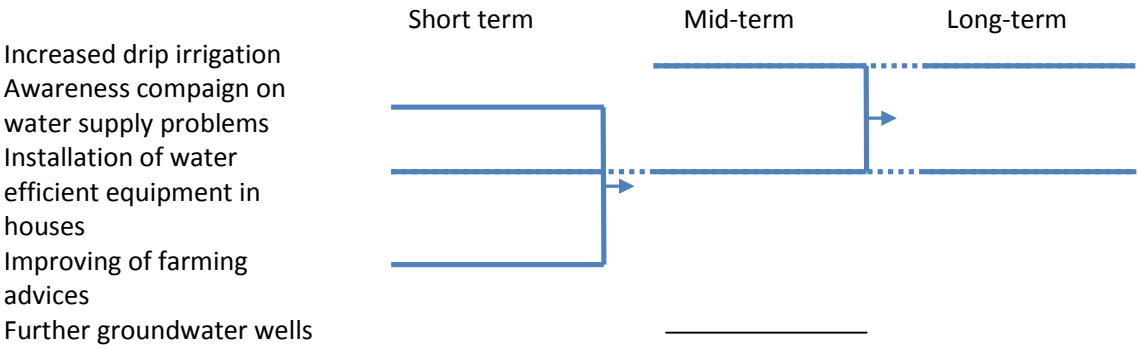
Using the timing proposed under "adjusted phasing" in Table 5, the implementation timeline of WMOs can be presented in a more illustrative way. Figure 1 below presents how this

[2] ICEM (2013): USAID Mekong ARCC Climate Change Impact and Adaptation. Study for the Lower Mekong Basin: Main Report. Prepared for the United States Agency for International Development by CEM – International Centre for Environmental Management. Bangkok: USAID Mekong ARCC Project. Available online at: www.mekongarcc.net/resource.

information can be presented as adaptation pathways. One figure should be prepared for each challenge. The figures will be presented and discussed with the stakeholders at the WP4 workshop.

Figure 1. Pathways for each challenge

Example: Pathway for challenge Water Quantity



(Blue: Pathway, black: not implemented)

Step 2.4: Identifying draft objectives of adaptive management approach

The BeWater RBAPs are research-oriented documents. They aim to test methodologies and serve to inspire future planning processes, linking water and adaptation to global change. They are not a statutory plan requiring implementation, but provide examples of WMOs strengthening overall resilience. In this view, it is difficult to develop a strict adaptive management plan, which identifies responsibilities, leadership and future collaborative activities – including the monitoring of implementation of WMOs. Given the objectives of the BeWater project, it is not expected to be applied with the view of ensuring implementation. Rather, it was developed to test the methods and promote reflection amongst partners and stakeholders on adaptive management planning.

The main objective of this step is to prepare options in relation to the scope of future revisions to the RBAP. It aims in particular to help identify the level of ambition for future monitoring, evaluation and reporting activities, and potential future partnerships.

The necessary resources to perform this step are estimated at 0,5PM.

Based on their knowledge of the local context and level of interest by local stakeholders, options may be prepared regarding the 1) overall objective of future revisions, 2) periodicity of planned revisions, and 3) scope of the future partnership. These options will be presented at the WP4 Workshop. Table 7 below presents some example questions and options based on other reviewed river basin plans.

Table 7. Key questions to help define the scope of future revisions to the RBAP

Questions	Options (examples only)
What could be the overall objectives of future revisions? Is it for:	• ... checking whether WMOs have a noticeable impact in line with the objectives of the RBAP? • ... checking whether the RBAP is still relevant for the new state of the river basin? • ... checking whether WMOs are effectively being implemented? • ... checking whether information flows between stakeholders, and whether learning occurs?
What could the periodicity of planned revisions and their scope be? Such a planned evaluation could include the following:	• An annual "check", for example, synthesizing activities carried out in the last year possibly resulting in modification in RBAP or specific projects implementation procedures. • Key milestones that indicate substantial achievements in the implementation of the RBAP. For example, the reaching of target expenditure levels or key target values from indicator list, key events organised or projects implemented. • A "mid-term" review of the RBAP, which may potentially re-consider the appropriateness of multiple dimensions of the RBAP or may focus on key common challenges and necessary improvements. • The complete revision of the RBAP, which would result in the development of a new RBAP approach.
What could be the scope of the future partnership? Three aspects should be explored	• What form should future engagement take? E.g. just dissemination of information? Or involving a participative process? • Should there be a "steering" group? How should broader society be engaged/involved? • What procedures should be used? E.g. use of media (e.g. printed, e-mails, internet) and/or events (e.g. stakeholder workshops, community meetings, one-to-one exchange, conferences, etc)?

Reporting of progress to relevant actors in the river basin is an important step as it ensures that lessons are drawn collectively and priorities for adaptation to the RBAP are made in a transparent way. WMOs may be added to the RBAP to ensure that capacities and ideal budgets are allocated to activities related to monitoring, evaluation and adaptation. It may also be a good idea to format the final plan in a way that simplifies the revision process (if changes are needed throughout the implementation process based on new information coming from monitoring and evaluation activities).

Step 3: The WP4 workshop

Step 3 at a glance...

Objective	To present the first draft RBAPs
Activities required	Step 3.1 Preparing material to be presented and address logistical issues Step 3.2 Moderating the workshop Step 3.4 Post workshop processing
Output	Adaptation pathways (revised bundles of WMOs) and implementation arrangements
Resources expected required per CS partners	2PM
Timescale	November 2015 (1 month before workshop) –March 2016 (one month after workshop)

Step 3.1: Preparing material to be presented and logistical issues

The objective of this step is to prepare presentable information for the workshop, drawing on the activities of Step 1 and Step 2, and organise the meeting (invitation, room booking, organisation of sessions, etc).

The necessary resources for this step for CS partners are estimated at 0,5 PM.

The overall aim of the WP4 Workshop is to reach a common understanding and, if possible, agreement on the implementation of WMOs and the future of the local stakeholder partnership. The first draft of the RBAP should also be presented. The specific objectives and supporting information to be presented and discussed are shown in Table 8.

Table 8. Objectives of WP4 Workshop and supporting information

Objective of the workshop	Supporting information
To agree on policy options (regulations, funding, on-going/future local/national initiatives) and barriers for the implementation of the WMOs	Policy assessment of WMO
To identify level of individual interest in taking forward some WMOs, and how to overcome where acceptance is low	Stakeholder assessment of WMO
To agree on an efficient way to implement WMOs	Bundling of WMOs co-benefits/synergies
To agree on a timeline for WMO implementation	Bundling of WMOs
To agree on a potential future collaboration between stakeholders, and options for taking WMO forward	Adaptive management approach
To agree on/discuss the structure/outline of the RBAP	First draft of RBAP

Step 3.2: Moderating the workshop

The workshop will be moderated by Ecologic Institute and the local partners. The resources necessary for this task for CS partners are estimated at 0,5 PM.

Step 3.3: Post workshop processing

The objectives of this step are to prepare feedback to the stakeholders on the workshop (in the form e.g. of a report) and, if necessary, to follow up key issues with some of the stakeholders (through e.g. targeted interviews/meetings). The resources necessary for this task for CS partners are estimated at 1 PM.

Step 4: Preparing the adaptive management approach

Step 4 at a glance...

Objective	To identify ways to set in place an adaptive management approach for the long-term implementation of the RBAP
Activities required	Step 4.1: Defining the evaluative questions Step 4.2: Identifying monitoring questions, indicators and data sources Step 4.3: Identify possible involvement in monitoring, including reporting procedures
Output	A draft plan for monitoring, evaluation and reporting procedures
Resources expected required per CS partners	2PMs
Timescale	March 2016 (after WP4 workshop) – May 2016 (before sending 2nd draft RBAP)

Note: Step 4 is led by CS partners. All results will be validated via the involvement of stakeholders in the revision of the second draft of the RBAP in Step 5.

The BeWater RBAPs are research-oriented documents. They aim to test methodologies and serve to inspire future planning processes, linking water and adaptation to global change. They are not a statutory plan requiring implementation, but provide examples of WMOs strengthening overall resilience. In this view, it is difficult to develop a strict adaptive management plan that identifies responsibilities, leadership and future collaborative activities—including monitoring implementation of WMOs. Given the objectives of the BeWater project, it is not expected to be applied with the view of ensuring implementation. Rather, it was develop to test the methods and promote reflection amongst partners and stakeholders on adaptive management planning.

Step 4.1: Defining the evaluative questions

The objective of Step 4.1 is to define the specific scope of the adaptive management approach. The validation by stakeholders of these questions should occur through the revision of the second draft of the RBAP in Step 5.

The resources necessary to do this step are estimated at 0,5PMs.

Evaluation on adaptation policy is a difficult process since the policy is dealing with risks. There is a lack of regular benchmarks to evaluate processes, making the long-term more problematic and uncertaintain. Evaluation will often happen before real impacts become known. In addition, given the complexity of social-ecological systems, it is difficult to identify cause-and-effect relationships in water resource management (e.g. effect of land use change on flood risk) and to locate precisely the effect of specific WMOs (e.g. cross-sectoral effects, long causal chains, etc). Monitoring indicators need to be developed with these issues in mind, and methodologies of the evaluation process should be adequate.

The WP4 Workshop will have provided stakeholder input on the 1) overall objective of future revisions, 2) periodicity of planned revisions, and 3) scope of the future partnerships (see Task 2.4 and Task 3.3). Following these general directions, Step 4.1 should serve to identify which of the following questions in Table 9 are relevant to each case study.

Table 9. Potential specific evaluative questions for the adaptive management approach

Focus of Evaluation	Evaluation question
Relevance	Do the goals of the RBAP remain appropriate for increasing overall resilience of the river basin? To what extent are the objectives of the RBAP still in line with the priorities of the stakeholders? Did any changes happen?
Effectiveness	Is there any significant change in the environmental, economic and social characteristics of the river or river basin? To what extent is it attributable to the RBAP? To what extent has the RBAP led to more sustainable behaviours? To what extent has the RBAP increased stakeholder support for action to tackle challenges associated with global changes?
Efficiency	Is the RBAP being implemented within the estimated budget? Does the RBAP optimally/fairly distribute efforts between sectors/stakeholders in order to reach its objectives?
Outcome	To what extent does the engagement strategy encourage stakeholders to take part in implementation? Are there any unintended positive or negative outcomes from the RBAP?
Learning	What worked and what did not? Can specific practices/methods/approaches be replicated elsewhere? Are the positive changes self-sustaining or do they require continuious intervention?

Step 4.2: Identifying monitoring questions, indicators and sources

The objective of this step is to define monitoring questions, indicators and sources that enable answers to evaluative questions from the collected data. The validation by stakeholders of questions, indicators and sources should occur through the revision of the second draft of the RBAP in Step 5.

The resources necessary to do this step are estimated at 0,5PMs.

Monitoring supports evaluation of RBAP and WMOs through the systematic collection of data. Monitoring is best organised around a list of measurable indicators that answer the selected evaluative questions. Table 10 presents one way to move from evaluative questions, to monitoring questions, indicators and data sources.

Table 10. Moving from evaluative questions to data sources: an example

Evaluation question	Monitoring question	Indicator	Data collection method	Timeframe
To what extent are the objectives of the RBAP in line with the priorities of the stakeholders?	What are the priorities of the stakeholders?	Expressed needs by stakeholders Expressed needs by stakeholders	Survey Workshop	Every 2 years Every 4 years
Question	Monitoring question Monitoring question Monitoring question			
...	...	...	...	...

Table 11 presents relevant indicators and data collection methods. Indicators may be measured in a quantitative or qualitative way.

	Indicators should be simple, cost-effective and affordable. They may avoid duplication of effort, and therefore one may aim to use existing data or new data for multiple purposes. Key environmental variables for example tend to require continuous data collection. Thus, the cost of the data collection is rather high. Moreover, data collection needs to be extensive in order to deliver statistically reliable results.

Table 11. Examples of relevant indicators and data collection methods for monitoring RBAPs

Indicator group	Indicator	Data collection method
On the river basin status		
Environmental variables	Weather and climate variables, stream flow, water quality, water use, etc	Meteorological and hydrological monitoring network Metering on resource use
Socio-economic variables	Population size, growth, age structure, income levels, regional production, etc	Surveys
Indices	On vulnerability index, resilience or adaptive capacity, water scarcity, land degradation, etc	Surveys
Governance and stakeholders	Design of the policy framework, skills, attitudes, knowledge/capacities, etc	Documentary analysis Interviews Surveys Workshops and focus groups
On the progress of RBAP implementation		
WMOs	Expenditure levels, activities undertaken/completed, amount/volume undertaken, etc	Budget tracking
Compliance	Number of water user licenses delivered, number of site visits performed, etc	Regulatory databases

An additional step would be to agree on “thresholds”, i.e. pre-defined values for selected indicators, over which specific action should be taken (e.g. implementation of a WMO). These thresholds may be regulatory targets (e.g. water quality standards, minimum water flow) or other target values for selected indicators identified through negotiation between stakeholders.

Step 4.3: Identify possible responsibilities for monitoring, including reporting procedures

The objective of this step is to identify who could contribute to collecting the data and reporting it to the lead partner who is monitoring the RBAP’s implementation. The validation by stakeholders of possible responsibilities for monitoring should occur through the revision of the second draft of the RBAP in Step 5.

The necessary resources for CS partners to carry out this step are estimated at 1PM.

	Commitment of stakeholders is important for the success of monitoring activities. Indicators and the procedures for measuring them should therefore be preferably

	designed in a participatory way. Indicators should be perceived as being clearly useful, legitimate and easily retrievable by a range of actors.

Monitoring, reporting and evaluation are not isolated activities by one organisation, but rely on the contribution of many public and private actors in the river basin. Relevant data may be collected and recorded individually, but agreement should be sought for communicating and sharing this information.

The organisation leading the implementation of the RBAP should ideally centralise all data, and ensure that the RBAP is being evaluated accordingly to the agreed upon procedures. Where this is not feasible, a simple agreed approach to share data for the agreed periodic revisions of the RBAP should be identified. One-to-one discussion to key stakeholders may be needed to identifiy these approaches.

Reporting of evaluation results should ideally be embedded in the river basin's stakeholder participation approach. Different levels of engagement for reporting are possible (Table 12).

Table 12. Options regarding the level of participation for the periodic evaluation of the RBAP

Level of engagement	Description
Dissemination	Involves the distribution of information via relevant networks and communication channels. This may be most relevant when reporting on-going implementation of activities which does not require lessons-drawing exercise.
Partnership	Involves the core set of actors involved in the development and implementation of the RBAP. This may be most relevant when lessons need to be drawn on specific technical dimensions of the RBAP or cross-sectoral challenges.
Participative	Involves a wider set of actors interested in the RBAP. Participatory evaluation can add value to the evaluation (e.g. increase accuracy) and enhance acceptance, but requires commitment from organizing actors. Participative processes may be used when assessing major events or challenges and during major revisions to the RBAP.

	The RBAP should be seen as "living", dynamic document, and it should not become quickly outdated. Anticipated decision chains should be explored to help deal with unexpected events or emerging drivers, to take into consideration new information, technologies, or lessons learned drawn from particular events. It may be valuable to think of identifying benchmarks or thresholds associated with indicators that can serve as (intermediary) targets to evaluate progress or as an "alarm" to trigger ad-hoc action.

Step 5: Reviewing the RBAP

Step 5 at a glance...

Objective	To prepare the final RBAP
Activities required	Step 5.1: Second draft RBAP Step 5.2: Third draft RBAP
Output	Final RBAP to be submitted to EC
Resources expected required per CS partners	2PM
Timescale	May 2016 – July 2016

Step 5.1: Second draft RBAP

The objective of this step is to prepare a second draft of the RBAP and send it to stakeholders for revision.

The necessary resources for CS partners are estimated at 1PM.

The second draft of the RBAP should be based on the first draft of the RBAP prepared in Step 1 and the information prepared in Step 2. Both of which will be amended following the WP4 Workshop. In addition, the draft adaptive management approach prepared in Step 4 should be added to the draft.

The second draft should be sent to stakeholders for comments. Issues/points of contention should be discussed through phone calls and/or personal meetings.

Step 5.2: Third and final RBAP

The objective of this step is to prepare the final draft of the RBAP following the collection of feedback from stakeholders. This draft will be submitted to the European Commission as a deliverable.

The necessary resources for CS partners are estimated at 1PM.

Part B. Draft outline of BeWater River Basin Adaptation Plans

Part B presents a suggested draft outline for the RBAP (Deliverable 4.2) with a brief description of the expected chapters, sections and content of the RBAP. The outline also includes links to the BeWater tasks and WPs where the relevant information should be produced.

The outline presented here is a first suggestion and is intended to trigger a discussion and agreement on the final structure and content. How information is presented and where remains uncertain as the output from other WPs are yet not available. More guidance will be prepared when this information becomes available.

We suggest this common outline should be used for all river basins. After completion and submission of the RBAP (Deliverable 4.2), we suggest that local partners and stakeholders may format this document in a way that satisfies them for dissemination purposes.

The proposed structure and content is based on the review of RBAPs and existing guidance documents on water and adaptation planning (Deliverable 4.1), as well as on feedback and discussions with the CS partners (e.g. at the Steering Committee meeting in February 2015).

Proposed overall outline of the RBAPs

Foreword

1. Introduction
1.1 Context
1.2 Approach and objectives
1.3 Overview of contents

2. The development of the river basin adaptation plan
2.1 Living in the {*name of the river basin*}
2.2 RBAP development and stakeholder engagement
2.3 Evaluation of the engagement process

3. Climate change impacts
3.1 Current state and future climate change impacts
3.2 Main challenges and their interlinkages
3.3 Uncertainty and knowledge gaps

4. Responding to climate change impacts
4.1 Name of bundle 1
4.2 Name of bundle 2
4.3 ...

5. Monitoring progress and adapting the plan
5.1 Overall strategy
5.2 Monitoring and evaluation
5.3 Reporting and reviewing

Foreword

Objective	To present a brief overview of why the plan was developed and what to expect within the plan itself
Content	• A brief summary of the main threats posed to the Mediterranean region and society as a result of global change, and climate change in particular, and the resultant need for adaptation; • Introduction to BeWater project (context, funding, consortium); • Context of RBAP development; • Overview of RBAP (based on main pressures/circumstances of river basin)

Example 'Foreword' section of RBAP

From 2013-2017, the BeWater project worked together with four Mediterranean river basins to collaboratively develop river basin adaptation plans in each area. The European Commission's 7th Framework Programme funded the project, which involved 12 consortium members. Close cooperation between the four river basins, including {*Name of RB*} as well as {*Name of remaining 3 RBs*}, and the remaining project partners guided the process of writing the respective river basin adaptation plans.

Over the course of the four-year project, the following river basin adaptation plans for the {*Name of RB*} have been developed. This basin was selected due to the need for increased awareness of challenges facing its citizens and the environment due to global changes. The plan that has been developed is thus the result of intense team effort, targeted information gathering, wide stakeholder involvement, critical analysis, and thoughtful planning.

The main emphasis of this river basin adaptation plan is on {*relevant sectors*}, as well as the potential economic impacts of global and climatic changes on those resources and the cost of implementing the suggested WMOs. The goal of the adaptation plan is to act as a catalyst for the development of further river basin adaptation plans in the Mediterranean region, as well as across Europe more broadly.

1. Introduction

Chapter 1 at a glance…

Objective	To briefly introduce the river basin, the reasons for developing the RBAP, its main objectives, and an overview of the contents included in the RBAP
Sub-chapters	1.1. Context 1.2. Approach and objectives 1.3. Overview of content
Where to get this information	Most information in this chapter may be collected via the Aquaknow Platform (WP3 Task 3.2), the Stakeholder Workshop reports (WP3 Task 3.3) and needs of policy makers/stakeholders based on interviews (WP4 Task 4.1).

1.1 Context

This section should present a brief overview of the river basin and challenges faced in the context of global changes. Information to be presented includes:

1. Location (with map);
2. Catchment area size (km^2) and catchment area boundaries (map)
3. Information (where relevant) on sub-catchments (how many, name, size, etc);
4. Impending river basin-specific global change threats, with particular focus on climate change impacts;
5. Reasons for developing the plan the RBAP, including a short overview of the BeWater project and local aspirations.

This information should stem from the River Basin Naratives produced in WP3.

1.2 Approach and objectives

The processes underpinning the development of the RBAP should be presented in 2-3 sentences, focusing primarily on the stakeholder engagement strategy.

The objectives of the RBAP and its role in addressing the future vision for the RB should then be outlined. It should be further specified that the plan is voluntary.

This section will be largely the same for all four case studies, differing only slightly if there were varying elements included in the stakeholder engagement and/or RBAP writing processes.

1.3 Overview of contents

An overview of the the contents which will be covered in the subsequent chapters of the plan should be provided.

2. The development of the river basin adaptation plan

Chapter 2 at a glance…

Objective	To present the manner in which river basin stakeholders were engaged in the planning process, and the purposes of this engagement. This chapter shall enable RBAP readers to understand the rationale for stakeholder involvement in the planning process. A careful explanation of the stakeholder engagement process within BeWater will underline the legitimacy of the participatory approach taken, due to the protagonist role of local stakeholders in defining the problems and responses.
Sub-chapters	2.1 Living in the {*name of the river basin*} 2.2 RBAP development and stakeholder engagement 2.3 List of dissemination and engagement activities
Where to get this information	The main sources of information will be the BeWater Protocol for Performance of Participatory Processes, Protocol on the Development of Water Management Options, the Protocol on Adaptation Planning (WP2 Task 2.2), the Stakeholder Workshop reports (WP3 Task 3.3), needs of policy makers/stakeholders based on interviews (WP4 Task 4.1), policy assessment (WP4 Task 4.1, see Protocol RBAP (Part A Step 2)) and the policy reports (WP6).

	**The importance of explaining how stakeholders and experts were involved** Participatory planning processes don't put stakeholders at the centre in each and every step of the process, but usually put them in charge of a few of the planning steps. Typically, a project team usually delivers the key results, e.g. by using a methodology based on stakeholder information. For instance, an approach may ask stakeholders to prioritise objectives and evaluate WMOs. A multicriteria method is then used to prioritise WMOs. Stakeholder involvement can also take the form of reviewing/validating and/or complementing results obtained by other methods (e.g. models), which is often the case when general results should be validated in a local context. Planning processes can also involve (scientific) experts, e.g. to help determine the costs and the benefits of a particular adaptation WMO in the local context.

2.1 Living in the {*name of the river basin*}

This section should provide a brief overview of the main actor groups and their roles/competing interests in the river basin (e.g. environmental protection, farming, flood protection). A brief reference to how these actors may be affected by impacts of global changes is relevant.

In addition, legislation and policies affecting management planning of the river basin should be listed and described, as well as the mandates of relevant public authorities (e.g. flood protection responsibilities).

2.2 RBAP development and stakeholder engagement

This section should present very briefly the methodology and procedures used to evaluate and select WMOs. This section should specifically outline the steps of the RBAP planning process in which stakeholders were involved, and the type of involvement.

It should be outlined if stakeholders had the main responsibility for developing the outcomes presented in the RBAP (e.g. stakeholders are asked to define their expectations for the future of the basin), or if they played a supporting role (e.g. they were asked to complement information provided). This supporting role should be specified; possible roles could be to complement outcomes with additional (local) information, review outcomes for local implementability, review outcomes for accuracy, give approval to process outcome, etc.

As was outlined above for stakeholders, the role of experts (if relevant) should be described. Experts can be responsible for the main outcome of a process step, or have a supporting role in its outcome, just as the stakeholders did.

<table>
<tr>
<td>  </td>
<td>The specified process steps should present those of the BeWater methodology. The description of RBAP development and where/how stakeholders provided can be mapped against these steps

• Elicit the current state and future expectations;
  ○ Description of the current status and pressures in the river basin
  ○ Description of the expectations regarding the future status of the river basin
  ○ Identify challenges in the river basin
  ○ Create a narrative of the basin
• Formulate water management options
  ○ Identify and characterise options
  ○ Cluster options
  ○ Check for completeness
  ○ Refine options
• Evaluate water management options
  ○ Impact assessment of water management options
  ○ Evaluate water management options
• Validate water management options
• Preparing the first draft RBAP
• Policy and implementation assessment
  ○ Characterising the policy and stakeholder basis of WMOs
  ○ Assessing synergies and co-benefits
  ○ Preparing draft adaptation pathways
  ○ Identifying draft objectives of adaptive management approach
• The WP4 workshop Step 3.1 Preparing material to be presented
  ○ The stakeholder workshop
  ○ Post workshop processing
• Preparing the adaptive management approach
  ○ Defining the evaluative questions
  ○ Identifying monitoring questions, indicators and data sources
  ○ Identify possible involvement in monitoring, including reporting procedures
• Reviewing the RBAP
  ○ Second draft
  ○ Final draft</td>
</tr>
</table>

2.3 List of engagement and dissemination activities

This section should contain the list of events held, information products prepared and disseminated, as well as target groups and stakeholders involved. A table format can be used (Table 1).

Table 1. List of engagement and dissemination activities

Dissemination/engagement activity	Content	Target group	Dates

3. The {name of river basin}

Chapter 3 at a glance…

Objective	To present information on describing the current state and the expected future state of the river basin. The information presented here should in particular help the readers of the RBAP to have a good overview of the relevant challenges for water management in the river basin.
Sub-chapters	3.1 Current and future state of the river basin 3.2 Main challenges and their interlinkages 3.3 Uncertainty and knowledge gaps
Where to get this information	The main sources of information will be: the Aquaknow platform (D3.1), the Stakeholder Workshop reports (WP3 Task 3.3), and the policy reports (WP6).

Each BeWater case-study should aim to collect and present the information suggested in this chapter. However, data avalability, data needs and data limitations will vary, and the final content of the chapter may vary accordingly.

Importantly, the type of information produced in WP3 will influence the structure and content of this chapter. The current outline is therefore a first attempt, and should be reviewed in light of WP3 results.

Important and facultative topics are identified. The topics that need to be displayed in each case study are marked with an "*". This information is partly identical with the data stored on the Aquaknow platform (DL3.1).

3.1 Current and future state of the river basin

This section should introduce the reader to the current state and expected future state of the land, water, biodiversity and people for the whole basin. Table 2 lists some relevant indicators. Maps and photos should be included where they bring added value.

Table 2. Examples of information for the description of the current and future state of the river basin

Social-ecologic system	Current state	Future state
Land	Ownership of land Primary industries* Current land use/cover (and geographic variations)*	Expected land use change
Water	For surface water, the following may be described: Overview of basin, including information on temperature*; precipitation*; runoff and aridity*; Rivers, including discharge*, streamflow*, floods characteristics*; Water availability and water quality*; Current vulnerabilities in terms of water quantity and quality; Human modifications to water bodies. For groundwater Basic geology;	Impacts of global changes on water availability*, temperature*, precipitation,* extreme hydrological events* and changing patterns of climate extremes* (e.g. strom events, cyclones, heatwaves, which occur on short timescale); Expected changes in demand and uses of water; Impacts of global changes on water quality (streamflow*).

	Groundwater yields*.	
Biodiversity	Vegetation*; Habitat and ecosystem types; Species and nationally or EU protected areas (e.g. Natura 2000 sites, national parks, etc).	Expected population development; Socio-economic development change for following relevant sectors: forestry*, agriculture*, industry*, navigation, hydropower, tourism, public health, drinking water facilities.
People	Entitlements (e.g. property rights, use rights including public and private) Water demand and uses of water*, including drinking water facilities*, agriculture*, forestry*, navigation, hydropower, tourism, public health, etc; Economic variables: employment by industry, investment and trading patterns, etc; Social variables: Income, demographic trends, urbanization patterns*, etc; Other potential relevant topics: trends in diet, etc.	Planned evolution in the variables presented in the previous column

3.2 Main challenges and their interlinkages

This sub-section should present the main challenges facing the river basin, based on results of WP3. The cognitive map should be used to discuss interlinkages between these challenges.

3.3 Uncertainty and knowledge gaps

This sub-section aims to present uncertainties and related knowledge gaps based on the impact and vulnerability data presented in the previous section.

4. Water management options

Chapter 4 at a glance…

Objective	To present information on the WMOs selected by stakeholders during the BeWater project. The information presented here should help the readers of the RBAP to have a good overview of the type of water management options (WMO) that would contribute to adaptation in water management in the river basin. The proposed actions for each BeWater river basin are based on a number of WMOs that have been grouped and combined into "bundles". This allows for exploiting synergies and co-benefits, and minimizing conflicts between individual WMOs.
Sub-chapters	4.1 Name of bundle 1 4.2 Name of bundle 2 4.3 ...
Where to get this information	The information presented in this chapter should be prepared during the application of the methodology for selecting WMOs (WP3) and their bundling (WP4, Task 4.1, see also Protocol RBAP (Part A Step 2)).

This section should present an overview of bundles of WMO that will be developed through WP3 and WP4. The bundles will contain individual WMOs that are interlinked with each other with the Adaptation Pathways. Further information for all individual WMOs will be presented in the RBAP Annexes in the format of WMO factsheets.

The structure and proposed information per bundle and WMOs are based on the screening of RBAP and guidelines in D4.1, which showed that the level of information provided in existing RBAPs vary significantly.

We tried to find an approach that includes the main information in order to understand WMOs and some implementation factors, but still tries to keep the chapter clear and compact. Further additional information on the WMOs can then be found in the factsheet in the Annex (cross-reference).

	Each BeWater case-study should aim to collect and present the information suggested in this chapter. However, priorities and data limitations will vary and the final content of the chapter may vary accordingly (e.g. for the same descriptive criteria, one case–study may present qualitative as opposed to quantitative information).

4.1 Name of bundle 1

The aim of this sub-section is to present one bundle of WMOs. Table 3 shows the main information that should be provided on each bundle.

This section should contain some general information on the bundle as an introduction.

As background information, a summary of the context with overall vulnerabilities will be included (the information should come from WP3 and/or existing material of the river basin partners).

The WMOs will be presented according to the methodology used for the bundling of options. The objective of the bundle should be briefly explained, followed by a section or table with the WMOs for this climate impact/challenge (including indication of high/medium/low priority of the option).

The main implementation facts will be described in this chapter. This will include cost assessment, responsibility for the implementation of the WMOs in the bundle and the description of the funding options for the WMOs in the bundle. The format for the presentation of costs, responsibilities and possible funding sources could be presented in a text or table format.

Table 3. Main necessary information on each bundle

Context of the bundle	Summary of relevant global change impacts/vulnerabilities within the watershed according to land, people and … (depending on methodology)
Description of the Adaptation Pathway	Listing the WMOs of the bundle, and their planned phased implementation
Responsibility for the implementation of WMOs in the bundle	Responsible entities for the overall planning and coordination between the implementation of the water management options
Cost assessment of the bundle	Capital cost, operation cost, maintenance cost, etc
Description of funding options for the bundle	If the bundle is financed in total, financing for individual water management options will be outlined in the description of the option

4.2 Name of bundle 2

For each subsequent bundle, the same information as outlined in 4.1 should be presented.

4.3 ...

5. Monitoring progress and adapting to change

Chapter 5 at a glance…

Objective	To present information on the procedures established or to be established for monitoring progress on the implementation of the RBAP and ensure continued collaboration from interested local actors. The information presented in this chapter should help readers of the RBAP to understand when, how and by whom RBAPs will be evaluated and revised in the future. These are important steps in enhancing the effectiveness and adaptability of the RBAP as new conditions arise, ensuring transparency in decision-making and maintaining confidence in the planning process.
Sub-chapters	5.1. The overall strategy to monitor progress and review the RBAP 5.2. Evaluation and monitoring procedures 5.3. Reporting and reviewing procedures
Where to get this information	WP4 (Task 4.1), Protocol RBAP (Part A Step 4)

	Each BeWater case-study should aim to collect and present the information suggested in this chapter. However, priorities and data limitations will vary, and the final content of the chapter may vary accordingly (e.g. for the same descriptive criteria, one case–study may present qualitative as opposed to quantitative information).

5.1 Overall strategy

This section should present the overall approach taken in the river basin to monitor progress and adjust the RBAP in the future. A short description of the workflow between monitoring, evaluation and reporting processes should also be presented, including:

- Procedures for planned evaluations and revisions of the RBAP, including their scope and periodicity, e.g. annual progress, progress against key milestones, progress towards long-term strategic RBAP vision/objectives, and complete revision of the RBAP.
- Responsibilities, in particular a clear lead for initiating the evaluation process, managing monitoring, and ensuring a partnership and participative approach.
- Procedures for ad-hoc modification of the plan and anticipated decision chains;

5.2 Evaluation and monitoring procedures

This section should present the procedures for evaluating progress towards the objectives of the RBAP. Information that may be synthesised in this sub-section include:

- Procedures for evaluating whether monitored change in the social, environmental and economic characteristics of the river basin and/or implementation of the RBAP is appropriate;
- Procedures for evaluating whether RBAP WMOs contribute to these observed changes;
- Procedures for identifying and learning from good practice.

This section should also present the procedures set up to record progress in implementation of the RBAP and in reaching RBAP objectives. It should present:

- The indicators used for WMOs (i) changes in the ecological, economic and social conditions of the river basin and/or (ii) the progress of the implementation of WMOs;
- The procedures used to monitor, including agreements on the sharing of data, information flow between relevant actors.

5.3 Reporting and reviewing procedures

To remain relevant and to ensure the selected WMOs remain appropriate over time, a periodic review of the RBAP is needed.

This section should present the procedures used for reporting results from evaluation and monitoring activities, and the review process that may lead to a re-adjustment of the plan. Information on reporting to be presented should include:

- Target audience: a “steering” group, core group of stakeholders, broader society;
- Intensity of engagement: dissemination, partnership, participative;
- Procedures to be used: media (printed, e-mails, internet), events (stakeholder workshops, community meetings, one-to-one exchange, conferences, etc).

Procedures for reviewing the plan and follow-up taking action should also ideally be presented.

Annex 1 Detailed presentation of water management options

The detailed presentation of the individual WMOs should be presented in factsheets. Here we tried to include the most important information on the WMOs in a structured way to get an easy overview on characteristics and implementation issues of the WMOs.

Name of WMO	
Short explanation	Description of WMO in max. 3-4 sentences
Addressed challenges	Challenge, to which it refers, e.g. water quantity, water quality
Benefits	e.g. higher flexibility of sewage systems, reduced sealing, increased awareness for flooding, increased knowledge exchange and cooperation Impact regarding environmental, social, economic and social system Transboundary impact of the WMO
Potential negative impacts	Listing potential environmental, social and economic impacts, and options on to minimize them
Synergies and conflicts with policy objectives	Mentioning of existing synergies and conflicts between the WMO and identified policy objectives
Implementation scale	Which geographic scale and administrative scales are appropriate for implementation?
Urgency/timeline of implementation	At what timescales does action need to be taken to be responding effectively to the challenge?
Preconditions for success	What has to be implemented before the WMO can function? What information is needed for a successful implementation?
Relevant stakeholders	Which actors should be involved in the implementation of the WMO?
Acceptance	Different dimensions may be presented • Is the WMO politically and socially acceptable? • Who wins and who loses?
Feasibility	What (technical, social, institutional, etc) barriers are there to implementation?
Robustness	An option is considered robust to uncertainties if it can maintain its effectiveness under different climatic and socio-economic development scenarios.
Flexibility	An option is considered flexible when it can be adjusted/ complemented or reversed when it turns out to be inadequate or inappropriate in practice. In this sense, adjustable options should be able to be adapted to different climate scenarios as well as socio-economic development trends.
Costs	Costs split in investment costs and maintenance/running costs: Low/medium/high costs
Financing of the WMO	Outlines different, available funding sources. If the WMO can only be financed as part of a bundle, reference to the bundle.
Responsibilities for implementation	Who could be responsible for implementation of the WMO?
Concrete examples where applied	Short description of examples where WMO was already implemented
Literature source of the WMO	