CC-ARP-CE – INTEGRATED TOOLBOX FOR CLIMATE CHANGE ADAPTATION AND RISK PREVENTION

WORK PACKAGE T2 - INTEGRATION: CC-ARP-CE TOOLBOX FOR CLIMATE CHANGE ADAPTATION AND RISK PREVENTION IN CE

OUTPUT O.T2.1

Lead Institution	University of Ljubljana
Lead Author/s	Jerca Praprotnik Kastelic, Barbara Čenčur Curk, Ana Strgar, Ajda Cilenšek, Primož Banovec
Version	V-01
Date last release	01.02.2022

- University of Ljubljana (PP1-LP):
  Jerca Praprotnik Kastelic, Ana Strgar, Barbara Čenčur Curk, Anja Torkar, Ajda Cilenšek, Primož Banovec, Matej Cerk, Uroš Lasjak
- Infrastruktur & Umwelt – Professor Böhm & Partner (PP3):
  Anna Goris, Stefanie Weiner, Anne Lehmann, Birgit Haupter
- Warsaw University of Life Sciences (PP4):
  Ignacy Kardel, Tomasz Stańczyk, Paweł Trandziuk
- Euro-Mediterranean Center on Climate Change Foundation - CMCC (PP5):
  Guido Rianna
- Federal Research and Training Centre for Forests, Natural Hazards and Landscape (PP7):
  Viktoria Valenta
- Middle Tisza District Water Directorate (PP9):
  Judit Palatinus, Gabor Harsanyi
- Saxon State Office for Environment, Agriculture and Geology - LfULG (PP2):
- Infrastruktur & Umwelt – Professor Böhm & Partner (PP3)
- Warsaw University of Life Sciences (PP4)
- University of Natural Resources and Life Sciences, Vienna - BOKU (PP6)
- Global Water Partnership Central and Eastern Europe (PP8)
- Po river district Authority (PP10)
- Institute of Meteorology and Water Management - National Research Institute (PP11)
- Czech University of Life Sciences (PP12)

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1. Introduction

The main objective of the TEACHER-CE project was to develop an Integrated toolbox for Climate Change Adaptation and Risk Prevention in Central Europe – CC-ARP-CE – which focuses on the adaptation of the water management sector to Climate change (CC) to mitigate the risk of floods/heavy rain/drought as far as possible, e.g. by small water retention measures or protection of drinking water resources through sustainable land-use management.

The TEACHER-CE toolbox is the main component of the project having a specific role as a central online platform to support stakeholders for the integrated consideration of different fields of action of the water management sector that are affected by climate change. The project is integrating and harmonizing results of previously funded projects dealing with CC adaptation and risk prevention, focusing on:

- Management of the effects of heavy rainfall and floods (CE project RAINMAN);
- Exploitation of small water retention measures (CE project FRAMWAT);
- Protection of drinking water through sustainable land use (CE project PROLINE-CE);
- and proper management of forests under CC (CE project SUSTREE).

And on integration of other projects (CE: LUMAT; H2020: FAIRWAY, LifeLocalAdapt; DTP: DRIDANUBE and DAREFFORT, Copernicus Climate Change Service (C3S): Sectoral Information System Disaster Risk Reduction and Demo Case “Soil Erosion”). Moreover, synergies with additional selected projects were built.

Building on the tools from the existing projects, TEACHER-CE developed a decision support tool to support **C**limate **C**hange **A**daptation and **R**isk **P**revention in **C**entral **E**urope (CC-ARP-CE) in the water management sector. The idea of the capitalization of the aforementioned tools was to:

- make the tools "climate proof" and applicable in a climate change perspective,
- Integrate the tools into a comprehensive Toolbox to address interacting water-related issues that affect CE,
- position the toolbox in the area where the interests of different user groups meet and confront the challenges related to the climate change adaptation process in the water management sector,
- stimulate the exchange of different views and visions on the development of water in specific catchments with different stakeholders.

Figure 1: Logo of the CC-ARP-CE (TEACHER-CE) Toolbox:
Integrated toolbox for Climate Change Adaptation and Risk

All aspects covered in the project are included into the CC-ARP-CE toolbox logo (Figure 1): vertical blue lines are presenting rainfall (heavy rain), inclined yellow lines are presenting sun (rising temperature), blue curls are presenting water (runoff and floods) and brown horizontal lines soil (drought) and all these elements are affected by climate change.

In order to support the use of the toolbox CC-ARP-CE and to guide the users with step-by-step instructions, the tutorials (Appendix 1) were created and to present the theoretical basis of the toolbox of integrated tools the manual (Appendix 2) was prepared.

2. CC-ARP-CE

The TEACHER-CE Toolbox CC-ARP-CE supports local and regional stakeholders for the integrated consideration of different fields of action of the water management sector that are affected by climate change. Seven fields of action of the water management sector were identified that are relevant for TEACHER-CE: Fluvial flood risk management, Pluvial flood risk management, Groundwater management, Drinking water supply management, Irrigation water management, Water scarcity and drought management, Management of water-dependent ecosystems.

The toolbox helps the user to define their water related issues/problems/ideas within a specific location (Figure 2) and enables the comparison with other similar issues in other countries. The toolbox includes a web map service which provides spatial orientation and information about expected variations induced by climate change in weather forcing, impacting water related issues by means of widely consolidated climate indicators. Additionally, an overview about the national tools is available. Each user can get an overview of the evaluation tools developed in other projects.

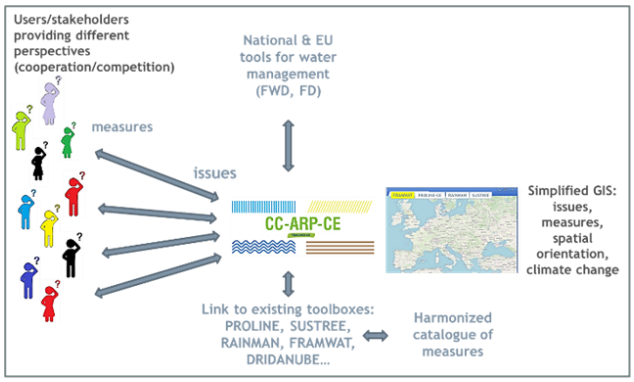

Figure 2: Conceptual scheme of the Toolbox

The user can explore the issues and proposed measures from other users, can view these issues on the map, can get an overview of CC impacts on a NUTS level and can receive information related to the national tools for water management (WFD & FD). The result of using this toolbox is a compilation of stakeholder issues identified on a single platform, including measures selected from the catalogue and ranked according to specific criteria by the user. Additionally, the assessment of the impact of CC and the reference to the national water management tools are included, which supports the development of river basin management plans and the integration of green infrastructure in specific river basins.

The CC-ARP-CE tool is the TEACHER-CE project's main output and is designed to support the needs of the users in the water management sector. The tool provides spatial orientation among all identified issues in water management, provides information on climate change scenarios with key indicators, allows navigation through EU and national data portals, provides links to tools developed in past EU projects and provides an integrated comprehensive catalogue of measures.

All these functions are included in the Toolbox as 5 features (Figure 3):

1. Map of Climate Indicators
2. Ranking and Catalogue of measures
3. Identification of Issues with selection of measures
4. Reference EU and National links
5. Other Project Tools

Figure 3: CC-ARP-CE Navigation Menu

The Toolbox is open for use after logging in. The menu and the main parts of the toolbox including the catalogue of measures are translated into different languages (Czech, English, German, Hungarian, Italian, Polish, Slovakian or Slovenian).

The Toolbox can be found at: https://teacher.apps.vokas.si/

APPENDIX 1

CC-ARP-CE TOOLBOX TUTORIAL

CC-ARP-CE TOOLBOX TUTORIAL

WORK PACKAGE T2 - INTEGRATION: CC-ARP-CE TOOLBOX FOR CLIMATE CHANGE ADAPTATION AND RISK PREVENTION IN CE

ACTIVITY A.T2.1 INTEGRATED TOOLBOX FOR CLIMATE CHANGE ADAPTATION AND RISK PREVENTION - VERSIONS FOR TESTING

DELIVERABLE D.T2.1.3 TOOLBOX OF INTEGRATED TOOL (CC-ARP-CE) – VERSION 1.0 FOR TESTING BY STAKEHOLDERS

- University of Ljubljana (PP1-LP):
  Ana Strgar, Jerca Praprotnik Kastelic, Barbara Čenčur Curk, Anja Torkar, Ajda Cilenšek, Primož Banovec, Matej Cerk
- Saxon State Office for Environment, Agriculture and Geology - LfULG (PP2):
  Name…
- Infrastruktur & Umwelt – Professor Böhm & Partner (PP3):
  Anna Goris, Peter Heiland, Birgit Haupter, Stefanie Weiner, Laura Kieser
- Warsaw University of Life Sciences (PP4):
  Name…
- Euro-Mediterranean Center on Climate Change Foundation - CMCC (PP5):
  Name…
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  Name…
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- Global Water Partnership Central and Eastern Europe (PP8):
  Name…
- Middle Tisza District Water Directorate (PP9):
  Janos Ferér
- Po river district Authority (PP10):
  Name…
- Institute of Meteorology and Water Management - National Research Institute (PP11):
  Name…
- Czech University of Life Sciences (PP12):
  Name…

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4. Introduction

The TEACHER-CE Toolbox CC-ARP-CE supports local and regional stakeholders for the integrated consideration of different fields of action of the water management sector that are affected by climate change. The users provide their ideas/issues/problems within a specific location (Figure 3). Additionally, an overview about the national tools is available. The toolbox includes a web map service which provides spatial orientation and information about expected variations induced by climate change in weather forcing, impacting water related issues by means of widely consolidated climate indicators.

Each user can identify and enter his/her issues (Figure 4) in the toolbox and gets an overview of the evaluation tools developed in other projects. The user can explore the issues and proposed measures from other users, can view these issues on the map, can get an overview of CC impacts on a NUTS level and can receive information related to the national tools for water management (WFD & FD).

The result of using this toolbox is a compilation of stakeholder issues identified on a single platform, including measures selected from the catalogue and ranked according to specific criteria by the user. Additionally, the assessment of the impact of CC and the reference to the national water management tools are included. This will support the development of river basin management plans and the integration of green infrastructure in specific river basins.

The Toolbox can be found at: https://teacher.apps.vokas.si/

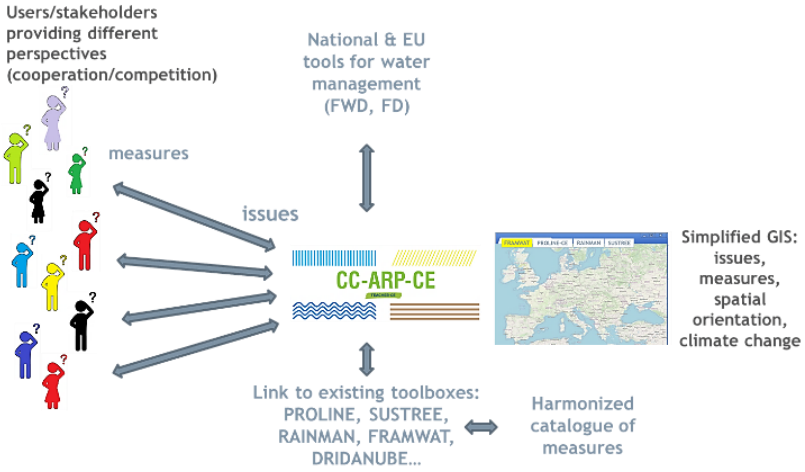


Figure 3: Toolbox workflow

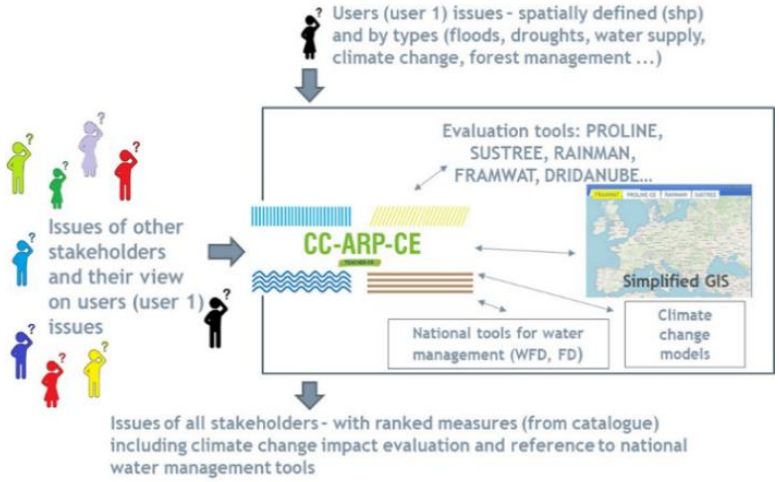


Figure 4: Conceptual scheme of the Toolbox

5. Home

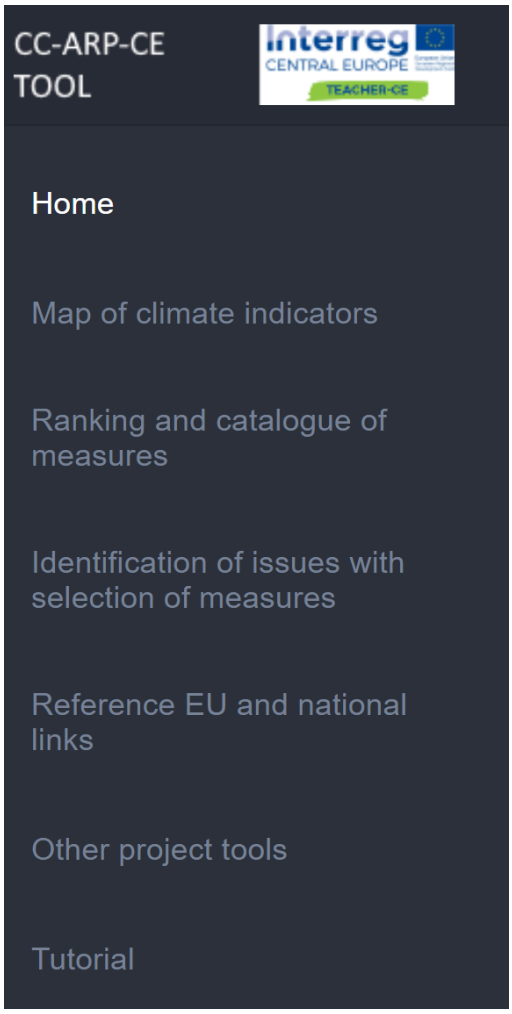


Figure 5: Main navigation panel - Home

"Home" includes a short presentation of the TEACHER-CE project and the CC-ARP-CE toolbox. Additionally, it provides an overview of the toolbox features.

Some features such as "Identification of issues with selection of measures" and "Map of climate indicators are only accessible to the registered users. To register, click on Log in button at the top right corner (Figure 6). This opens new page with log in and register options. Each user should be registered for better identification of users, as the information inserted in the toolbox is sensitive in nature and can be easily manipulated, so control is needed over (reliable) users.

To log in, use the "Log in" button in the upper right corner of the webpage. There you can also choose a language (Czech, English, German, Hungarian, Italian, Polish, Slovakian or Slovenian) (Figure 6). The main parts of the toolbox including the catalogue of measures also translated into the mentioned languages.

Figure 6: Choose a language and Log in panel

6. Map of climate indicators

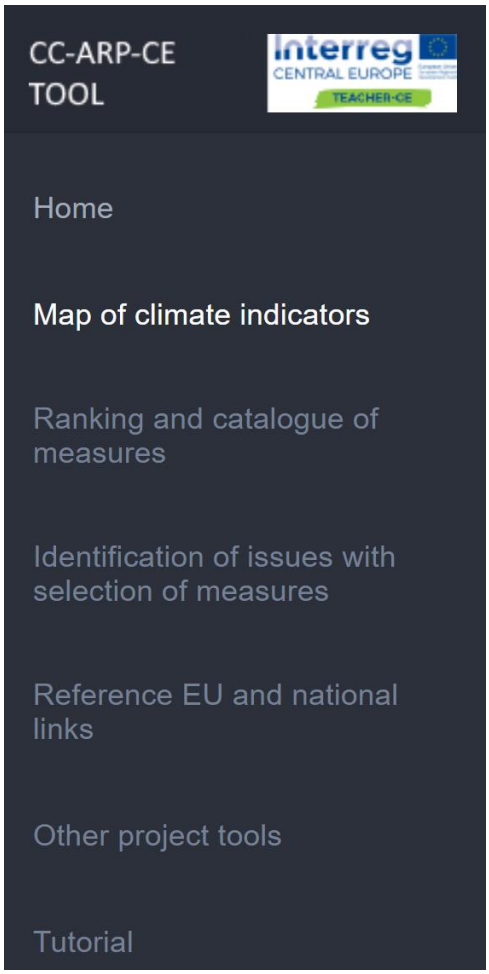


Figure 7: Main navigation panel – Map of climate indicators

This feature of the toolbox is available only to the registered users (see Chapter 5 for more information).

For each climate indicator, two – IPCC Scenarios (Representative Concentration Pathway – RCP: the midway RCP4.5 and the more extreme RCP8.5; more details in Appendix 1 of the CC-ARP-CE Manual) and time horizons (2021-2050 vs 1971-2000 or 2071-2100 vs 1971-2000) are provided, the values are visualized in terms of median value of the anomalies aggregated at NUTS level (level 3 for all the countries except Germany for which level 2 is used).

For more expert users, beyond median values, data corresponding to the first and third quartiles are also provided at NUTS level and at grid point level (exploiting the grid points as provided by EURO-CORDEX simulations) for Interreg Central European Programme area.

Climate data can be downloaded by clicking Download climate data (in the selection panel). First name, last name, email address and institution must be provided in the next step.

For a complete list of indicators and their specifics, refer to the CC-ARP-CE Manual and its Annex 1 (climate data, expected variations in climate proxies, impact indicators for application in toolbox).

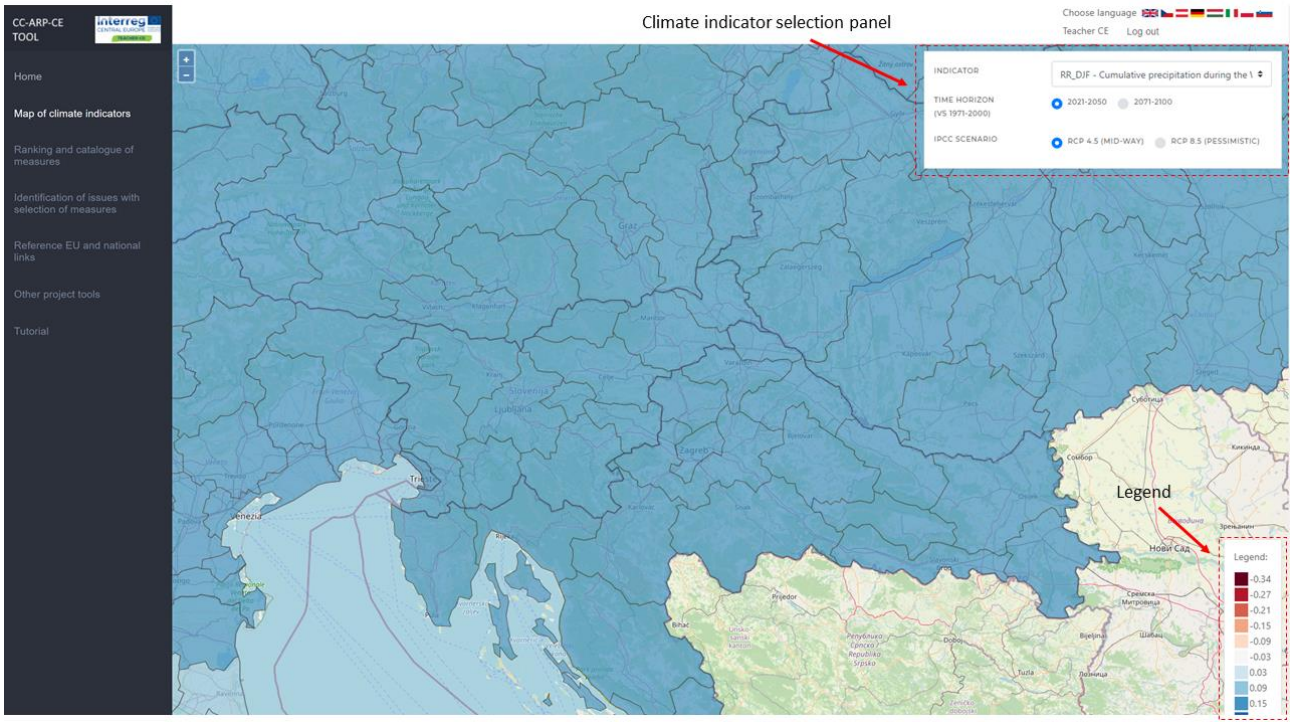


Figure 8: Map of climate indicators main page

To display the map of the selected indicator, use the selection panel in the upper right corner of the map (Figure 8, Figure 9):

1. Select the climate indicator from a drop-drown menu
2. Select the time horizon.
3. Select the IPCC scenario.

Figure 9: Climate indicator selection panel

The legend corresponds to the selected indicator.

To display the values of the selected indictor for all time horizons and both scenarios:

1. Click on the area (NUTS) of interest.
2. A new window will open with values for the selected indicator on top and all other indicators below (Figure 10).
3. In addition to values of all indicators also information about reference elevation used for calculation of the indicators, together with the min/max elevation in the region, in the selected NUTS area is displayed.

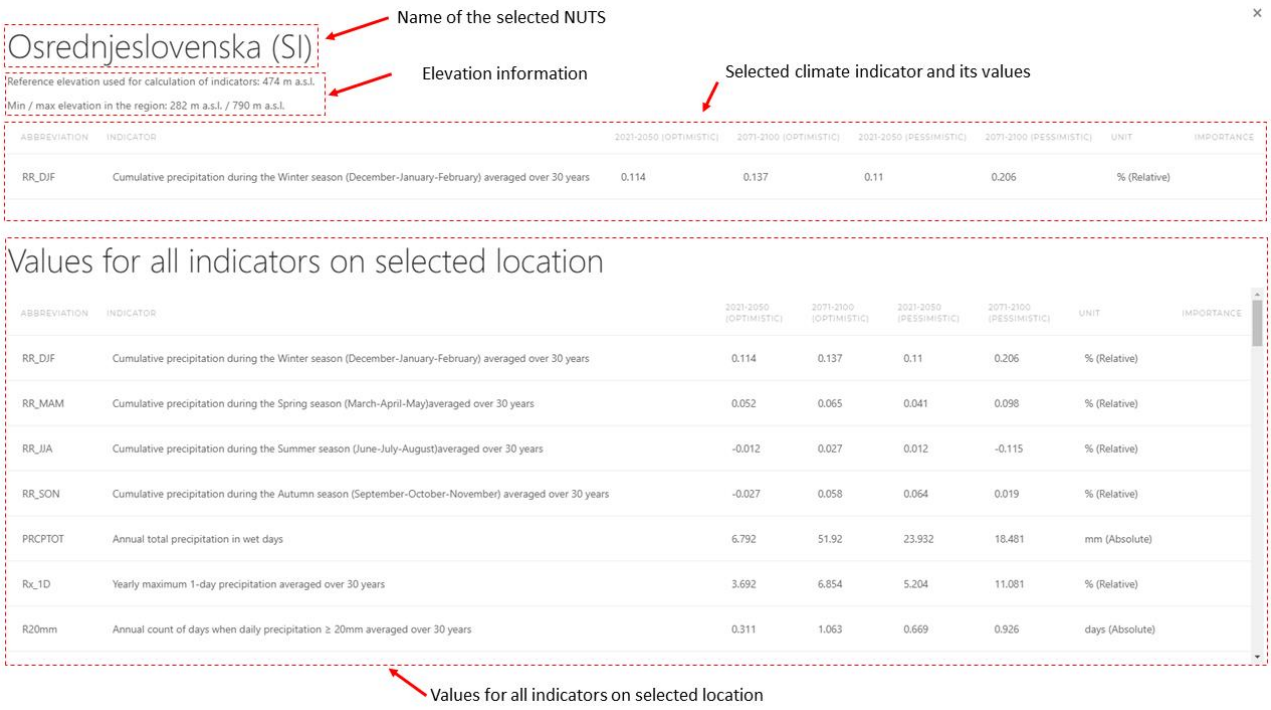


Figure 10: Display window of the indicators for the selected NUTS

7. Ranking and catalogue of measures

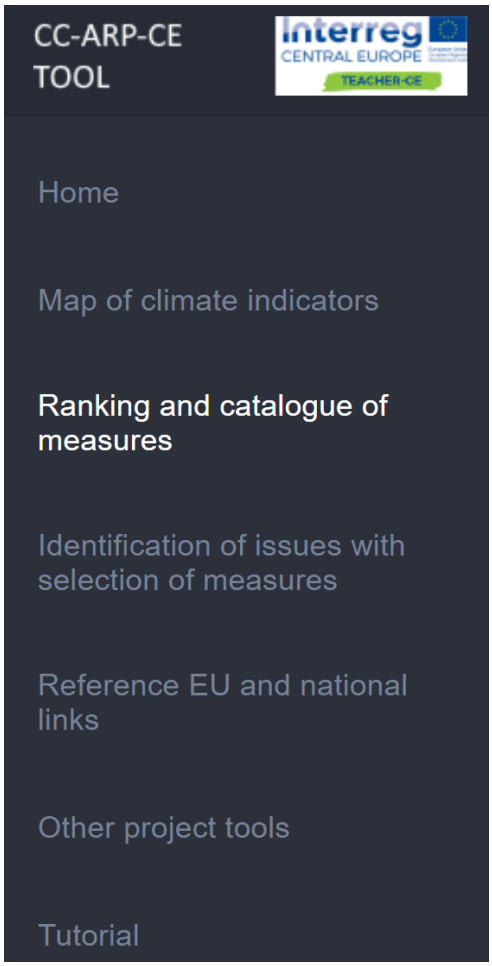


Figure 11: Main navigation panel - Ranking and catalogue of measures

The core of the TEACHER-CE Toolbox CC-ARP-CE is a harmonized comprehensive catalogue of measures, gathered from all directly exploited projects and some from other connected EU projects.

The different catalogues of measures of selected projects were reviewed and harmonized by our expert group to create synergies and select measures relevant for the objectives of TEACHER-CE. The result of this approach is a harmonized catalogue of measures which was then further evaluated according to the selected criteria. The measures can be filtered by categories (fields of action, land use, type of measures) and assessed with the help of the Analytical Hierarchical Process (AHP) for prioritization of measures according to criteria with pairwise comparison (cost, multi-functionality, robustness, duration and complexity of implementation).

For more information on the AHP method refer to the CC-ARP-CE Manual.

This part of the Toolbox is divided into four major topics:

1. Filter by (Figure 12)
2. Choose which parameter weighs more (Figure 12)
3. Selected weights (Figure 13)
4. Suggested measures (Figure 13)

Filter by and *Choose which parameter weighs more* are an input selected by the user. Calculation of *Selected weights* is only for informative purposes, while the main output is *Suggested measures*.

The upper part of the tool window is reserved for the user's input (Nr. 1 and 2), followed by Nr. 3 which is only informative and cannot be directly altered, and Nr. 4 which is the outcome of the tool. The application's main window is shown in the Figure 12 and Figure 13.

If the user does not specify preferences on which parameter weighs more, all measures are listed without weights → this means that the measures are listed by default and there is no influence of specific criteria.

The catalogue of measures is listed at the bottom of the tool (Nr. 4).

After the user alters the mandatory parameters/weights (Nr. 2), measures in the catalogue (Nr. 4) are assigned the calculated scores and listed in descending order based on the score. The topmost measure in the list has the biggest score meaning that it should be the best fit regarding user input.

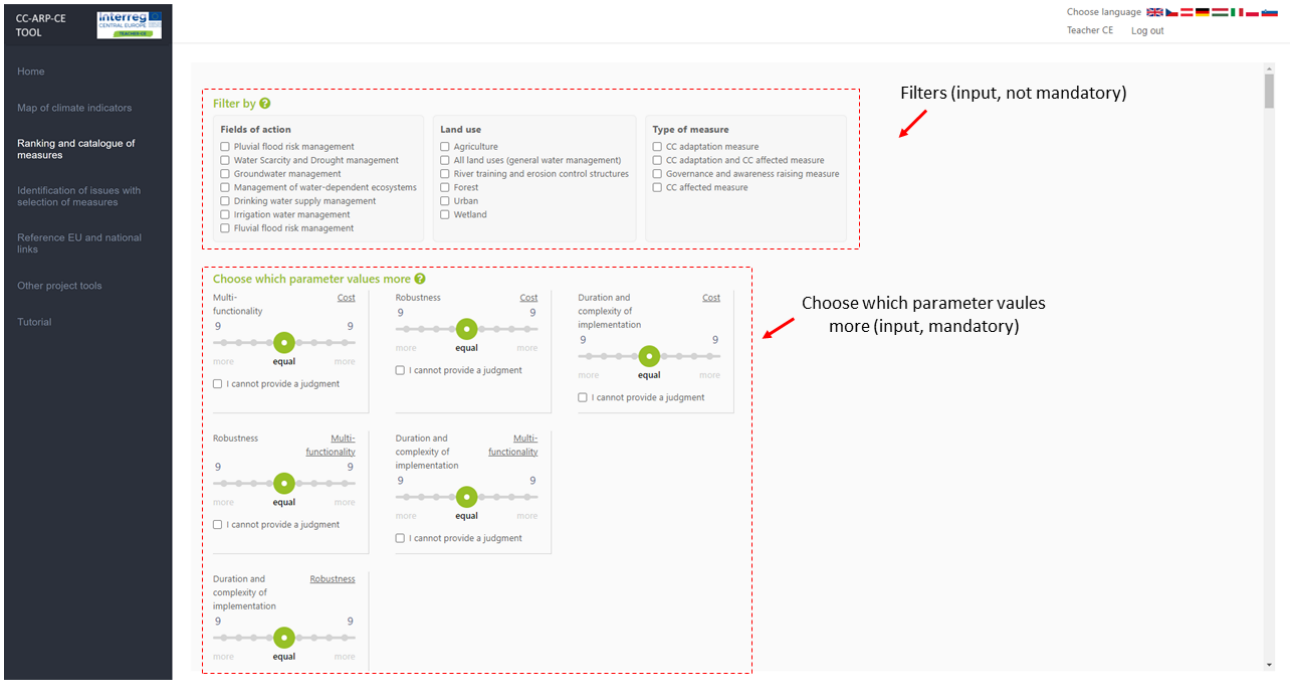


Figure 12: Ranking and catalogue of measures page (part I)

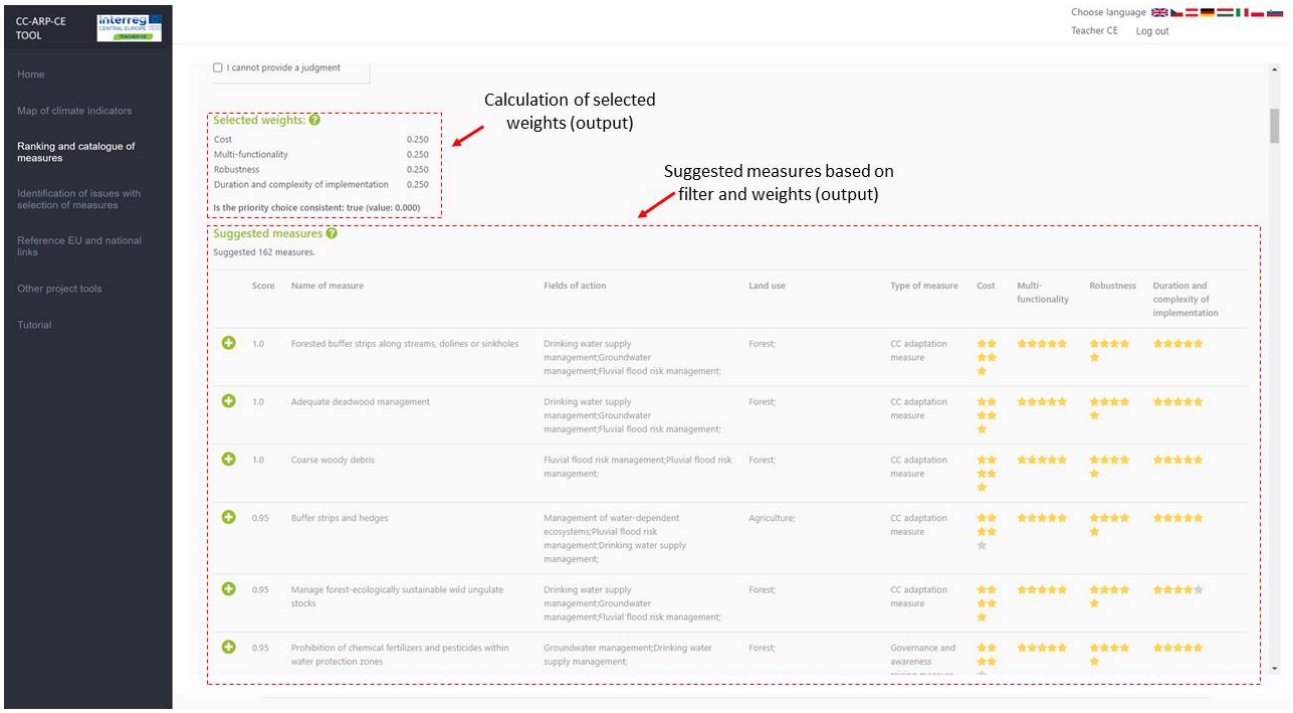


Figure 13: Ranking and catalogue of measures page (part II)

7.1. Filter by

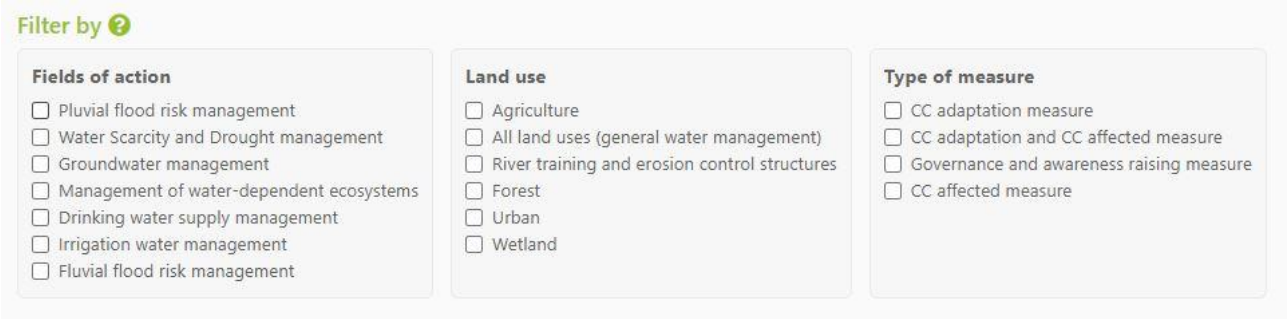


Figure 14: Filter by topic

The user can filter the catalogue of measures by selecting several options. A selection is not mandatory. In case nothing is selected, all measures under Suggested measures (Nr. 4) will be shown in descending order based on a calculated score from weighted parameters (see Chapter 7.2). If some filters are selected, only measures that fit the filter selection will be shown. Actual content may vary, depending on the selected filters.

7.2. Choose which parameter values more

Figure 15: Choose which parameter weighs more topic. Arrows represent the option to slide the green circle left or right, depending on the value of parameters.

This input is mandatory if you want to create user specific prioritized list of measures. Without it the resulting measures will not be based on the weights.

The user can move the slider towards the parameter that the user thinks is more important. This conceptual selection directly influences the calculated weights and the prioritization of measures. The tool also shows information about consistency of the chosen parameters. The choice between parameters is based on the preference of the user (which aspect of a measure is more important to them?).

Listed parameters:

- cost
- multi-functionality
- robustness
- duration and complexity of implementation

Parameters for each measure were theoretically assessed in advance by expert group within project consortium.

7.3. Selected weights

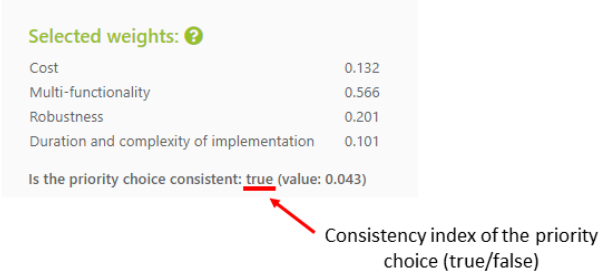
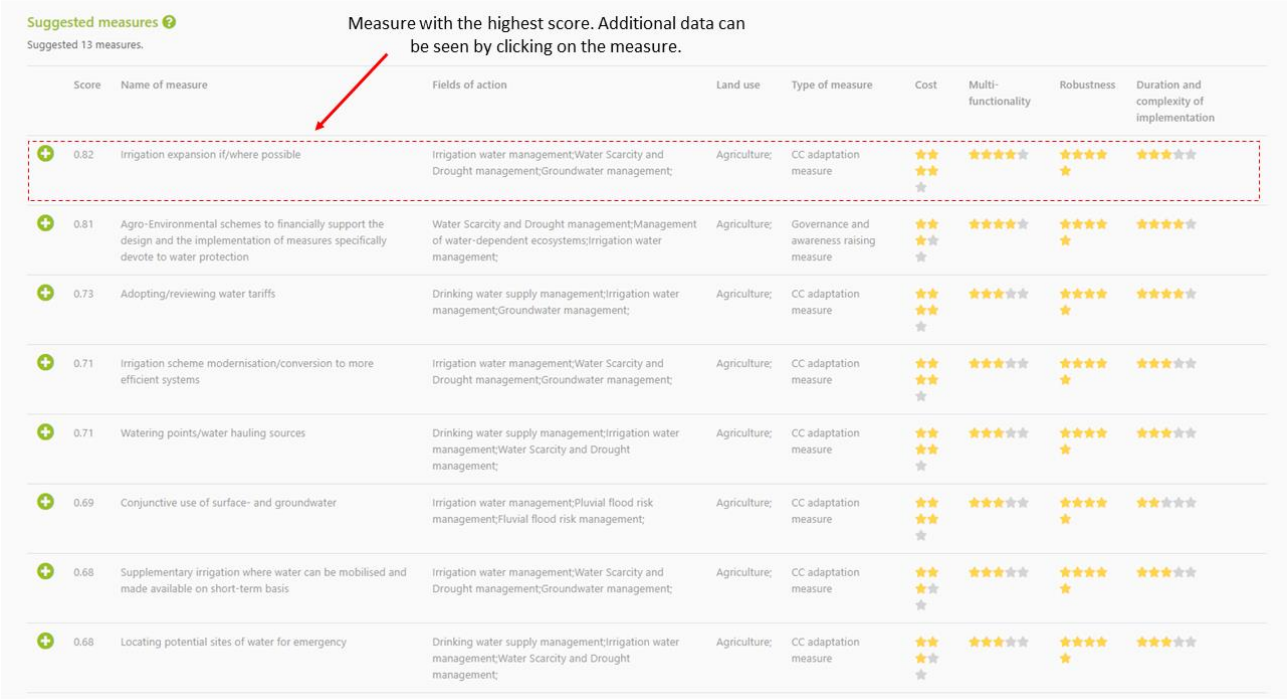


Figure 16: Example of Select weight topic.

Here, the user can not alter anything; it is meant for informative purpose only. The consistency index is calculated in the previous step based on users' input (weights) (Choose which parameter weighs more (Nr. 2)). "True" means that the user's selected weights are consistent in relation to each other and results in the next step are calculated correctly, while "False" means the contrary. In a case of a "False" index, the user should inspect his choice and correct inconsistently selected weights (Under Nr. 2, Choose which parameter values more).

7.4. Suggested measures



Score	Name of measure	Fields of action	Land use	Type of measure	Cost	Multi-functionality	Robustness	Duration and complexity of implementation
0.82	Irrigation expansion if/where possible	Irrigation water management;Water Scarcity and Drought management;Groundwater management;	Agriculture;	CC adaptation measure				
0.81	Agro-Environmental schemes to financially support the design and the implementation of measures specifically devote to water protection	Water Scarcity and Drought management;Management of water-dependent ecosystems;Irrigation water management;	Agriculture;	Governance and awareness raising measure				
0.73	Adopting/reviewing water tariffs	Drinking water supply management;Irrigation water management;Groundwater management;	Agriculture;	CC adaptation measure				
0.71	Irrigation scheme modernisation/conversion to more efficient systems	Irrigation water management;Water Scarcity and Drought management;Groundwater management;	Agriculture;	CC adaptation measure				
0.71	Watering points/water hauling sources	Drinking water supply management;Irrigation water management;Water Scarcity and Drought management;	Agriculture;	CC adaptation measure				
0.69	Conjunctive use of surface- and groundwater	Irrigation water management;Pluvial flood risk management;Fluvial flood risk management;	Agriculture;	CC adaptation measure				
0.68	Supplementary irrigation where water can be mobilised and made available on short-term basis	Irrigation water management;Water Scarcity and Drought management;Groundwater management;	Agriculture;	CC adaptation measure				
0.68	Locating potential sites of water for emergency	Drinking water supply management;Irrigation water management;Water Scarcity and Drought management;	Agriculture;	CC adaptation measure				

Figure 17: Example of Suggested measures based on user input

This section of the webpage lists the measures in descending order based on the calculated score. The topmost measure in the list has the highest score meaning, it is the best fit based on the user's input and is as such suggested by the tool more than measures listed further below. Cost, Multi-functionality, Robustness and Duration and complexity of implementation for each measure ware theoretically assessed in advance by expert group within project consortium.

By clicking on the measure, a new window opens with some additional information to give a user a better understanding of what the measure is about.

Name of measure	Water retention
Description	Measure includes:dry and wet retention reservoires with or without constant flow, small retentions reservoires, polders, Water damming in ditches, wires with constant crest (valleys), Construction of reservoirs on outflows from drainage systems, Construction of small reservoirs on rivers (dammed reservoirs),
Land use	River training and erosion control structures;
Land use sub-category	0

Figure 18: Window with additional information about the measure opens by clicking on the specific measure

8. Identification of issues with selection of measures

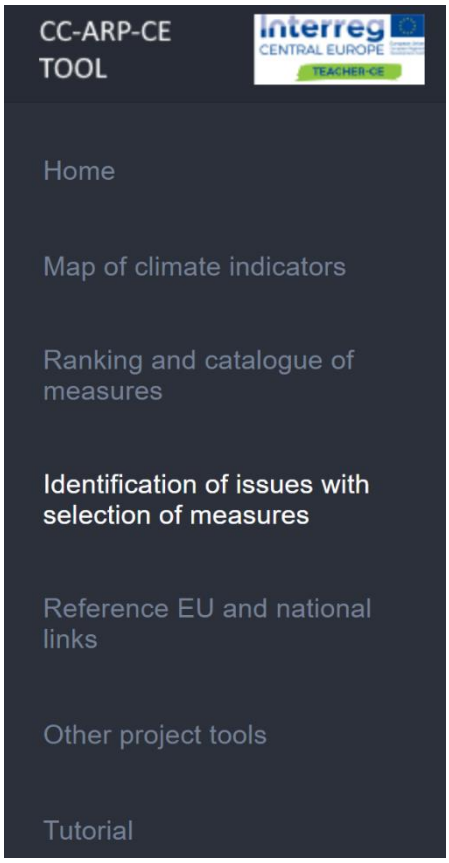


Figure 19: Main navigation panel – Other project tools

This feature of the toolbox is available only to the registered users (see Chapter 11 for more information).

The tool helps the user to define their water related issue and enables the comparison with other similar issues in other countries. For each issue, a report includes proposed measures and expected variations of different climate indicators – proxies for water-related issues - under 2 time horizons and concentration scenarios, which are connected to the selected Field of Action. The proposed measures help to improve the capacities of local and regional stakeholders in the field of water management to climate change.

The issues are shown on the map and are listed in a table below the map (Figure 20). An issue is depicted with an icon relevant to the Field of Action, with the colour of the icon representing the category of land use as shown in Figure 22 (forestry, general water management, and more).

In the report of an issues users also have the possibility to comment on the specific issue (below the issue description). Their comment will be seen in the report of the specific issue.

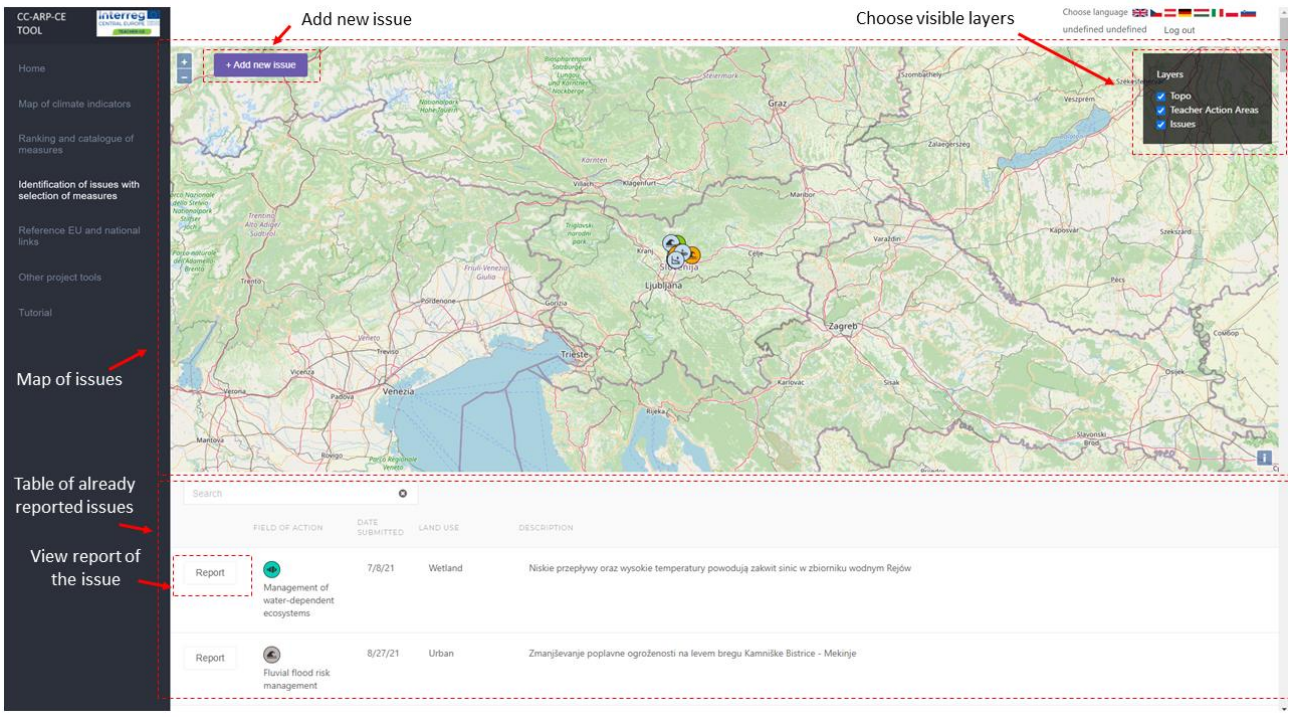


Figure 20: Identification of issues main page

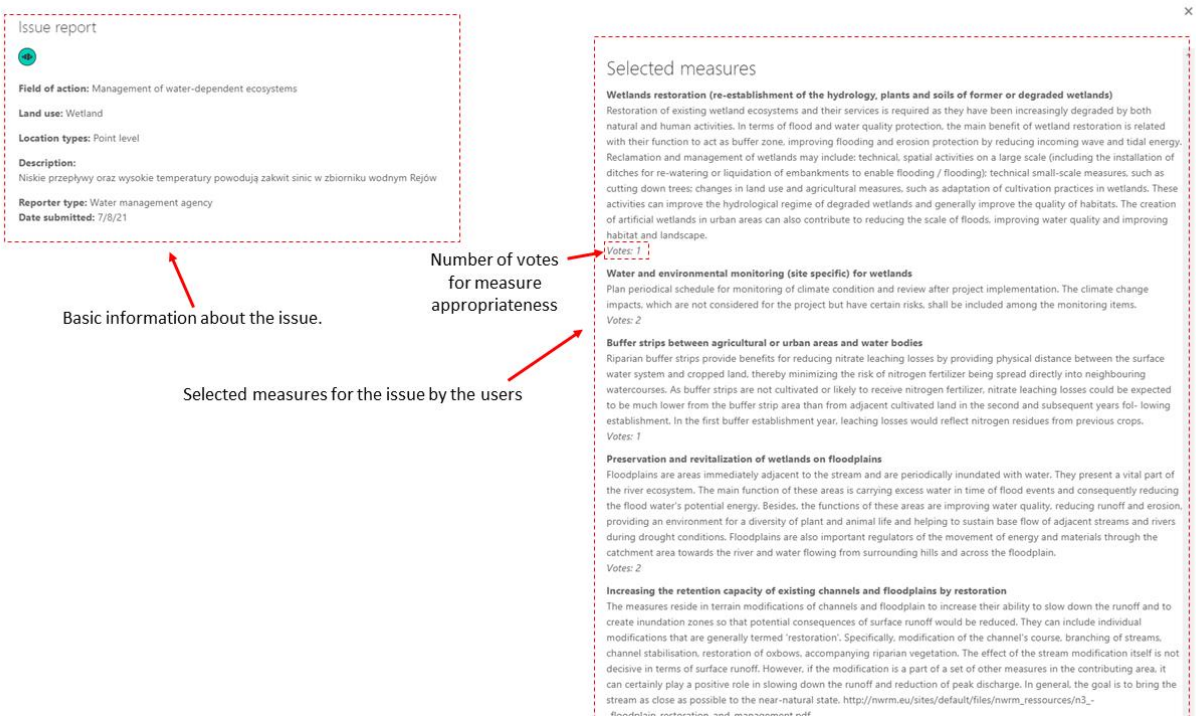


Figure 21: Example of the issue report, which can be opened by clicking on the report button of a specific issue (Figure 20)

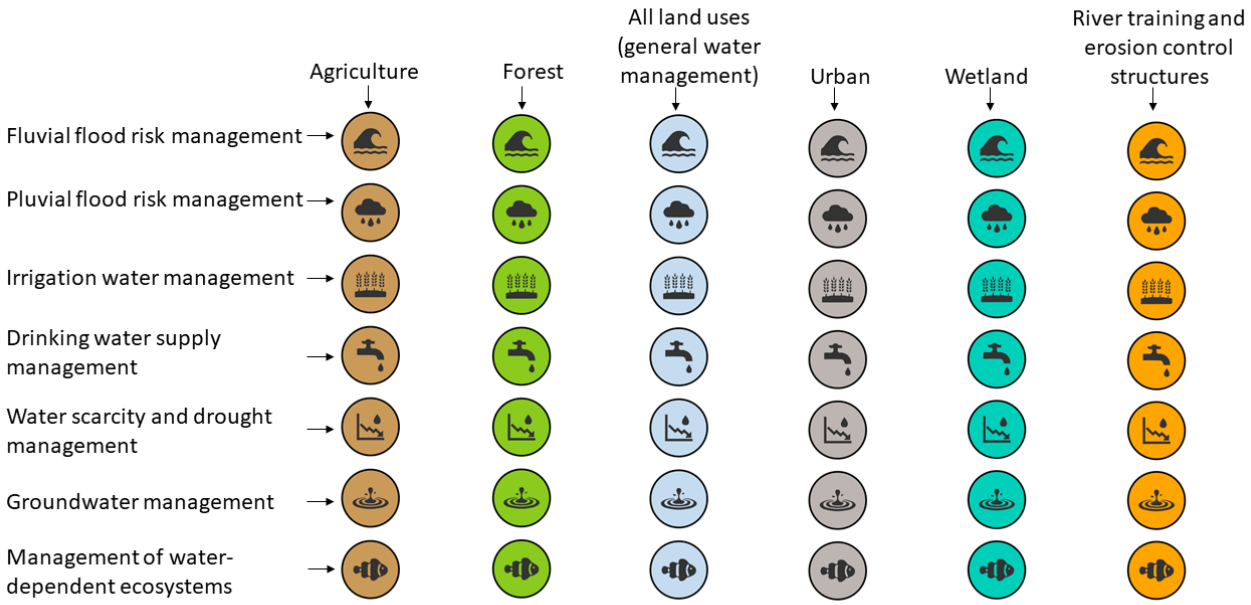


Figure 22: Icons representing different Fields of Action and land use category

The identification of the issue procedure:

1. Click on “Add new issue” (Figure 23), locate the issue on the map (Figure 24)

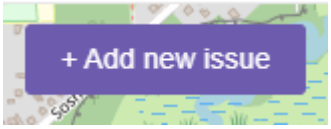


Figure 23: Add new issue button

Figure 24: Locate the issue on the map by clicking on the map.

2. “Add new issue” window will open (Figure 25).
   a. Select the reporter type.
   b. Select field of action.
   c. Select location type.
   d. Select land use.
   e. Describe the issue.
   f. The user can also evaluate the measures and select the most relevant ones. If the user is not sure about the selection, they can first use the feature Catalogue of measures - ranking of measures, where with the help of the Analytic Hierarchy Process (AHP) method they can browse the measures which will be prioritized according to their choice.
   g. The user can also view the climate indicators related to the selected location of the measures (see also Chapter 6). They are sorted by importance for the selected Field of Action.

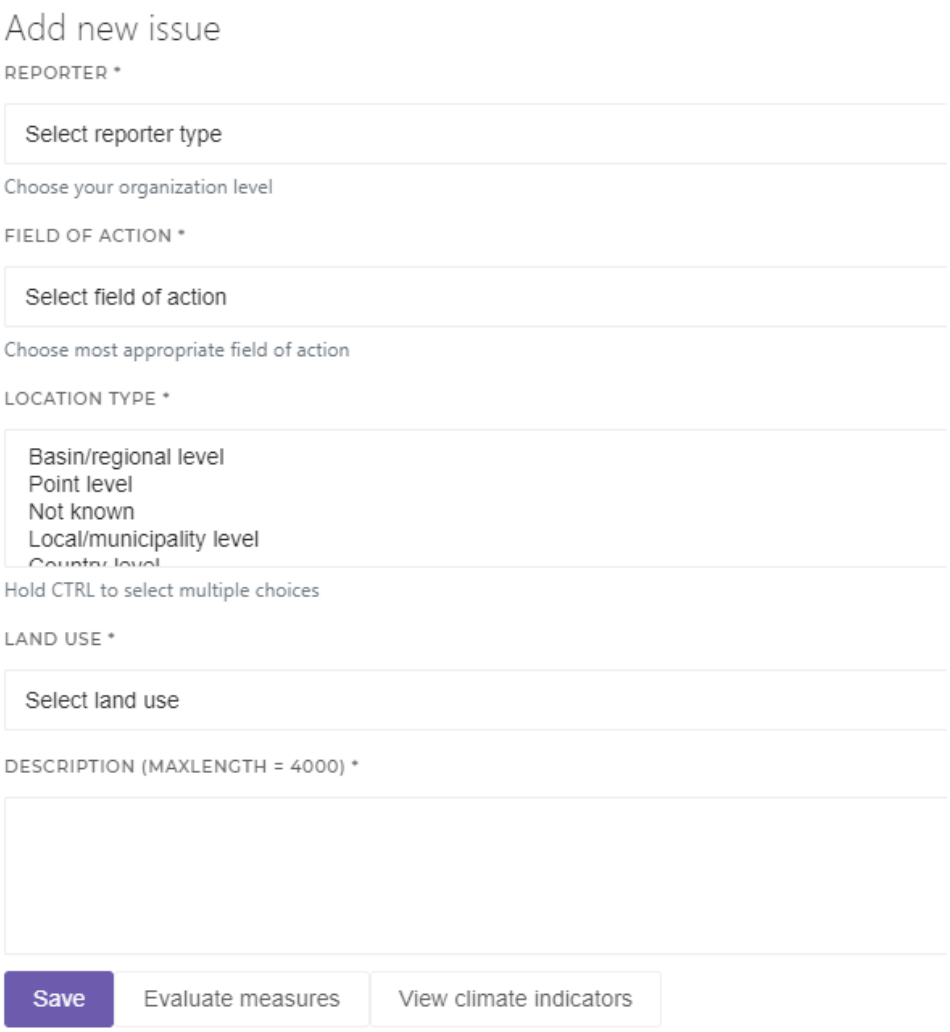


Figure 25: Add new issue window.

9. Reference EU and national links

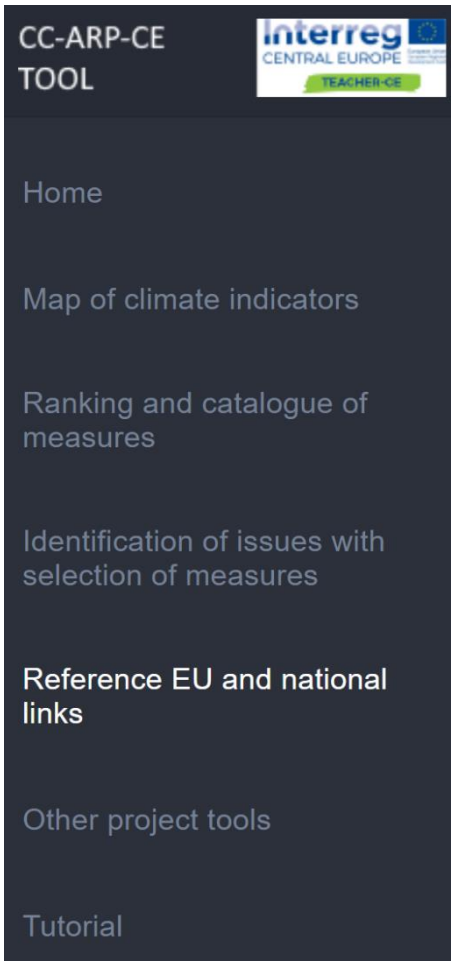


Figure 26: Main navigation panel - Reference EU and national links

Navigating the universe of pre-existing tools in the field of water management is challenging. Therefore, a collection of existing national links to different tools (data portals, reports, legislation, etc.) that are closely related to the implementation of EU legislation was gathered:

- Water Framework Directive (WFD),
- Floods Directive (FD),
- Urban Waste-Water Treatment Directive (UWWTD),
- Nitrate Directive (ND),
- Drinking Water Directive (DWD),
- Bathing Water Directive (BWT),
- Industrial Emissions Directive (IED, ex. IPPC),
- Priority Substances Directive (PSD)

The tool provides a transparent overview of the existing national and EU tools and provides direct links. The links are categorized by its content and structured into Fields of Actions.

To browse through the collected links related to Water Management (Figure 27):

1. Choose a country (European Union, Austria, Czechia, Germany, Hungary, Italy, Poland, Slovakia, Slovenia).
2. Decide on the Field of Action.
3. Click on the provided link for the GIS Tools or Data Portals. Selected link will open in the new tab in your browser.

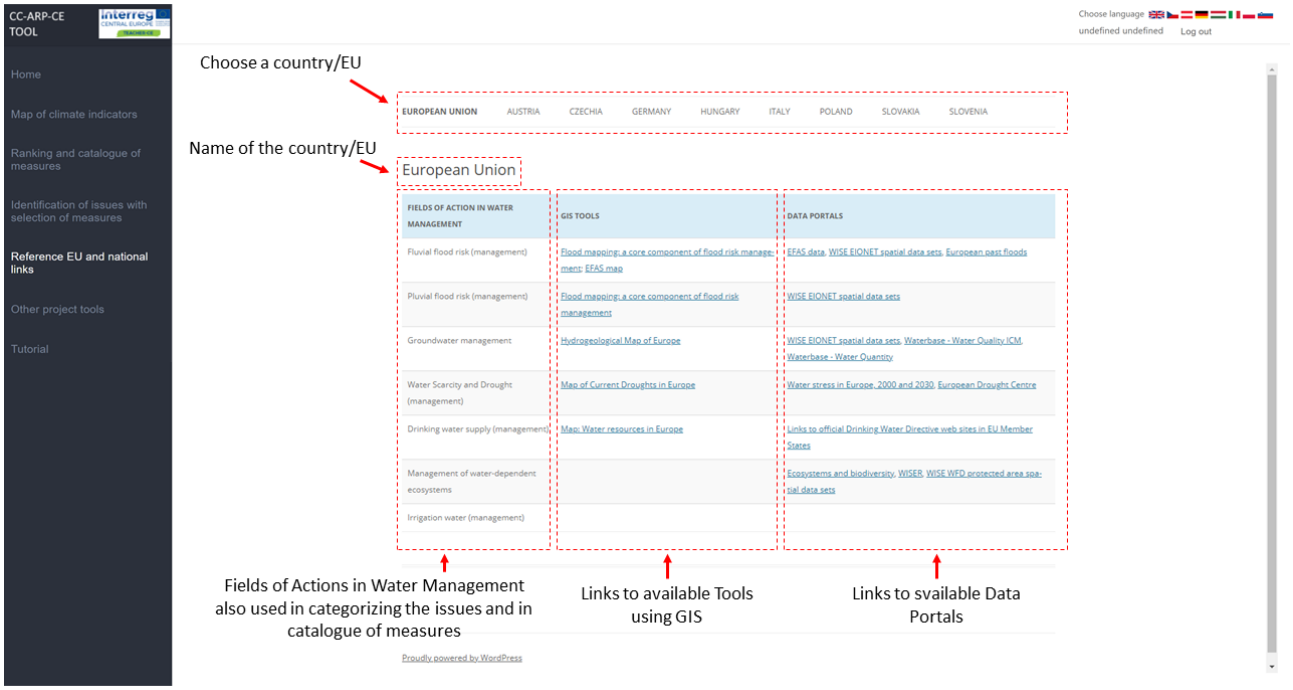


Figure 27: Reference EU and national links page

10. Other project tools

Figure 28: Main navigation panel - Other project tools

The Toolbox focuses on the integration of the results and tools developed in selected Interreg Central Europe (CE) projects. The projects integrated into the TEACHER-CE toolbox are shortly presented on the *Other project tools* page.

The presentation of the four main projects (FRAMWAT, PROLINE-CE, RAINMAN and SUSTREE) includes a link to the developed tool, a link to the main project websites and a short description of their tool (Figure 29).

In addition, also the tools from other connected EU projects, together with the short description, are listed.

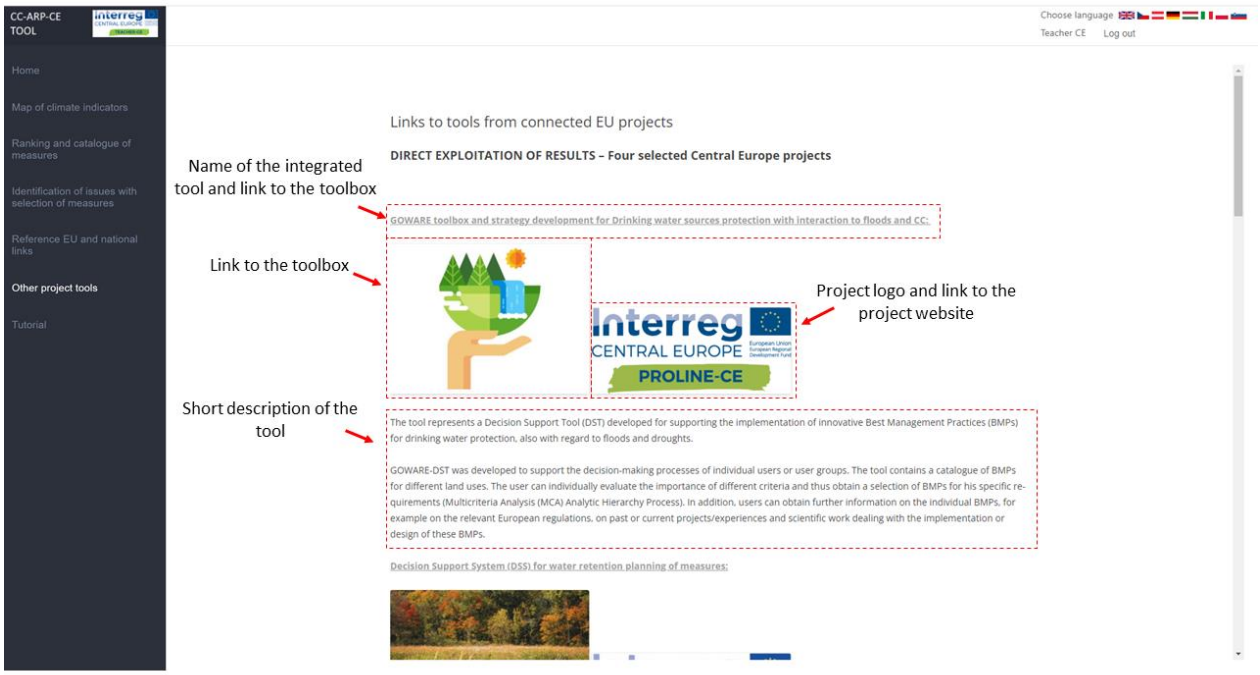


Figure 29: Other project tools page

APPENDIX 2

CC-ARP-CE TOOLBOX MANUAL

CC-ARP-CE TOOLBOX MANUAL – BETA VERSION FOR TESTING BY PPs

WORK PACKAGE T2 - INTEGRATION: CC-ARP-CE TOOLBOX FOR CLIMATE CHANGE ADAPTATION AND RISK PREVENTION IN CE

ACTIVITY A.T2.1 INTEGRATED TOOLBOX FOR CLIMATE CHANGE ADAPTATION AND RISK PREVENTION - VERSIONS FOR TESTING

DELIVERABLE D.T2.1.2 TOOLBOX OF INTEGRATED TOOLS (CC-ARP-CE) – BETA VERSION FOR TESTING BY PPS WITH INSTRUCTIONS

- Infrastruktur & Umwelt – Professor Böhm & Partner (PP3):
  Anna Goris, Stefanie Weiner, Anne Lehmann, Birgit Haupter
- Warsaw University of Life Sciences (PP4):
  Ignacy Kardel, Tomasz Stańczyk, Paweł Trandziuk
- Euro-Mediterranean Center on Climate Change Foundation - CMCC (PP5):
  Guido Rianna
- Federal Research and Training Centre for Forests, Natural Hazards and Landscape (PP7):
  Viktoria Valenta
- Middle Tisza District Water Directorate (PP9):
  Judit Palatinus, Gabor Harsanyi

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List of abbreviations

AHP	Analytic hierarchy process
BMP	Best Management Practices
BWT	Bathing Water Directive
CC-ARP-CE	Integrated toolbox for Climate Change Adaptation and Risk Prevention in Central Europe
CC	Climate change
CE	Central Europe
C3S	Copernicus Climate Change Service
DSS	Decision Support System
DST	Decision Support Tool
DTP	Danube Transnational Programme
DWD	Drink Water Directive
FD	Floods Directive
GIS	Geographic Information System
GWD	Groundwater Directive
GDE	Groundwater Dependent Ecosystems
IED	Industrial Emissions Directive
IPPC	Integrated Pollution Prevention and Control Directive
MCDA	Multi-Criteria Decision Analysis
NSWRM	Natural Small Water Retention Measures
ND	Nitrate Directive
PSD	Priority Substances Directive
SDG	Sustainable Development Goals
RCM	Regional Climate Models
RCP	Representative Concentration Pathway
UWWTD	Urban Waste-water Treatment Directive
WDE	Water Dependent Ecosystems
WFD	Water Framework Directive
WISE	Water information system for Europe

12. Introduction

The main objective of the TEACHER-CE project is to develop an Integrated toolbox for Climate Change Adaptation and Risk Prevention in Central Europe – CC-ARP-CE – which focuses on the adaptation of the water management sector to Climate change (CC) to mitigate the risk of floods/heavy rain/drought as far as possible, e.g. by small water retention measures or protection of drinking water resources through sustainable land-use management.

The TEACHER-CE toolbox is the main component of the project having a specific role as a central online platform to support stakeholders for the integrated consideration of different fields of action of the water management sector that are affected by climate change. The project is integrating and harmonizing results of previously funded projects dealing with CC adaptation and risk prevention, focusing on:

- Management of the effects of heavy rainfall and floods (CE project RAINMAN);
- Exploitation of small water retention measures (CE project FRAMWAT);
- Protection of drinking water through sustainable land use (CE project PROLINE-CE);
- and proper management of forests under CC (CE project SUSTREE).

And on integration of other projects (CE: LUMAT; H2020: FAIRWAY, LifeLocalAdapt; DTP: DRIDANUBE and DAREFFORT, Copernicus Climate Change Service (C3S): Sectoral Information System Disaster Risk Reduction and Demo Case “Soil Erosion”). Moreover, synergies with additional selected projects were built. The conceptualization of the toolbox was performed in a way that it meets the defined aim, but at the same time it is user-friendly and operational.

Building on the tools from the existing projects, TEACHER-CE developed a decision support tool to support **C**limate **C**hange **A**daptation and **R**isk **P**revention in **C**entral **E**urope (CC-ARP-CE) in the water management sector. All these aspects are included into the CC-ARP-CE toolbox logo (Figure 1): vertical blue lines are presenting rainfall (heavy rain), inclined yellow lines are presenting sun (rising temperature), blue curls are presenting water (runoff and floods) and brown horizontal lines soil (drought) and all these elements are affected by climate change.

Figure 30: Logo of the CC-ARP-CE (TEACHER-CE) Toolbox: Integrated toolbox for Climate Change Adaptation and Risk Prevention in Central Europe

The User Experience Design is especially important. In addition to the selected projects named above, the project partners have identified that a plethora of tools supporting water management on national level as well as EU level already exists. These tools have been put into perspective as the potential users of the toolbox should not be confused with one more tool having similar features as comparable, already existing tools. Some of the tools which exist on the national level are official tools providing information on water bodies and especially their status (according to EU WFD), information on flood hazards and program for the implementation of flood risk reduction measures (EU Floods Directive). A collection of maps for the Water Information System for Europe (WISE) can be found in the Floods Directive section (Floods Directive 2007/60/EC).

The toolbox is defined as the main objective of the project in the TEACHER-CE application form. Tools will be developed, prepared/programmed for an online platform and validated in pilot activities with the aim to support stakeholders of water management in integrated strategies and actions for climate change adaptation and prevention/reduction of associated risks. We have recognized the need for and positioning of the toolbox in the area where it can help integrate cross-use strategies for specific catchment (i.e. size of the TEACHER-CE pilot actions) where interests of different user groups meet and confront the challenges related to the climate change adaptation process in the water management sector.

To link multiple sectors involved in the decision-making process on the level of sub-basins and catchments which are close to the municipalities in longer-term strategic vision (e.g.: potential drinking water source), the idea of the capitalization of the aforementioned tools is to:

(a) make the tools "climate proof" and applicable in a climate change perspective and

(b) Integrate the tools in a comprehensive Toolbox to tackle interacting water-related issues affecting CE.

The aim of the TEACHER-CE Toolbox is also that of stimulating the exchange of different views and visions on the development of water in specific catchments with different stakeholders. Therefore, it is supporting the learning process along with the participatory process which is already envisaged by the WFD CIS Guidance Document No 8 - Public Participation in Relation to the Water Framework Directive (European Communities, 2003).

TEACHER-CE is therefore having a holistic approach focusing on water issues. It contributes to the improvement and implementation of the EU WFD, FD, GWD, DWD and SDG6 by:

(i) developing the TEACHER-CE Toolbox and recommendations considering climate change (CC);

(ii) promotion of policy recommendations to stakeholders that have not been approached before;

(iii) linking the Toolbox for CC adaptation and risk prevention with other tools from the broad field of action in integrative and participatory water and land use management.

It is therefore well embedded in the context of existing WFD and FD processes, but at the same time attempting to avoid the multiplication of the existing tools.

In order to support the use of the toolbox CC-ARP-CE this manual was created to present the theoretical basis of the toolbox of integrated tools - beta version. After the toolbox has been revised and reviewed by the Project Partners and other experts, the toolbox will be further updated into version 1.0 (Figure 2). The Toolbox version 1.0 manual (D.T2.1.3) will provide tutorials (step-by-step instructions) to assist stakeholders and other users in the water management sector.

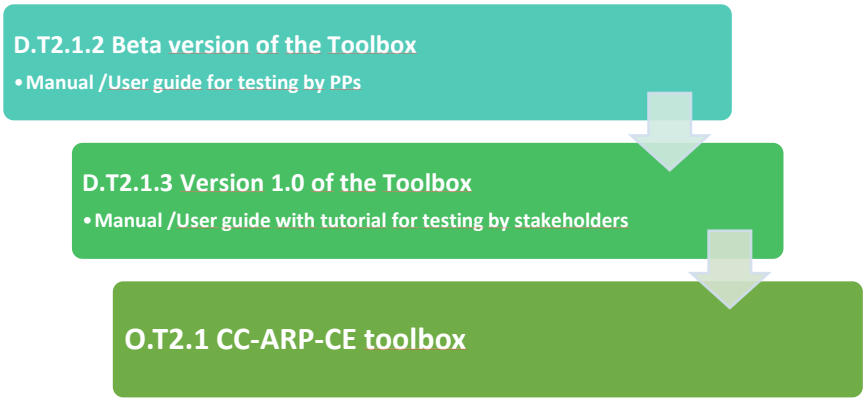

Figure 31: CC-ARP-CE toolbox development

13. CC-ARP-CE

The CC-ARP-CE aims at the integration of different views. The users provide their ideas/issues/problems within a specific sub-river basin (Figure 3) and overview about the national tools is available. The toolbox includes a web map service which provides spatial orientation and provides information about expected variations induced by climate change in weather forcing impacting water related issues by means of widely consolidated climate indicators.

Each specific user can identify and enter his/her issue (Figure 4) in the toolbox, gets an overview about the evaluation tools developed in other projects. The user can understand the issues and the proposed measure from the other users, sees these issues on the map, gets an overview about CC impacts on a NUTS level and gets information related to the national tools for water management (WFD & FD).

The result of using this tool would be the issues of all stakeholders identified on a platform with a ranking of the measures from the catalogue (described in Chapter 2.5), including the assessment of the impact of CC and the reference to the national water management tools. This will support the development of river management plans and the integration of Green Infrastructure and Nature Based Solutions in specific river basins.

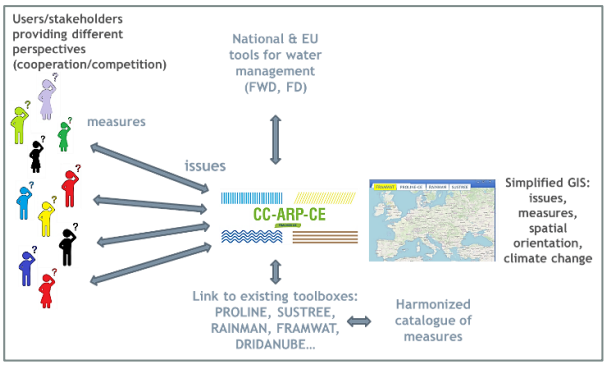

Figure 32: Conceptual scheme of the Toolbox

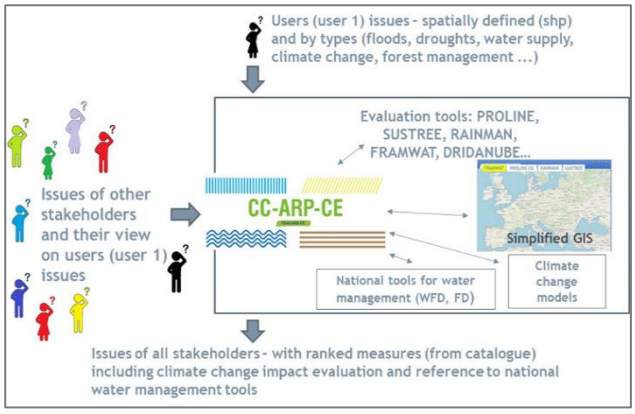

Figure 33: Toolbox workflow

13.1. The Toolbox Structure

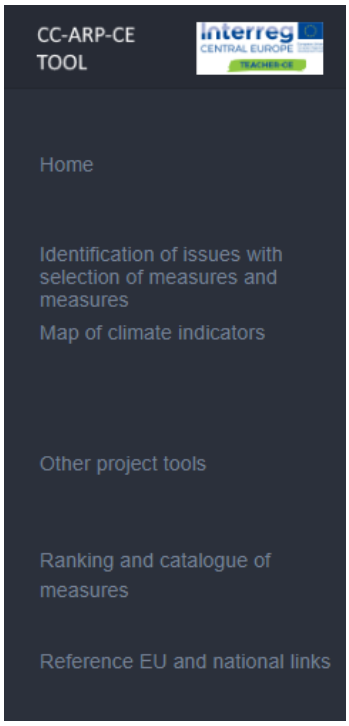

Figure 34: CC-ARP-CE toolbox functions.

I. Identification of Issues with selection of measures
II. Map of Climate indicators
III. Other Project Tools
IV. Catalogue of measures
V. Reference of EU and National links

The Toolbox can be found at: http://teacher.apps.vokas.si/

The user name and the password are assigned when contacting the administrator (ajda.cilensek@fgg.uni-lj.si). Each user should be registered for better identification of users, as the information inserted in the toolbox is sensitive in nature and can be easily manipulated, so we need to have a control over (reliable) users.

13.2. Identification of Issues

The CC-ARP-CE tool focuses on the identification of potential water related issues such as floods, heavy rains and droughts and connecting them with measures for flood and drought risk prevention, for adaptation to climate change and for protection of water resources through sustainable land-use management. It aims to identify potential climate impacts on water availability and water quality which could affect surface and groundwater. Users can insert recognised issues related to impacts of climate change on the water management sector in the CC-ARP-CE toolbox. Issues are documented in the toolbox by using a GIS feature and locating the issues at a specific point on the map. For each issue it is also possible to connect them to the relevant field of action (described in chapter 2.2.1), land use and administrative level. Based on this information, a set of measures applicable for this specific issue is proposed by the toolbox – the user has the possibility to make an individual selection out of this set of measures.

The tool helps the user with defining the issue, enables the comparison with other similar issues in other countries, checks the proposed measures, and provides the expected variations in different climate indicators, proxies for water-related issues, under two time horizons and concentration scenarios for a selected area. The proposed measures help improve the capacities of local and regional stakeholders to adapt to different impacts with the focus on climate-proof water management.

The issues are shown on the map and are listed in a table below the map. The issue is presented with the icon relevant to the Field of action and the colour represents the category as shown in the legend (forestry, general water management, and more).

The identification of the issues procedure:

3. click new issues, locate the issue on the map

4. describe the issue
5. choose the relevant field of action
6. the location level (as attribute) should be added: e.g. point, municipality, region
7. evaluation of the proposed measures - select the most relevant ones. If the user is not sure about the selection, he/she can first use the feature “Catalogue of measures - ranking of measures”, where with the help of AHP method he/she can browse the measures which will be prioritized according to his/her choice.
8. the climate indicators computed at NUTS level are shown sorted by importance - which are relevant for the selected Field of action.
9. The report of the specific issue includes all the selected measures (by type of evaluator).

The user can comment an issue proposed by other users, when choosing an issue and clicking: comment an issue (button below the issue description). This comment will be seen in the report of the specific issue.

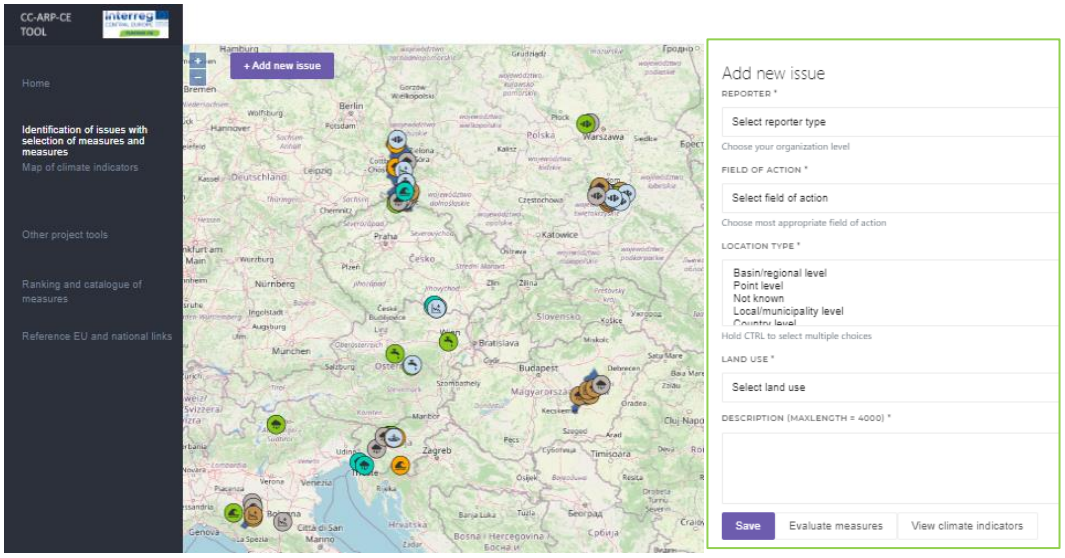

Figure 35: Add new issue option (Screenshot from CC-ARP-CE)

13.2.1. Fields of Action in Water Management

The potential water related issues are categorized according to the relevant field of action. This is due to the broad scope of the term “water management”, which comprises many different fields of action on all administrative levels, regarding water quantity as well as water quality and concerning a wide variety of management tasks of freshwater and other waters (e.g. waste water) in different geographic circumstances (e.g. rivers, lakes, marine). In this compilation, this scope has been narrowed to the main aims of the TEACHER-CE Tool within the D.T1.1.3 deliverable (TEACHER,2020) to achieve a targeted input. In this way several fields of action of the water management sector were identified that are affected by climate change.

The terminology used in D.T1.1.3 was updated with expressions used in EU legislation and strategies and from other strategies (WMO, GWP, WHO, etc.). Seven fields of action of the water management sector were identified that are relevant for TEACHER-CE:

- Fluvial flood risk management
- Pluvial flood risk management
- Groundwater management

- Drinking water supply management
- Irrigation water management
- Water scarcity and drought management
- Management of water-dependent ecosystems

The identified issue is shown on the map with the icon of the relevant Field of action and coloured according to the relevant category (forestry, general water management, agriculture, wetland, grassland, river training and erosion control structures and urban) as shown in **Napaka! Vira sklicevanja ni bilo mogoče najti..**

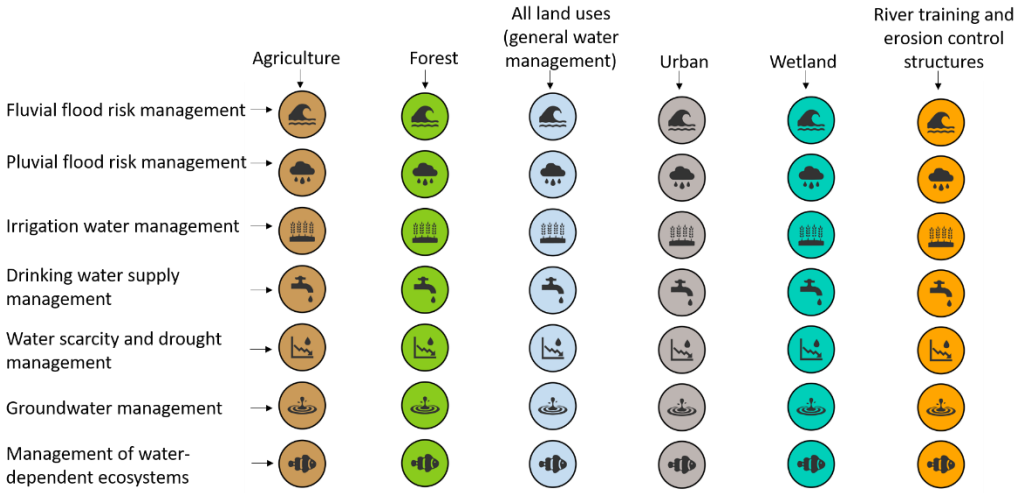

Figure 36: Icons representing identified issues according to the relevant Field of Action and Category

1. **Fluvial flood risk management**

Fluvial (river) floods occur when a natural or artificial drainage system, such as a river, stream or drainage channel, exceeds its capacity (European Court of Auditors: Special Report Floods Directive, no 25/2018). Management of flood risks (prevention, protection, preparedness) is aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods (EU Flood Directive (2007/60/EC)).

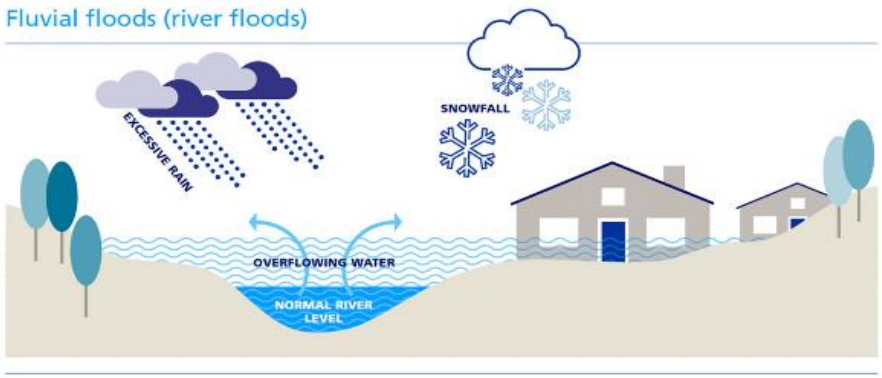

Figure 37: Fluvial floods (source: www.zurich.com)

2. **Pluvial flood risk management**

Pluvial flooding is “direct runoff over land causing local flooding in areas not previously associated with natural or manmade water courses”. Two key aspects of the definition are “the lack of proper drainage network in the area impacted by the flood” (Monacelli and Bussettini, 2011) and a lack of retention of surface water before it enters (urban) areas (RAINMAN Policy Brief, June 2020).

Flash flood is a flood that rises and falls quite rapidly with little or no advance warning, usually as the result of intense rainfall over a relatively small area (Glossary of the American Meteorological Society, 2000). Key aspect of the definition is the time scale: sudden hydrological response to the causative event. Flash floods occur when heavy rainfall (and/or rapid snowmelt) exceeds the ability of the ground to absorb water and/or the ability to drain the water and the water level rises and falls quite rapidly. Flash Floods can occur also due to Dam or Levee Breaks, and they can be associated to hyper-concentrated flows (Monacelli and Bussettini, 2011).

Sustainable Drainage Systems (SuDS) measures are part of pluvial flood risk management because they are important in urban areas, i.e. the ability to infiltrate water into the ground. (Donatello, 2021).

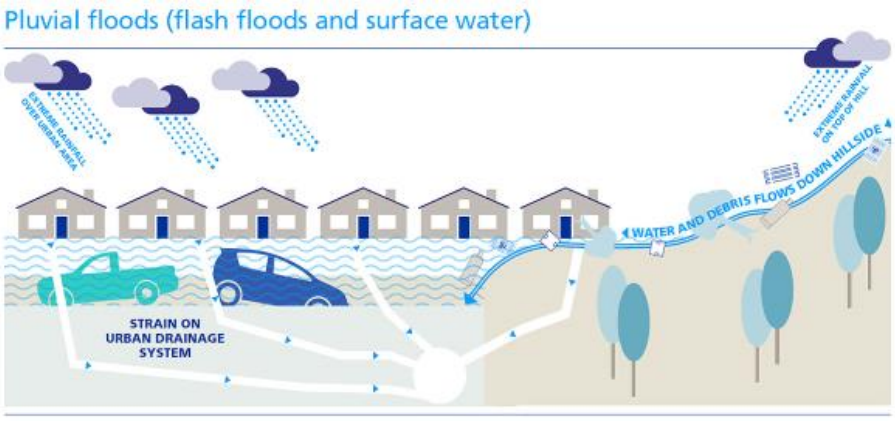

Figure 38: Pluvial floods (source: www.zurich.com)

3. Water Scarcity and Drought management

Water scarcity represents a condition of long-term water shortage preventing to satisfy long-term average requirements; it refers to long-term water imbalances, combining low water availability with a level of water demand exceeding the supply capacity of the natural system (Water Exploitation Index) (EU Action on Water Scarcity and Drought - Policy Review 2012).

Drought (meteorological, hydrological, agricultural) is a temporary decrease of the average water availability due to e.g. rainfall deficiency or significant evaporative demand; imbalances between water demands and the supply capacity of the natural system. Recent documents added the expression socio-economic drought, which is associated with an imbalance between water demand and water supply and having an impact on society and the economy (GWP CEE 2015).

4. Groundwater management

Groundwater management refers to the groundwater quality management (pollution prevention & groundwater protection) and the groundwater quantity management (recharge and water use/demand); also risk and uncertainty.

Measures for the achievement of good quantitative and chemical status of groundwater are presented in EU WFD (Directive 2000/60/EC). Specific measures to prevent and control groundwater pollution are described in the EU Groundwater Directive (Directive 2006/118/EC).

5. Drinking water supply management

Drinking water sources protection demands establishing water protection zones for bodies of water used for the abstraction of water intended for human consumption - EU WFD (Directive 2000/60/EC).

Quality of and access to water intended for human consumption are specified in the EU Drinking Water Directive (98/83/EC).

REMARK: in TEACHER-CE we are addressing only protection and management of drinking water sources (recharge area) and we are not addressing the entire chain of drinking water supply elements (raw water treatment and drinking water distribution system).

6. **Management of water-dependent ecosystems**

The chemical composition of the groundwater body is such that the concentrations of pollutants would not result in any significant damage to terrestrial ecosystems which depend directly on the groundwater body (GDE - groundwater-dependent-ecosystems) (EU WFD (Directive 2000/60/EC)).

Groundwater should be protected from deterioration and chemical pollution, which is particularly important for groundwater-dependent ecosystems (EU DWD (98/83/EC)).

Water dependent ecosystems (WDE) are parts of the environment in which the composition of species and natural ecological processes are determined by the permanent or temporary presence of flowing or standing surface water or groundwater. The in-stream areas of rivers, riparian vegetation, springs, wetlands, floodplains, estuaries, karst systems and groundwater-dependent terrestrial vegetation are all WDEs (Gov. Western Australia, Guidance note 7: Managing the hydrology and hydrogeology of water dependent ecosystems).

7. **Irrigation (water) management**

Irrigation is water management primarily for agriculture: irrigation is the provision of water to support the growth of crops when rainfall is insufficient. There are also irrigated parks, sports fields, golf courses, and other green spaces.

13.3. Map of Climate Indicators

The Toolbox CC-ARP-CE provides information about expected variations in climate indicators potentially due to climate change. Climate indicators are used as proxies for impacts which could affect water management in Central Europe. Fifty-three indicators have been selected accounting for Project Partners and stakeholders' requirements collected by using a web-survey or during the stakeholder workshops held in Autumn 2020.

The indicators are computed exploiting 19 climate simulation chains included in EURO-CORDEX multi-model ensemble where dynamical downscaling by using Regional Climate Models (RCM) is carried out at a horizontal resolution of about 12 km (0.11°). The list of considered modelling chains is reported in deliverable D.T2.1.1, which is attached to this document as an Appendix 1.

For each climate indicator, two Representative Concentration Pathway RCPs (the midway RCP4.5 and the more extreme RCP8.5; more details in Appendix 1)) and time horizon (2021-2050 vs 1971-2000 or 2071-2100 vs 1971-2000) are provided. The values can be visualized in terms of median value of the anomalies aggregated at NUTS level (level 3 for all the countries except Germany for which level 2 is used). For more expert users, beyond median values, data corresponding to the first and third quartiles are also provided at NUTS level and grid point level (exploiting the grid points as provided by EURO-CORDEX simulations).

Currently, the use of absolute values is hindered by biases affecting climate modeling due to the achievable spatial and temporal resolutions or to the adoption of physically parametrizations for subgrid processes. In recent years, statistically approaches usually known as bias correction approaches have been developed for

such purposes but they are time and resource consuming over large areas, they entail further assumptions (e.g. on the basis of selected statistical methods for adjustment) and require the choice of adequate datasets for the correction. Then, under the strong assumption that the model is affected by similar biases for current and future time spans, the use of anomalies is expected to minimize the relevance of biases. At the same time, providing information for the current period over the entire CE domain is not a trivial task. Local observations are the most important source of information but they are not homogeneous in spatial and temporal terms while pros and cons associated to the transnational gridded datasets have to be clearly reported to the stakeholders used to think in terms of point scale observations.

The List of the selected Climate Indicators:

SU	Number of summer days: Annual count of days when TX (daily maximum temperature) > 25°C
FD	Number of frost days: Annual count of days when TN (daily minimum temperature) < 0°C
PRCPTOT	Annual total precipitation in wet days
R20mm	Annual count of days when PRCP≥ 20mm
R95pTOT	Annual total PRCP when RR > 95p
Rx5day	Monthly maximum consecutive 5-day precipitation
SPI3	Standardized Precipitation Index (3 months)
CDD	Maximum length of dry spell: maximum number of consecutive days with RR < 1mm
CWD	Maximum length of wet spell: maximum number of consecutive days with RR ≥ 1mm
GSL	Growing season length: Annual count between first span of at least 6 days with daily mean temperature T>5°C and first span with T<5°C
HCB	Hydro-Climatic Budget
PR95prctile	95th percentile of daily precipitation
PrRP	Variations in expected precipitation for fixed return period (5,10,25,50,100)
TR	Number of tropical nights: Annual count of days when TN (daily minimum temperature) > 20°C
HD	Number of hot days: Annual count of days when TX (daily maximum temperature) > 30°C
R30mm	Annual count of days when PRCP≥ 30mm
CFD	Consecutive Frost Days - maximum number of consecutive days with Tmin < 0°C
CHD	Heat spell - annual number of days with at least 3 consecutive days when TX> 30°C
DHD	Degree of heating days per year
Bio1	Annual mean temperature
Bio2	Annual mean diurnal range
Bio3	Isothermality
Bio4	Temperature Seasonality
Bio5	Max Temperature of Warmest Month
Bio6	Min Temperature of Coldest Month
Bio7	Annual Temperature Range
Bio8	Mean Temperature of Wettest Quarter

Bio9	Mean Temperature of Driest Quarter
Bio10	Mean Temperature of Warmest Quarter
Bio11	Mean Temperature of Coldest Quarter
Bio12	Annual Precipitation
Bio13	Precipitation of Wettest Month
Bio14	Precipitation of Driest Month
Bio15	Precipitation Seasonality
Bio16	Precipitation of Wettest Quarter
Bio17	Precipitation of Driest Quarter
Bio18	Precipitation of Warmest Quarter
Bio19	Precipitation of Coldest Quarter
SSA	Mean of daily surface snow amount (mm)
EWS	98th percentile of daily maximum wind speed (m/s)
SCD=SSA 30	Snow Cover Duration (number of days with surface snow amount >= 30 mm)

To display the desired values of indicators for a specific area use the navigation window in the upper right corner:

4. Select the climate indicator (Figure 39)
5. Select the period (Figure 39)
6. Select the RCP scenario (Figure 39)
7. Click on the area (NUTS) of interest

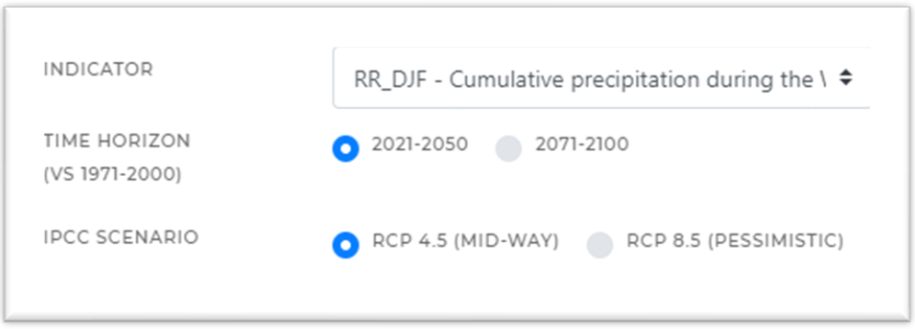

Figure 39: Climate indicator selection panel

Climate indicators relate to measures through Fields of actions.

The map shows the climate indicators at NUTS level, but for the advanced users the download of the EUROCORDEX grid point level of the indicators will be optional upon request to the administrator.

13.4. Other Project Tools

The Toolbox focuses on the integration of the results and tools developed in the selected Interreg Central Europe (CE) projects and other EU projects, reviewed in D.T1.1.1, in D.T1.1.5 and D.T2.1.5.

The selected results of each project integrated into the TEACHER-CE toolbox are shortly presented below.

The core of the catalogue of measures is formed by the specific outcomes of four projects (FRAMWAT, PROLINE-CE, RAINMAN and SUSTREE) which results are directly exploited.

The focus of the TEACHER-CE Toolbox is set on the climate-proof management of water related issues, recognizing common achievements of the four transnational cooperation projects in the programme area of Central Europe. They are sharing several focus points:

- floods/heavy rain/drought risk prevention (FRAMWAT, PROLINE-CE, RAINMAN),
- small water retention measures (FRAMWAT, PROLINE-CE, RAINMAN),
- protection of (drinking) water sources through sustainable land-use management (PROLINE-CE),
- forest adaptation process (SUSTREE).

In addition to the four selected main projects, the toolbox CC -ARP- CE and its catalogue of measures integrates the catalogues of measures and the tools from other EU projects analysed in D.T1.1.1 as listed below: Direct exploitation of results - Other European projects (LUMAT, LIFE LocalAdapt, LIFE+ KAMPINOS, H2020 Fairway, DTP DRIDANUBE, DTP JOINTISZA, Sectoral Information System on Disaster Risk Reduction Contract in Copernicus Climate Change Service (C3S), Demo Case“Soil Erosion” in Copernicus Climate Change Service (C3S)).

The analysis also included the other EU projects to create synergies that are not directly exploited in the TEACHER-CE toolbox. Only selected measures were included in the catalogue of measures. Indirect exploitation of results - Other European projects (CE boDEREC, DTP CAMARO-D, DTP Danube Floodplain, DTP DAREFFORT, DTP REFOCuS, CEF Telecom HIGHLANDER, H2020 Shui, LIFE+ ReQpro, V-A DE-Saxony/CZ; STRIMA II, V-A Saxony/PL TRANSGEA, V-A Saxony/PL NEYMO-NW).

Figure 40: Other Project Tools panel with information about relevant projects and links to tools

Not all projects from the list of exploited projects produced catalogues of measures, some of them produced modelling tools instead. These projects are integrated into our toolbox in two possible ways: as links to the tools or within the catalogue as a measure.

Table 1: Overview of the key features of the tools integrated in the TEACHER- CE project

FRAMWAT:	Development of the two-stage system of sub-basin status identification, static tool assessment (simplified modelling), dynamic tool assessment (modelling), development of concept plan and action plan for the implementation of mitigation measures based upon the non-structural small water retention measures. Use of the GIS DSS tools on different level of this process. Focus on floods, droughts and water quality. Climate change impact and adaptation process is not addressed.
PROLINE-CE:	Focused on the groundwater protection zones for drinking water supply, interaction with floods and forest management. Development of a complex catalogue of measures related to drinking water protection, including CC and nonstructural flood measures, which are related to the pilot actions. The AHP decision support tool uses this catalogue of measures as a core DSS component of the project.
RAINMAN:	Catalogue of measures to mitigate heavy rain risks. The RAINMAN toolbox informs about risk mitigation measures and does not depend on climate related changes (whereas the implementation of some of the measures by the user would depend on it). The RAINMAN-Toolbox guides the adaptation process of municipalities and regions related to heavy rain risks with the assumption that heavy rain events will increase in the future.
SUSTREE:	Identification of vulnerability of forest species/structure to climate change. The toolbox is a delineation model for forest seed transfer and genetic conservation.

13.5. Ranking and catalogue of measures

13.5.1. AHP Method - short introduction

The AHP method (Analytic Hierarchy Process) is a Multi-Criteria Decision Analysis (MCDA) tool for the analysis of complex decision-making processes and for supporting decision makers in the selection of the most suitable decisions among a number of alternative solutions. Rather than prescribing a "correct" decision, the AHP helps decision makers to find one that best suits their goals and their understanding of the issue. It does this by using a set of evaluation criteria that can be analysed independently. The process ends with the attribution of a weight to each of the available solutions which leads to the identification of the most suitable measures (PROLINE, 2019).

The AHP method can be summarized by the following operative steps:

1- formulate the hierarchic tree,

2- create a pairwise comparison matrix,

3- check the consistency of the assigned values,

4- calculate the weights,

5- evaluate the final ranking of the alternative and take the final decision.

A detailed description of the AHP method, can be found in Appendix 2, attached to this document.

13.5.2. Ranking of Measures using AHP Criteria

The core of the TEACHER-CE Toolbox CC-ARP-CE is an integrated comprehensive catalogue of measures, gathered from all directly exploited projects and some from other connected EU projects (described in Chapter 2.4).

The results of selected projects were reviewed and harmonized by our expert group to create synergies and include measures that meet the objectives of TEACHER-CE. The result of this approach is the harmonised catalogue of measures which was evaluated according to the ranking of selected criteria. The measures can be filtered by categories (fields of action, land use, type of measures) and assessed with the Analytical Hierarchical Process for selecting measures according to criteria with pairwise comparison (see chapter 2.5.1). The selected criterias are listed below and described in subchapters 2.5.2.1 – 2.5.2.4:

1. cost
2. multi-functionality
3. robustness
4. duration & complexity of implementation

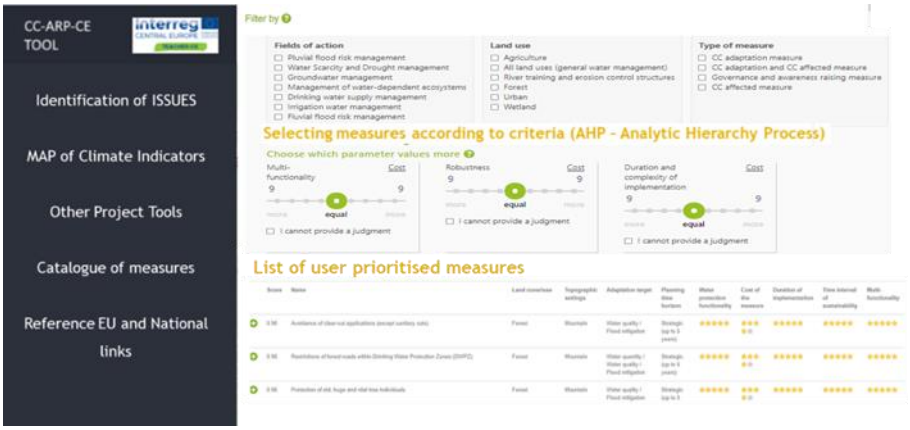

Figure 41: Ranking of measures using AHP criteria

An additional filtering category was added according to CC adaptation measure, CC affected measure, CC adaptation and CC affected measure, Governance and awareness raising measure:

- CC adaptation measures are measures to prepare and adapt to both the current impacts of climate change and the projected impacts in the future.
- CC affected measures are measures whose effectiveness could be limited by the climate change.
- Governance and awareness raising measures are general measures important to the water management sector connected to governance and for raising awareness.

13.5.2.1. Cost

Cost is defined in terms of the relevance of economic constraints to the selection of measures. All aspects "from cradle to grave" should be considered.

Including:

- cost-efficiency: e.g., in terms of quantity (m3) rather than general cause.

- Land requirements: usually an investment (e.g. storage area) or measure (e.g. temporary inundation) needs a specific piece of land that is not obviously owned by the investor (state, municipality, etc.). A sub-criterion (land requirement) can be defined for more detailed evaluation of the cost of the selected measure.

Rating: the cheaper the BMP, the higher the associated rate.

13.5.2.2. Multi-functionality

Multifunctionality, meaning the ability to provide other functions for which the BMP is not specifically designed. It includes additional functions, for example hydrological regulating functions (objective status of the waterbodies) as additional services (e.g., supporting, provisioning, regulating, cultural).

Rating: the larger/higher the suite of services provided, the higher the associated rate.

13.5.2.3. Robustness (Sustainability with Climate Robustness)

This refers to the ability of BMPs to cope with external constraints that were not planned for or were subject to uncertainty during the design phase (e.g., climate change or land use change in surrounding areas). Under such constraints, robust BMPs should be able to maintain sufficient effectiveness despite limited adjustments (e.g., in the form of additional maintenance).

Rating: the more robust the BMPs, the higher the associated rate

13.5.2.4. Duration & Complexity of Implementation

The duration of implementation is very complex and can be seen as a barrier to realisation. Duration is the time it takes to implement BMPs and until a measure is effective. It should include all aspects: e.g., securing social acceptance, eminent domain, administrative issues, actual realization until sufficient BMP effectiveness is achieved. The implementation time criterion is focused mainly on the implementation itself and generally does not address the ever-repeating necessary maintenance of a specific measures. The “duration” criterion therefore refers only to the first implementation.

The issue of maintenance should properly be addressed in the “cost” criterion, where also the maintenance costs should be assessed.

The main problem with nature and climate-oriented rehabilitation of water bodies is the realisation and duration of land acquisition, in some countries it is not a question of available budgets or costs. It is simply a matter of land availability and willingness to sell and the complex land acquisition procedures for public (environmental) needs. Thus, based on reality, the most multifunctional and robust measure may make the smallest contribution to actual adaptation.

Rating: The shorter and simpler the implementation process, the higher the rate.

13.6. Reference EU and National links

Navigating the universe of pre-existing tools in the field of water management is challenging. Therefore, we have collected the existing national links to different tools (data portals, reports, legislation, etc.) that are closely related to the implementation of EU legislation:

- Water Framework Directive (WFD),
- Floods Directive (FD),
- Urban Waste-water Treatment Directive (UWWTD),
- Nitrate Directive (ND),

- Drinking Water Directive (DWD),
- Bathing Water Directive (BWT),
- Industrial Emissions Directive (IED, ex. IPPC),
- Priority Substances Directive (PSD).

The Water navigation node provides a transparent overview of the existing national and EU tools accessible through the CC-ARP-CE. The links are categorized by its content and structured into Fields of actions.

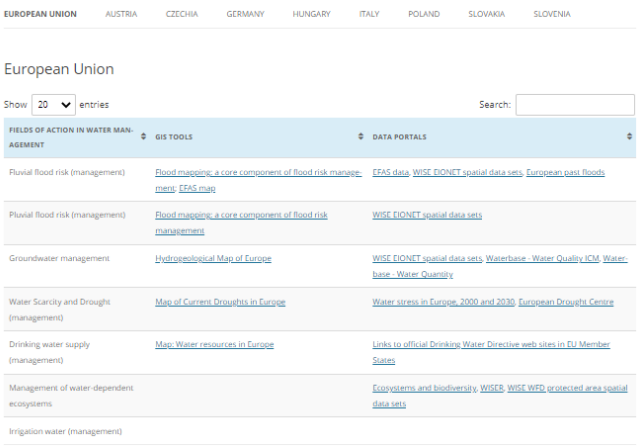

Figure 42: Water Navigation Node

14. Conclusions

The CC-ARP-CE tool is the TEACHER-CE project's main output and is designed to support the needs of the users in the water management sector. The tool is developed for an online platform and validated in pilot activities with the aim to support stakeholders of water management in integrated strategies and actions for climate change adaptation and prevention/reduction of associated risks. This manual was written in order to help the users to understand the structure of the CC-ARP-CE toolbox and its contents. The toolbox includes a web map service which provides spatial orientation that provides a spatial orientation among all identified issues in water management, provides information on climate change scenarios with key indicators, provides navigation through EU and national data portals, links to the tools developed in the past EU projects and provides an integrated comprehensive catalogue of measures. The tool is designed with simple to use options for basic use and broader audience. However, it also includes advanced features for expert use which elevate the complexity of the tool and require background data.

15. References

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