

STRATEGY FOR WATER MANAGEMENT PLANNING PROCESSES INCLUDING CC ADAPTATION AND RISK PREVENTION

WORK PACKAGE T4 - JOINT STRATEGY DEFINING POTENTIAL
COMMITMENTS IN IMPROVEMENT OF PLANNING PROCESS
CONSIDERING CC

OUTPUT O.T4.1

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- [Annex 1 - Review form](#) - MS Excel file
- [Annex 2 - Lookup table gaps and tools](#)- MS Excel file



List of abbreviations

BMP	Best Management Practices
BWD	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
EQS	Environmental Quality Standards
EU	European Union
FD	Floods Directive
FHRM	Flood Hazard and Risk Map
FRMP	Flood Risk Management Plan
GIS	Geographic Information System
GWD	Groundwater Directive
IPCC	Intergovernmental Panel on Climate Change
NSWRM	Natural Small Water Retention Measures
PFRA	Preliminary Flood Risk Assessment
RBMP	River Basin Management Plan
WFD	Water Framework Directive

1. Introduction

The effects of climate change can hinder the achievement of local development objectives defined in existing documents. For this reason, it is highly recommended to mainstream adaptation to climate change into the planning process. But the issue even goes beyond the simple local level: from a broader point of view, the local level is a key element in climate change adaptation policies, because it also allows the implementation of objectives from the regional, national or European level.

To face these challenges, the main objectives of the TEACHER-CE project were to develop (see Figure 1):

- > an Integrated toolbox for Climate Change Adaptation and Risk Prevention in Central Europe CC-ARP-CE;
- > an integrated and joint strategy for improvement of existing water management practices (implementation of EU water legislation) taking into consideration knowledge gained from previous projects.

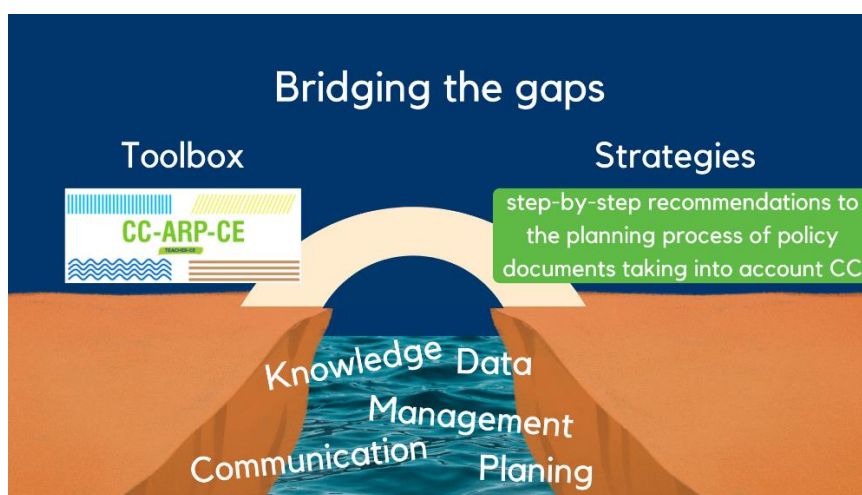


Figure 1 The main objectives of the TEACHER-CE project (Source: Viktoria Valenta)

The 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. In the framework of TEACHER-CE, seven fields of action of the water management sector were identified:

- > 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 integrated and joint strategy covers all these fields of actions and has been built on the implementation experiences from all Pilot Area (PA) of the TEACHER-CE projects. As a first step to build it, the gaps in

existing strategies have been identified. Then main visions have been prepared for involved Pilot Actions (local level), regions and/or countries for improvement of existing policy documents. These main visions were completed by the findings from:

- > case studies about already implemented good practices or implementation possibilities of the TEACHER-CE Toolbox (CC-ARP-CE);
- > Forums organized with Key stakeholders to check the implementation, or the applicability to implement the Toolbox and the main visions.

This exercise lead to the following outputs:

- > General recommendations and Key Messages to better integrate CC-aspects in water management and so to get a better implementation of WFD, FD, DWD, RBMP on the local level using TEACHER-CE Toolbox CC-ARP-CE;
- > Operational recommendations (guidelines) to integrate the dynamics of the effects of climate change in the planning process of policy documents associated - directly or indirectly - with water management.

2. Integrated toolbox for Climate Change Adaptation and Risk Prevention in Central Europe

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 Climate Change Adaptation and Risk Prevention in Central Europe (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 2: Logo of the CC-ARP-CE (TEACHER-CE) Toolbox: Integrated toolbox for Climate Change Adaptation and Risk Prevention in Central Europe

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.

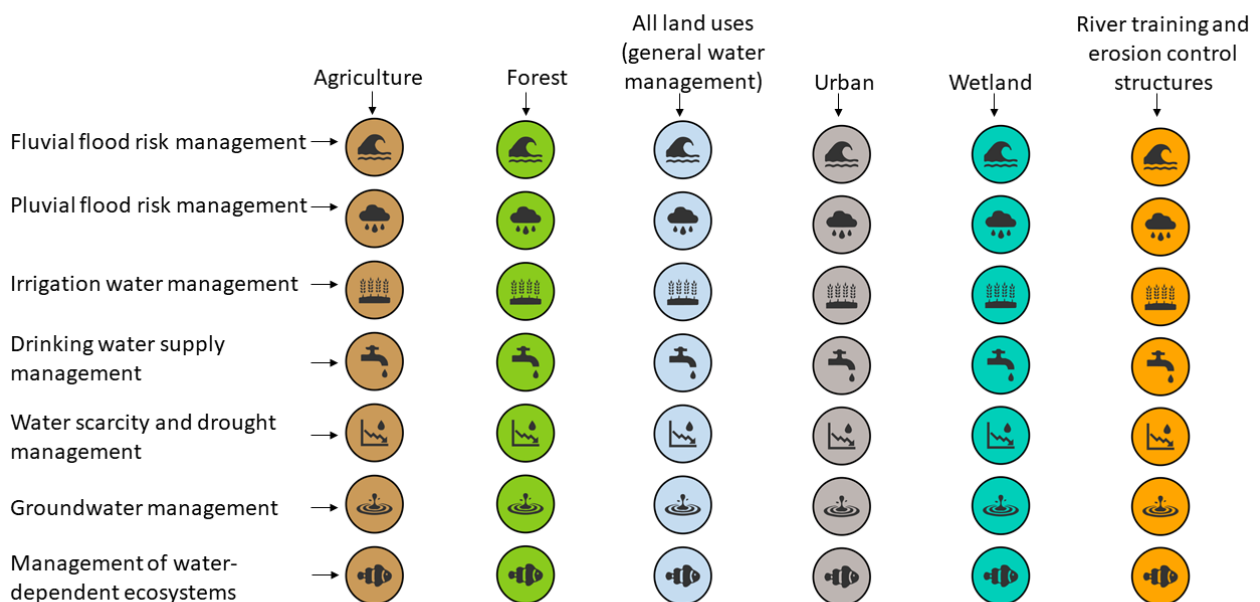


Figure 3: Icons representing different Fields of Action and land use category in the CC-ARP-CE Toolbox

The toolbox helps the user to define their water related issues/problems/ideas within a specific location (Figure 3) 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.

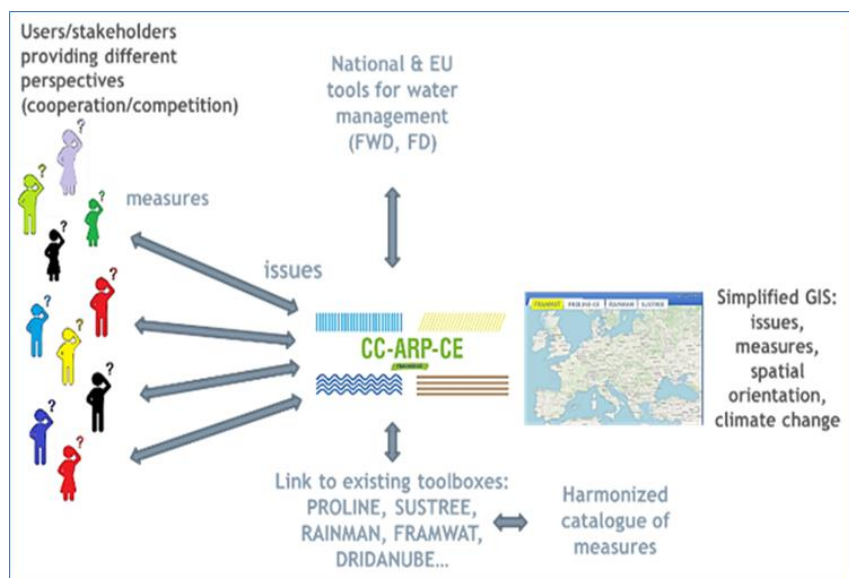


Figure 4: Conceptual scheme of the Toolbox

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 (see Table 1):

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.

Table 1 Description of the TEACHER-CE Toolbox CE-ARP-CE

Features	Description
Map of climate indicators	Maps of climate indicators, for the area of the Interreg Central Europe program, for two different time horizons (2021-2050 and 2071-2100) and two representative concentration pathways (RCP 4.5 and RCP 8.5)
Ranking and catalogue of measures	The 161 measures provided by the Toolbox are listed and it is possible to filter them on the basis of user needs
Identification of issue with selection of measures and measures	Presented as a map in which it is possible to insert new issues, each of these issues is represented by an icon representing the Field of action and the Land Use affected by the issue
Reference EU and national links	Reports reference to EU and national GIS tool and data portals
Other project tools	This page links to the tools of previously funded EU connected projects

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/>. The manual and tutorial of the Toolbox are presented in the Output O.T2.1.

3. The EU context of planning process in the field of CC adaptation and water management:

The main water management principles and objectives are set by the EU water legislations: the Water Framework Directive and its daughter' directives (Bathing Water Directive, Drinking Water Directive, Urban Waste Water Directive, IPPC Directive, Nitrogen Directive, EQS Directive) and the Flood Directive. These directives were transposed in the national laws to give force to them.

The WFD and the FD (and the relevant national laws that have transposed these directives) require the preparation of plans that define medium term specific objectives and define measures that will enable to meet these objectives: the River Basin Management Plan (RBMP) and the Flood Risk Management Plan (FRMP). The RBMP contains a characterisation of the water bodies, an assessment of drivers and pressures, an economic analysis and set the ecological objectives for every water body. Its program of measures lists measures that are needed to reach the environmental objectives. The preparation of the FRMP is preceded by the production of preliminary flood risk assessments (PFRAs), that is followed by the preparation of flood hazard and risk maps (FHRMs), showing how far floods might extend, the depth or level of water, and the impacts that might be on human health, economy, environment and cultural heritage. On this basis the FRMP defines objectives and identify the necessary measures to reach them.

The EU recommendations in the field of climate change adaptation come from the communications from the Commission:

- > [White Paper on adapting to climate change](#)¹ (2009);
- > [EU Strategy on adaptation to climate change](#)² (2013);
- > [EU Climate Adaptation Strategy](#)³ (2021);

and the regulations from the European Climate Law⁴ (2021).

Since the publication of the White Paper on adaption to climate change and also in the next ones, the EU Commision has encouraged Members States to develop national adaptation strategies. In the 2013 communication, these strategies are defined as “*key analytical instruments designed to inform and prioritise action and investment*”. This recommendation comes from the Art. 4 of the United Nations [Framework Convention on Climate Change](#)⁵ which stipulates that all parties should “*Formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and measures to facilitate adequate adaptation to climate change*”. The article 7 par. 9 of the [Paris Agreement](#) (2015)

¹ White paper - Adapting to climate change: towards a European framework for action {SEC(2009) 386} {SEC(2009) 387} {SEC(2009) 388}, COM/2009/0147

² COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS An EU Strategy on adaptation to climate change, COM/2013/0216

³ COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change, COM/2021/82 final

⁴ Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law')

⁵ UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, FCCC/INFORMAL/84 GE.05-62220 (E) 200705

also stipulates that States should engage themselves in adaptation planning processes: *“Each Party shall, as appropriate, engage in adaptation planning processes and the implementation of actions, including the development or enhancement of relevant plans, policies and/or contributions, which may include:*

- (a) The implementation of adaptation actions, undertakings and/or efforts;
- (b) The process to formulate and implement national adaptation plans;
- (c) The assessment of climate change impacts and vulnerability, with a view to formulating nationally determined prioritized actions, taking into account vulnerable people, places and ecosystems;
- (d) Monitoring and evaluating and learning from adaptation plans, policies, programmes and actions; and
- (e) Building the resilience of socioeconomic and ecological systems, including through economic diversification and sustainable management of natural resources.”

To support Member States to this challenge the Commission has launched an European climate and health observatory under the European Climate Adaptation Platform [Climate-ADAPT](#), to better understand, anticipate and minimize the health threats caused by climate change.

The 2021 EU Climate Adaptation Strategy was announced by the European Commission in the [European Green Deal](#) in December 2019. It was built on the experience of the 2013 strategy, but increases its ambition. The long-term vision described in the point 2. of the 2021 Strategy is that in 2050, *“the EU will be a climate-resilient society, fully adapted to the unavoidable impacts of climate change. This means that by 2050, when we aim to have reached climate neutrality, we will have reinforced adaptive capacity and minimised vulnerability to climate impacts, in line with the Paris Agreement and the proposed European Climate Law”*.

The 2021 strategy covers new areas and priorities by developing a more systemic approach with 3 cross cutting priorities:

- > integrating adaptation into macro-fiscal policy;
- > nature-based solutions for adaptation;
- > local adaptation action.

Other sectorial strategic documents associated with water management or climate change adaptation may be also developed at different administrative levels (from the EU to the local one) to define the challenges, the objectives or priority areas and indicate the expected results, e.g.: EU biodiversity strategy, national ecological policy, national spatial development strategy, etc.).

It is obvious that to be effective, all policy documents must also be consistent with each other. Thus, for the sake of consistency with the CC adaptation objectives, EU water legislation:

- > incorporates explicit CC adaptation requirements (e.g.: FD requires Member States to take into account the likely impact of climate change on the occurrence of floods (Article 14(3)) from the second planning cycle);
- > uses the principles already existing in European water legislation (eg. considering CC at the pressure analysis stage in the WFD planning cycle).

National laws and strategic documents may require or recommend the preparation of operational and implementation documents and instruments in order to implement the strategic documents objectives and specifying the necessary tasks (e.g.: water retention program, regional plan of adaptation to climate change, etc.). This approach is also recommended by the art. 13(5) of the WFD: *“River basin*

management plans may be supplemented by the production of more detailed programs and management plans for sub-basin, sector, issue, or water type, to deal with particular aspects of water management”.

4. Gaps in the implementation practise of climate change adaptation and the tools to address them

4.1. Gaps identification

First step for developing joint strategy for improvement of existing water management practices was identification of existing problems and shortcomings in existing policies and strategy documents in the area of water management. Those problems referred as gaps are considered as the main issues that should be improved to reach the sufficient level of description of climate change issues in existing documents. For the needs of this task, gaps were defined as: the distance between the methodological assumptions applied for the preparation of the document and the good practices in the field of climate change management. In the simplest way, the effect of identification of gap should be addressing its subject in update of existing policy or strategy at appropriate level of management: national, regional or local.

Identification of gaps in the field of water management was conducted in the form of scope review of existing policy documents at all level of administration. In this exercise partners involved in project (7 countries). Documents to be reviewed has been selected by project partners with intention to cover wide scope of spatial range of validity (national, regional and local level) as well as theme (variety of Field of Action and document types). A set of documents selected for review covered 110 documents of 15 types in all Field of Actions defined for the purposes of the project. The full overview of selected documents and its structure are described in deliverable D.T4.1.1: “Identification of gaps in existing strategies and directives implementation on operational level”.

To ensure comparability and quantification of review results special Review Form was prepared. Review Form allowed reviewers to summarize the properties of each reviewed document in the context of robust climate change description. Basing on experience from previous projects and general recommendations the key factors was identified and assumed to be indicators of sufficient CC description. These factors were divided into separate sections designed to evaluate individual elements and assumptions of the document - finding gaps. The evaluated elements referred to: description of the climate change issue in document, possible effect of the CC on the assumptions of the document, assessment of measures influence on CC issues, possibility of its adaptation to CC, matching of TEACHER's tools to improve this document. Each section and subsections were quantified to result with certain number of points which were summarized and adjusted to the document scope. The results were compared between countries, document types and Field of Action to assess the threshold of obtained results. Then the obtained results were analysed to identify quantitatively impact of particular elements on presence of gaps. The full methodology of review was described in deliverable D.T4.1.1. Review form is attached as an [Annex 1](#).

The process of identifying gaps were conducted in two steps. The first step was to identify potential gaps, categorize them and find potential indicator which represents the relation between content of the document and addressing of CC issues. Indicators and potential gaps identified before and after scope review of the documents were categorized in 6 categories/groups:

- Knowledge, data and tool availability
- Lack of adaptation measures
- No CC-resilience test of measures

- Planning / Communication / Management
- Weak assessment of the document impact on CC
- Weak description of the climate change issue

The questions and issues assigned to each of the categories inside the Review Form made it possible to quantify and assess the scale of each gap in the documents and also to identify scale of the problem in wide, international context.

Documents which were selected for the exercise were supposed to cover all management levels, spatial and thematic range in all countries. Table 2 shows the range and thematic scope of selected documents.

Table 2 Documents selected for the review.

Type of documents	Country (anonymized)							Total
	A	B	C	D	E	F	G	
Climate strategy			2		2	1	1	6
Drought management plan			1	1	1		1	4
Environmental Strategy	5		1		4	2	4	16
Flood risk management plan	1	1	2	4	1	1		10
Local plan of Adaptation to Climate Change		1		1	3			5
Local spatial development plan/strategy					1	1		2
National plan of adaptation to Climate Change		2		1		1		4
National spatial development plan/strategy		1	2	1		1		5
Other document			1	3				4
Other plan in the field of water management			2	2	3		1	8
Other strategy		1	2		2		12	17
Regional plan of adaptation to Climate Change		2		2				4
Regional spatial development plan/strategy	4	2	2	2	5			15
River basin management plan		1	3	2	1	2	1	10
Total	10	12	18	19	23	9	20	110

In their spatial scope, the documents covered various levels of detail: from national, through regional, to local. Evaluation of each spatial level was discussed as this division is not compatible with the administrative division of all countries, but it was finally assumed that local level is municipality - related region and regional level is every unit that is wider than municipality, but do not cover national level.

The reviewed covered 52 national documents, 29 regional and 20 locals. Documents were evaluated in connection with Field of Action (described in chapter 1). The reason of that was to identify possible gaps connected with scope of the document as well as spatial scale of the document. This aimed to evaluate vertical translatability of wide-scope policy documents to arrangements of specific low-level plans and programs. The documents were also evaluated in each category such as RBMPS, Spatial development plans etc. to compare and identify gaps in each type.

The results of analysis in each field of actions are presented in Figure 5. Figure 6 presents general evaluation of each gap.

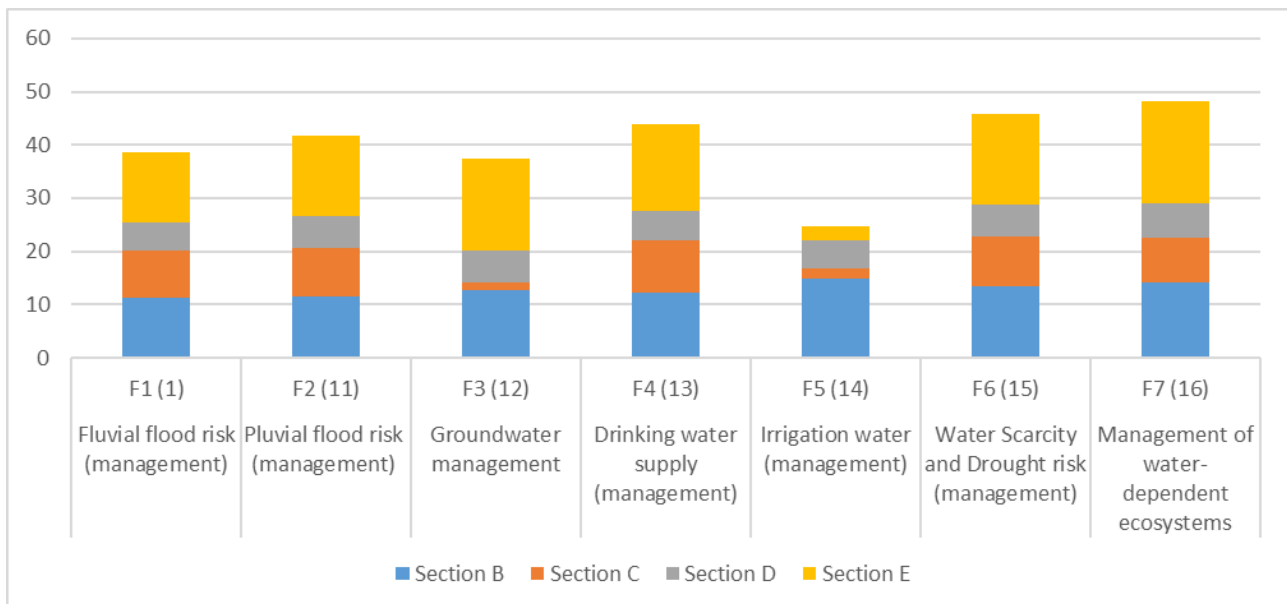


Figure 5 Results of scope review in each field of action

Gap code	Potential gaps	Robustness score - general [%]	Robustness score - local level [%]	Robustness score - regional level [%]	Robustness score - river basin level [%]	Robustness score - national level [%]
B1	non-optimal geographic scale	41%	33%	44%	33%	44%
B2	non-optimal time scale	64%	70%	82%	32%	82%
B3	weak meteorological description	48%	56%	52%	38%	52%
B4	weak hydrological description	34%	30%	31%	42%	31%
B5	weak hydrogeological description	24%	18%	20%	30%	20%
B6	no water use forecast	23%	17%	25%	17%	25%

Figure 6 General results in each category of gaps

Additional level of analysis was aimed to cover any international and directional policies of EU and to find if they result in gaps in national or subnational levels of management. The review were prepared at several levels: strategical and operational.

At the strategical level gaps in themselves define the good practices to be adopted:

- whether droughts have been reported as relevant for the country, preparing a sub-plan on water scarcity and droughts or / and addressing change climate should be considered (gap for 5/9 countries or 6/12 considering countries outside the Interreg Central Europe region);

- the conclusions of the national climate change adaptation strategy must be integrated into the plans to maintain a common thread and consistency (no clear coordination for 5/9 countries or 6/12);
- climate change should be considered when setting objectives, for instance by recalculating extreme events probability (gap for 3/9 countries or 4/12);
- the plans should clearly explain how climate change is taken into consideration in the plans or how it may affect the occurrence of extreme events (gap for 6/9 countries or 7/12).

At the operational level

- At the operational level, the assessment reports have pointed out:
- the lack of adaptation measures (2/9 countries or 2/12 considering countries outside the Interreg Central Europe region);
- the non-consideration of climate change in the design of measures (3/9 countries or 4/12).

Finally, the main output from identification of gaps was recommendation to apply a multi-perspective approach:

- > at the level of European Union water legislation in order to identify potential policy gaps that may explain difficulties at the local level;
- > at the level of countries from a formal perspective through the RBMP and FRMP assessment reports;
- > at the local, regional, river basin and national level in the frame of a scope review of policy documents;
- > from a horizontal perspective with review of grey and scientific literature and previously funded projects.
- > In the summary, the exercise led to the identification of 83 gaps thematically organized in 6 groups (see Table 3).

Table 3. Groups of gaps

Groups of gaps	Number of gaps
Knowledge / data and tool availability	31
Lack of adaptation measures	10
No CC- resilience test of measures	2
Planning / Communication / Management	32
Weak assessment of the document impact on CC (greenhouse emission/ adaptation)	2
Weak description of the climate change issue	6
Total	83

Based on the general results, the exercise made it possible to identify 1 omnipresent gap and 5 very prevalent gaps:

- Weak hydrogeological description (gap B5): while surface waters and other common components of environment (mostly related with atmosphere - temperature, wind speed etc.) are often at least mentioned to be climate-change vulnerable, groundwater and its relation with climate change was often not identified or not mentioned. Even the drought related documents very often described decrease of water resources as an effect of human activity and its CC-related reasons were barely identified. Utilization of modeling to predict groundwater changes were not identified in any of analyzed documents,
- No water uses forecast (Gap B6): climate change can impact water resources but can also influence water use (e.g. increased abstractions for irrigation). The interactions between the uses of water, the resources and their evolutions because of climate change can however generate tensions and have a negative impact on the uses and their economy. The lack of water use forecast is however one of the most prevalent gaps,
- No consideration of CC impact at the operational level (gaps C3 and E12): even if the effects of CC seem to be taken into account in the general assumptions of the documents (no gap for C1,), this effort is not followed at the more operational level of the documents:
 - No CC climate proofing test at the design stage of the measures (gap C3);
 - No evaluation of effectiveness of the adaptation measure (gap E12).
- These gaps are particularly present at the local level, where these 2 above - mentioned gaps have been qualified as omnipresent gap, as well as the C2 gap (No CC - resilience test of measures).
- Weak assessment of the document on emission of greenhouse gases or adaptation to the CC (gaps D1 and D2): taking into account the EU goal of climate neutrality or the need to enhance adaptation to CC in the policy documents can still be subject to improvement at the step of impact assessment for instance by supporting expert judgment with data;

5 quite prevalent gaps:

- None-optimal geographic scale (gap B1): the resolution of the CC analysis is coarser than the basic planning unit⁸ of the policy document. The coarser the resolution, the less precise the location of the most sensitive areas, and therefore the less optimal adaptation measures will be,
- Weak meteorological description (gap b3): many analysis in evaluated documents based on few indicators: mostly air temperature or surface water flow. The wide scope analysis with usage of many indicators to describe climate changes and predictions were used only in national level documents,
- Weak hydrological description (B4): despite the fact that the reviewed policy documents cover water-oriented fields of actions, the description of hydrological changes is quite limited,
- No CC- resilience test of measures (gap C2): it confirms the weak consideration of CC impact at the operational level,
- No consultation with neighboring countries in the field of adaption measures (E4);

and 7 uncommon gaps related to the non-optimal time scale of the CC description (B2) and the presence of adaptation measures in the policy documents (gaps E2 and E5 - E8).

The result of the analysis is presented in the Annex 2 of this document.

4.2. How to improve - lookup table of gaps and their solutions

Once the final list of gaps was established, members of the Review Group were invited to assess the applicability of the tools developed in the framework of TEACHER-CE and cross fertilized-projects to address the identified issues. Wide spectrum of projects / tools was taken into account in this evaluation:

- > Recommendations for strategy improvement - TEACHER-CE
- > Issues and discussion toolbox - TEACHER-CE
- > Map of climate indicators - TEACHER-CE
- > Ranking and catalogue of measures - TEACHER-CE
- > Tools from cross-fertilized projects:
 - DSS - FRAMWAT
 - FroGIS - FRAMWAT
 - Planning NSWRM - FRAMWAT
 - PROLINE-CE
 - RAINMAN
 - SUSTREE
 - DTP CAMARO-D
 - DRIDANUBE (DTP)
 - Datasets and applications hosted in Climate Data Store for C3S Disaster Risk Reduction Sectoral Information System - COPERNICUS CLIMATE CHANGE SERVICE (C3S)
 - Datasets and applications hosted in Climate Data Store for C3S Soil Erosion Demo Case - COPERNICUS CLIMATE CHANGE SERVICE (C3S).

The evaluation has shown that the above mentioned tools are applicable or partly applicable to address 92% of identified gaps (see Table 4).

Table 4 Applicability of the tools developed in the framework of TEACHER-CE and cross fertilized-projects

Groups of gaps	Applicability of the tools developed in the framework of TEACHER-CE and cross fertilized-projects	
	Applicable	At least partly applicable
Knowledge / data and tool availability	94%	97%
Lack of adaptation measures	100%	100%
No CC- resilience test of measures	100%	100%
Planning / Communication / Management	78%	84%
Weak assessment of the document impact on CC (greenhouse emission/ adaptation)	50%	50%
Weak description of the climate change issue	100%	100%
Total	88%	92%

The exercise led to the establishment of assumptions used to identify general recommendations for improving policy documents to better address climate change adaptation needs (see chapter 5).



5. General recommendations and key messages on how to consider climate change in local strategies and policy documents

5.1. The identification process of the general recommendations and key messages

The analysis carried out within the framework of the deliverables D.T4.1.2 and D.T4.2 led to highlighting the strategic elements to be taken into account in order to improve the policy documents. To define these recommendations/visions, the following assumptions were applied:

- > the recommendations/visions should lead to address gaps identified as possible, particularly those from the group of gaps “planning / communication / management” (see Chapter 4);
- > the recommendations/visions should promote and stimulate adoption of tools from TEACHER-CE Toolbox for efficient use by decision makers in water management planning;
- > the recommendations/visions should enhance the synergy between fields of action and support different but complementary types of activities.

The exercise has led to the identification of 6 main visions/general recommendations for climate change adaptation strategies:

1. integrating assumptions of national/regional documents into the planning process;
2. mainstreaming the climate change effects into the planning process;
3. maximizing of cross-sectoral benefits;
4. privileging the implementation of natural-based solutions, implementing sustainable land use;
5. involving stakeholders;
6. developing a science-based and data-driven strategy and implementation.

On the basis of the cases studies from Pilot Areas (PA) and the findings of the Forums with local Key Stakeholders, key messages have been identified to detail the implementation of these general recommendations. Therefore, key messages should be considered as overall objectives, that should be taken into account in relevant policies for the Improvement of adaptation to impacts of climate change in water management projects and spatial planning projects.

The Figure 7 presents the scheme of the identification process of the general recommendations and key messages.

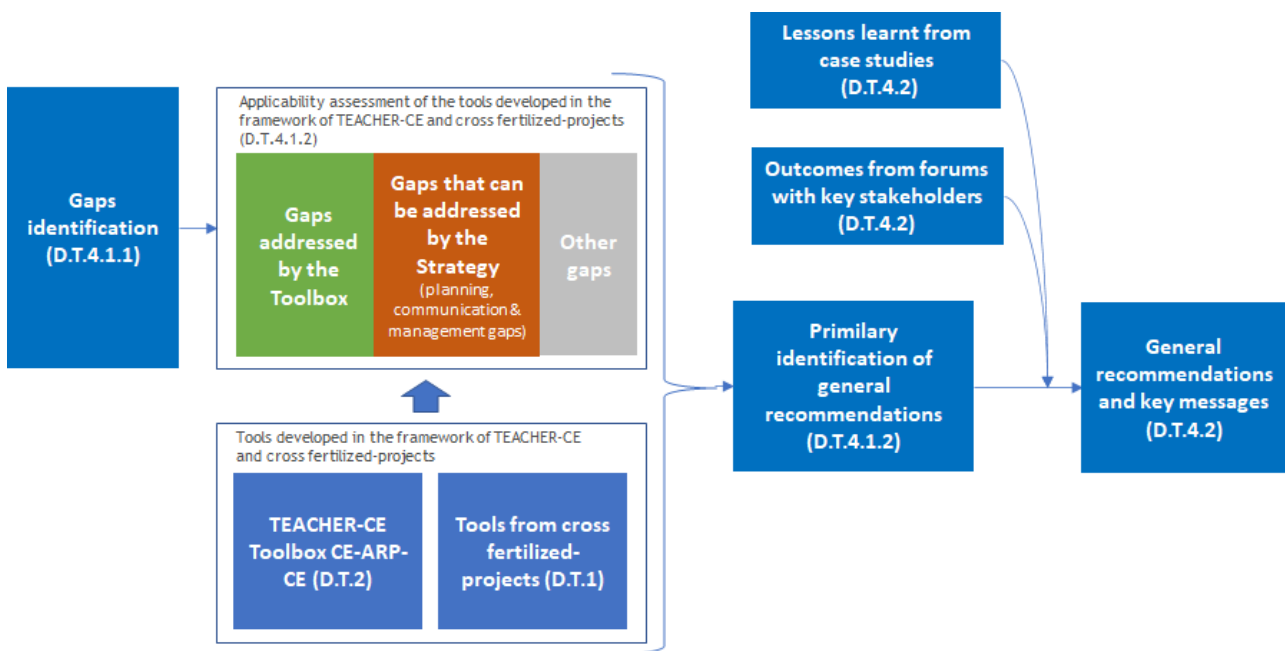


Figure 7 Scheme of the identification process of the general recommendations and key messages

5.2. General recommendation no. 1 - Integrating assumptions of national/regional documents into the planning process

Description of the recommendation:	Addressing problems at a coarse national/EU scale aims at setting the strategic framework, but is not appropriate to respond and manage risks locally. Nevertheless, local policy documents should consider the objectives of the national/ regional strategic documents to achieve synergies with them and, in case of RBMP and FRMP, be consistent on the river basin level.
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Key message 1.1: Using the potential of local spatial development plans

National or regional policy documents may define measures addressing agriculture or industrial pressures on water quality or increasing water retention, but these measures are not always possible to implement at the local level. **Therefore, the most important municipal tool that can reduce these pressures or increase retention are local spatial development plans.** Their findings should take into account not only functional and aesthetic considerations, but also the potential impact on reducing the pressures identified by water management plans or other analyses. For example, local spatial development plans could have been updated or re-established to develop new buffering zones in wetlands and river valleys to improve nutrient or water retention possibilities (see the D.T.4.2, factsheet 3.3 Improvement of policy documents in Pilot Area Kamienna). In urban area they could also define multifunctional land uses, e.g. traffic and parking areas suitable for collection, storage and drainage of water (see the factsheet 3.2 Improvement of policy documents in Pilot Area UPPER LUSATIA). The Forums point out the lack of knowledge in many municipalities about the possibilities of linking municipal planning with adaptation measures (see Table 1).

!!! *The ranking and catalogue of measures of the CC-ARP-CE Tool provides examples of measures that may be included in local spatial development plans.*



Key message 1.2: Prioritizing the implementation of measures from RBMP and FRMP in local policy documents

Local policy documents should consider the objectives of RBMP and FRMP to achieve synergy with them and be consistent at the watershed level (Figure 8). The factsheet 3.8 Improvement of policy documents in Pilot Area Nagykunsági illustrates this key message: the main issues in the field of “Pluvial/Fluvial flood risk” are the increasing frequency of extreme hydrometeorological events, such as extreme heavy rainfalls, and snowmelt caused by sudden warming. Managing the growing risk requires proper preparation and planning. In EU Flood risk management is carried out in accordance with the EU Flood Directive. As part of this, design flood levels as well as measures are constantly reviewed on river basin/ national level. For this reason, the local level should prioritize and implement flood risk management measures in accordance with the EU Floods Directive/Flood Risk Management Plan (FRMP) to achieve equal safety and equal economic risks.

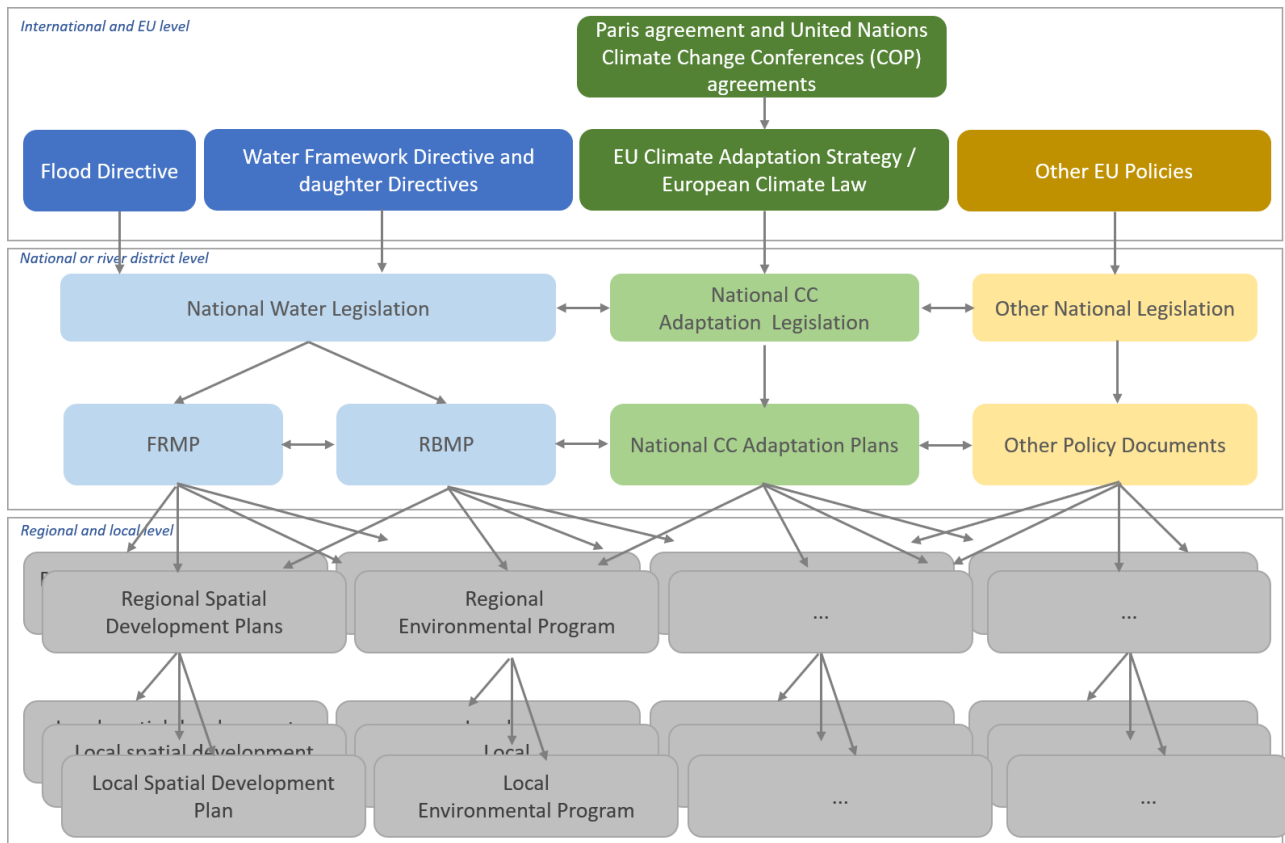


Figure 8. Schemes of the planning process from EU to local level in the field of water management and climate change



5.3. General recommendation no. 2 - Mainstreaming the climate change adaptation into the planning

Description of the recommendation:	Climate change effects should be considered when setting objectives for all relevant planning and policy documents. This exercise of integration should be transparent: the policy document should clearly explain how climate change is taken into consideration. To describe climate change, it is recommended to consider different reliable and updated projections as a reference.
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Key message 2.1: Water management and planning must be better integrated from the beginning of planning processes

The relevance of this message is all the more true in the urban environment: urban water management and urban planning must be better integrated from the beginning of planning processes on regarding the retention, storage, re-use and infiltration of rainwater, to improve:

- flood protection (for CC-induced increasing flood events);
- protection from storm water (heavy rain events);
- water scarcity in CC-induced dry periods;
- heat island effects due to cooling by evaporating water;
- urban green/urban nature which depends on sufficient water availability for growing, maintenance (in effects on cooling: evaporation, shadow).

Urban planning policies and water management policies have to set the overall objectives for development projects to create the urban space as sponge city: more space for retention areas, multifunctional uses to combine urban functions retention/storage capacities, unsealing of public and private space, disconnection of sealed areas from drainage systems, infiltration areas etc. (see the D.T4.2, factsheet 3.2 Improvement of policy documents in Pilot Area UPPER LUSATIA).

!!! *The D.T4.1.2 deliverable propose a step-by-step guideline (operational recommendations) that aims to integrate the dynamics of the effects of climate change in the planning process of policy documents associated - directly or indirectly - with water management.*

Key message 2.2: Providing more detailed predictions on climate change effects on water uses, considering extreme events

The D.T4.1.1 and D.T4.1.2 deliverables have identified the lack of water use forecast as a very prevalent gap in policy documents. The factsheet 3.9 Improvement of policy documents in Pilot Area Podyjí National Park illustrates an element of this problem: in the analysed policy documents the influence of climate change on water quality is limited to drought events with limited quantification of the actual effects. The policy documents should provide more detailed predictions on climate change effects on drinking water



quality supply, taking into consideration extreme events (e.g.: including water quality impact of flood events).

!!! *Identifying the impacts of climate change on the water use, considering the interactions between fields of actions is one of the task from the guideline of the D.T4.1.2 deliverable.*

5.4. General recommendation no. 3 - Maximizing cross-sectoral benefits

Description of the recommendation:	To maximize cross-sectoral benefits, local planning actors should apply integrated, multi-criteria and systematic solutions. Thus, an interdisciplinary approach should be followed. Maximizing cross-sectoral benefits will de facto promote combined green-blue infrastructure and nature-based solutions.
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Key message 3.1: Identifying of connections between fields of actions to maximize the cross-sectoral benefits

The potential synergies between the Field of Action “Water Scarcity and Drought risk (management)” with FoAs: “Management of water-dependent ecosystems” and “Pluvial/Fluvial flood risk (management)” results from cumulative character of planned or implemented measures. For example, implementation of the measures concerning the restoration of small retention and increasing retention in forest and agricultural areas result in protection against the impact of drought as well as in the improvement of ecological status of water bodies and protection against pluvial flood. Increase in the retention capacity of natural areas (wetlands, forests etc.) have the impact on rising availability of water resources at the catchment scale. In addition, appropriate maintenance or modernization of water drainage devices (ditches) enables the control of water outflow, its slowing down in dry periods (preventing drought) and water retention in periods of intense rainfall (reducing the risk of flooding) (see the D.T4.2, factsheet 3.4 Improvement of policy documents in Pilot Area Lusatian Neisse).

!!! *The ranking and catalogue of measures of the CC-ARP-CE Tool provides a prioritisation system with 4 criteria, one of which is precisely the multifunctionality of the measures.*

Key message 3.2: Broaden the scope of CC adaptation documents to cover relevant issues

CC adaptation documents should cover all relevant issues related to impacts of climate change in water management projects, e.g.: broaden the aspect of climate change impact related to quality and quantity of water resources based on climate scenarios (see the D.T4.2, factsheet 3.4 Improvement of policy documents in Pilot Area Lusatian Neisse), or broaden CC adaptation policy to fluvial risk management (see the D.T4.2, factsheet 3.1 Improvement of policy documents in Pilot Area Kamniška Bistrica River Basin).



This interdisciplinary approach is essential to identify connections among fields of actions, understand their interdependencies and so maximize the cross-sectoral benefits. In practice, interdisciplinary tasks are challenging to implement, as they may not fit to the daily work structure of local stakeholders (see DE Forum report - Annex 1).

!!! Identifying of connections between fields of action to understand the interdependencies and maximize the cross-sectoral benefits is one of the task from the guideline of the D.T4.1.2 deliverable

Key message 3.3: Improving the efficiency of water uses for the goods of all sectors by regulation/controls

A rational water resources usage could lead to a high-water availability for agriculture, manufacture, and so can bring a positive impact on the natural environment (see the D.T4.2, factsheet 3.5 Improvement of policy documents in Pilot Area Enza River Basin). Policy documents should include joint objectives for the regional management of water conflicts in drought periods, for human health, public water supply and public functions like firefighting, priorities for the functions of the ecosystems, lower priorities for individual water users etc. (see the D.T4.2, factsheet 3.2 Improvement of policy documents in Pilot Area UPPER LUSATIA)

5.5. General recommendation no. 4 - Privileging the implementation of nature-based solutions, implementing sustainable land use

Description of the recommendation:	Local planning actors should consider and promote the potential of ecosystem-based solutions for the protection of water resources (quantitatively and qualitatively) and the adaptation to climate change.
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Key message 4.1: Improving water retention capacity of the river basin

Improving water retention capacity of the river basin has an impact on the flood situation, improves soil water management, increases the available irrigation water supply, and is beneficial for water dependent ecosystems (see the D.T4.2, factsheet 3.8 Improvement of policy documents in Pilot Area Nagykunsági). Another example may be the PA Lusatian Neisse (see the factsheet 3.4 Improvement of policy documents in Pilot Area Lusatian Neisse) , where a large range of water retention measures have been recommended:

- construction of water retention facilities
- protection and preservation of existing meadows and pastures
- implementation and restoration of small retention and micro retention facilities in forest areas
- implementation and restoration of small retention and micro retention facilities in agricultural areas
- promoting and implementing agrotechnical measures which increase soil retention



- creation and restoration of mid-field, roadside and water-bearing trees
- shifts to less water-demanding crops and cropping systems
- creation and maintenance of “blue-green” retention areas in urban areas
- infiltrating pavements/permeable surfaces.

!!! *The catalogue of measures of the CC-ARP-CE Tool proposes a large range of measures to improve water retention capacity of the river basin with nature-based solutions.*

Key message 4.2: Implementing and maintaining sustainable land use

The case study presented in the factsheets 3.6 Improvement of forest ecosystem adaptability towards climate change in Pilot Action “Vienna Water Drinking Water Sources” and 3.7 Improvement of policy documents in Pilot Area Waidhofen/Ybbs illustrate the important role of the forest in ensuring the protection of drinking water resources. It also shows that a long-term water protection objective is ensured by securing the natural regeneration dynamics of the forest despite the conditions of climate change.

!!! *The catalogue of measures of the CC-ARP-CE Tool proposes a large range of measures related to land use as a CC adaptation solution.*

5.6. General recommendation no. 5 - Involving stakeholders

Description of the recommendation:	The involvement of stakeholders in the planning process ensures a reliable and improved acceptability of the adaptation measures, and so a better implementation of the policy documents, including straight forward climate change adaptation goals. Their involvement is over all needed at the step of assessing and approving adaptation options.
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Key message 5.1: Raising awareness among the inhabitants or stakeholders to ensure a wise use of water resources, increase acceptance

Raising the political leaders’ awareness about the opportunities and synergies of adaptation measures on all levels is still necessary to enhance integration into strategies. Additionally, obstacles that stand in the way of implementation on the local level need to be communicated openly (see the D.T4.2, factsheet 3.2 Improvement of policy documents in Pilot Area UPPER LUSATIA).

Raising public awareness or keeping this knowledge base alive through transfer strategies is also a necessary task for the execution of essential guidelines or regulations (see factsheet 3.7 Improvement of policy documents in Pilot Area Waidhofen/Ybbs 3.7 Improvement of policy documents in Pilot Area Waidhofen/Ybbs).



!!! The map of climate indicators within the TEACHER-CE Toolbox CC-ARP-CE may be a good starting point to illustrate the CC impacts. Cross-fertilized projects, e.g. RAINMAN provides an online knowledge platform, which offers good practice examples and guidance on (1) assessment and mapping, (2) a catalogue of risk reduction measures with additional detailed information on retention, prevention, spatial planning, early warning and emergency response and (3) risk communication.

Key message 5.2: Enhancing cooperating with stakeholders

To reduce consequences of climate change impacts policies and strategies for the management of water need to be developed in close cooperation of all relevant groups and stakeholders. For example in the PA Kamniška Bistrica, the management of drinking water supply is related or affected by most of the fields of actions. The biggest impact is seen by Fluvial and Pluvial flood risk management. In order to effectively face the problems related to surface water and groundwater, cross-sectoral cooperation between these three areas is required (see the D.T4.2, factsheet 3.1 Improvement of policy documents in Pilot Area Kamniška Bistrica River Basin). The factsheet 3.6 Improvement of forest ecosystem adaptability towards climate change in Pilot Action “Vienna Water Drinking Water Sources” underlines also that the communication and cooperation strategy between Vienna Water and alpine pasture farmers has to be continued in order to ensure the integration of water protection and climate change issues in management concepts for this land-use type.

!!! Setting up consultative and participatory mechanisms to enable multi-stakeholder engagement in the adaptation process and a continuous communication process for the engagement of the different target audiences, is one of the task from the guideline of the D.T4.1.2 deliverable

Key message 5.3: Privileging a bottom-up decision making system

The recommendation nr 1 should not be a justification to apply a top-down decision-making system. The bottom-up system is more recommended in terms of water management (see the Hungarian Forum report - Annex 1).

5.7. General recommendation no. 6 - Developing a science-based and data-driven strategy and implementation

Description of the recommendation:	The strategy should be based on strong scientific reference and reliable data. The implementation of the measures from the strategy should be monitored, as well as their contribution to relevant national or international commitments.
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Key message 6.1: Developing science-based strategies



Develop science-based strategies, and aligning measures proposed within them with strategic adaptation goals. This exercise should be transparent: the policy document should clearly explain how climate change is taken into consideration (see the Czech Forum report - Annex 1). More clarity is needed on how specific measures fulfil the goals, and how to implement them on specific site within the strategy. Closing data gaps, such as missing soil properties and forest vegetation mapping (see the Austrian Forum report - Annex 1).

!!! The map of climate indicators within the TEACHER-CE Toolbox CC-ARP-CE may be a good starting point to develop a science-based strategy.

Key message 6.2: Monitoring implementation progress, contributions and changing conditions

For implementing strategies, provide simple measurable (preferably non-site specific) indices to measure the policy contribution to relevant national or international commitments. Novel approaches to monitoring and continuous monitoring networks should support implementation of strategies, including harmonisation and homogenisation of data, future projections and modelling.

!!! Identifying indicators to evaluate the achievement of the objectives is one of the tasks from the guideline of the D.T4.1.2 deliverable

6. Operational recommendations to integrate the dynamics of the effects of CC in the planning process of policy documents

Operational recommendations take the form of a step-by-step guideline. They aim to integrate the dynamics of the effects of climate change in the planning process of policy documents associated - directly or indirectly - with water management. In other words, they try to ensure that the document's objectives are met despite the climate risk. The guideline mainly refers to the CC-ARP-CE tool and the cross-fertilized projects and considers the assumptions of the European Climate Adaptation Platform "Climate-ADAPT".

The recommendations apply to update an existing document or to prepare a new one (further referred as "reviewed document").



Guidelines	Tools and sources
Step #0 - Preparing the ground	
<ul style="list-style-type: none"> • Obtaining political support for adaptation • Setting up consultative and participatory mechanisms to enable: <ul style="list-style-type: none"> ○ the multi-stakeholder engagement in the adaptation process, ○ a continuous communication process for the engagement of the different target audiences, • Assigning roles and responsibilities of the “core adaptation team” responsible of the review of the strategy within the administration, setting up institutional cooperation, • Identifying and securing human, technical and financial resources 	<ul style="list-style-type: none"> • Local knowledge • Adaptation support tool (Climate - ADAPT platform)
Step #1 - Identifying and prioritising the relevant fields of action in the local context	
<ul style="list-style-type: none"> • Identifying which fields of action are considered as a relevant local issue: <ul style="list-style-type: none"> ○ Fluvial flood risk (management) ○ Pluvial flood risk (management) ○ Groundwater management ○ Drinking water supply (management) ○ Irrigation water (management) ○ Water Scarcity and Drought risk (management) ○ Management of water-dependent ecosystems ○ Other • Prioritising identified fields of action 	<ul style="list-style-type: none"> • Local Knowledge/ needs • Scope of the reviewed document • FRMP, RBMP • National CC adaptation strategy
Step #2- Assessing the climate change impacts	
<ul style="list-style-type: none"> • Recognizing past and present climate impacts (overview of past climate and extreme weather events, their consequences and existing response actions is in place) • Assessing the climate change impacts at the proper scale: <ul style="list-style-type: none"> ○ in the atmospheric subsystem; ○ in the hydrological subsystem; ○ in the hydrogeological subsystem; ○ in the frequency of extreme meteorological events. • Assessing the climate changes impacts with the appropriate timeframe. If possible, the time interval of the CC projection should fit to the timeframe of the policy document according to the objectives schedule of step #1. The time interval and the timeframe should fit together/overlap but do not need to be equal: If two climate projections (both showing comparison to a reference year of the climate projection) in-relatively short interval (e.g. <10 years) would be compared, the effects of climate change might not be significant. This is especially true for near-future projection. For short time intervals the projections cannot provide year-by-year forecast but should be exploited to identify trends and tendencies. The timeframes of CC 	<ul style="list-style-type: none"> • CC-ARP-CE tools: <ul style="list-style-type: none"> map of climate Indicators; reference EU and national links • FRMP • National CC adaptation strategy and/or plan



Guidelines	Tools and sources
<p>projection and policy objectives, should consider the lifespan of the investment measures prescribed in the policy document.</p>	
Step #3 - Describing the various fields of actions and objectives	
<ul style="list-style-type: none"> • Describing the state of art of the different fields of actions, understanding the evolution of the water demand • Describing objectives of the different field of actions • Setting up a schedule to reach the objectives (the time perspective of the reviewed document) • Using GIS methodologies/tools indicating potential needs (vulnerabilities) and possibilities (capacities) of NSWRM development based on multi-criteria analysis taking into account environmental conditions 	<ul style="list-style-type: none"> • Regional and national policy documents or other local documents • FroGIS (FRAMWAT)
Step #4 - Assessing the Climate Change risks associated with your objectives - Integration of the Step #2 with the Step #3	
<ul style="list-style-type: none"> • Preparing the assessment by determining the impact of the climate changes on the field of action objectives defined in the reviewed document, by: <ul style="list-style-type: none"> ○ identifying of connections between fields of action to understand the interdependencies and maximize the cross-sectoral benefits at the step #5 ○ identifying the impacts of climate change on the on the water use, considering the interactions between fields of actions ○ checking the robustness of the measures planned in the reviewed documents or its assumptions (climate change resilience test) • Assessing the climate change risk by developing an impact chain¹¹ by identifying and organizing its 3 components: <ul style="list-style-type: none"> ○ the hazards (e.g.: too high temperatures) on the basis #2 ○ the vulnerabilities (e.g.: unfavourable soil conditions) - on the basis of the step #3 ○ the exposures (e.g.: high proportion of agriculture in the local economy) on the basis #3 <p>which finally will lead to the risk (e.g.: risk of water scarcity for local farmers) and may initiate brainstorming session on potential adaptation measures.</p> 	<ul style="list-style-type: none"> • Climate - ADAPT platform • Risk Supplement to the Vulnerability Sourcebook Guidance¹² • Seed4forest - Forest CC vulnerability assessment tool and seed transfer models (SUSTREE)

¹¹ According to the Risk Supplement to the Vulnerability Sourcebook Guidance, an impact chain is an analytical tool that helps you better understand, systemise and prioritise the factors that drive risk in the system of concern. It is composed of 3 risk components: hazard, vulnerability, exposure.

¹² The Risk Supplement to the Vulnerability Sourcebook Guidance on how to apply the Vulnerability Sourcebook's approach with the new IPCC AR5 concept of climate risk is available from the Climate - ADAPT platform database at the address <https://climate-adapt.eea.europa.eu/metadata/guidances/risk-supplement-to-the-vulnerability-sourcebook-guidance-on-how-to-apply-the-vulnerability-sourcebook2019s-approach-with-the-new-ipcc-ar5-concept-of-climate-risk>

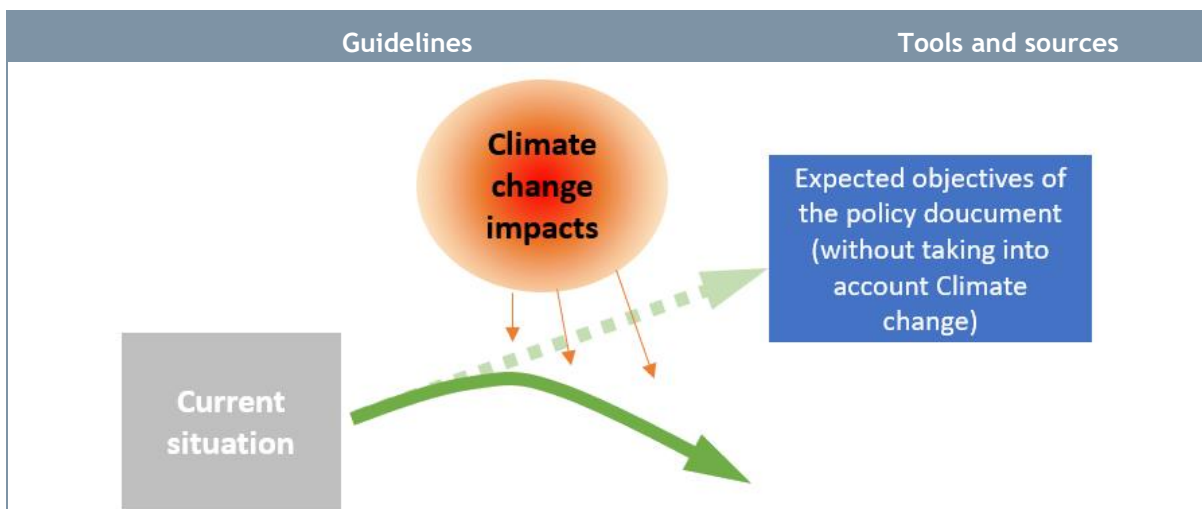


Figure 9. Climate change impacts associated with the objectives of the policy document

Step #5 - Identifying, assessing and selecting adaptation measures	
<ul style="list-style-type: none"> • Defining the operational priorities, e.g.: how much your objectives are time bounded? What is the affordability of the actors? E.g.: the ranking and catalogue of measures of the CC-ARP-CE Tool provides a prioritisation system with 4 criteria: <ul style="list-style-type: none"> ○ cost; ○ duration and complexity of implementation; ○ robustness; ○ multi-functionality • Involving stakeholders in the development of the prioritization/ selection system for adaptation measures or in the process of weighting criteria • Using Decision Support Tool (DST) developed for supporting the implementation of innovative Best Management Practices (BMPs) • Completing the analysis by discussing with stakeholders about the best way to address vulnerabilities (tackling sensitivity or enhancing capacities to moderate impact). 	<ul style="list-style-type: none"> • CC-ARP-CE tool: Catalog of measures • Seed4forest - Forest CC vulnerability assessment tool and seed transfer models (SUSTREE) • DSS and Planning NSWRM (FRAMWAT) • GOWARE tool (PROLINE) • RAINMAN toolbox • Local knowledge/ needs • Adaptation support tool (Climate - ADAPT platform)

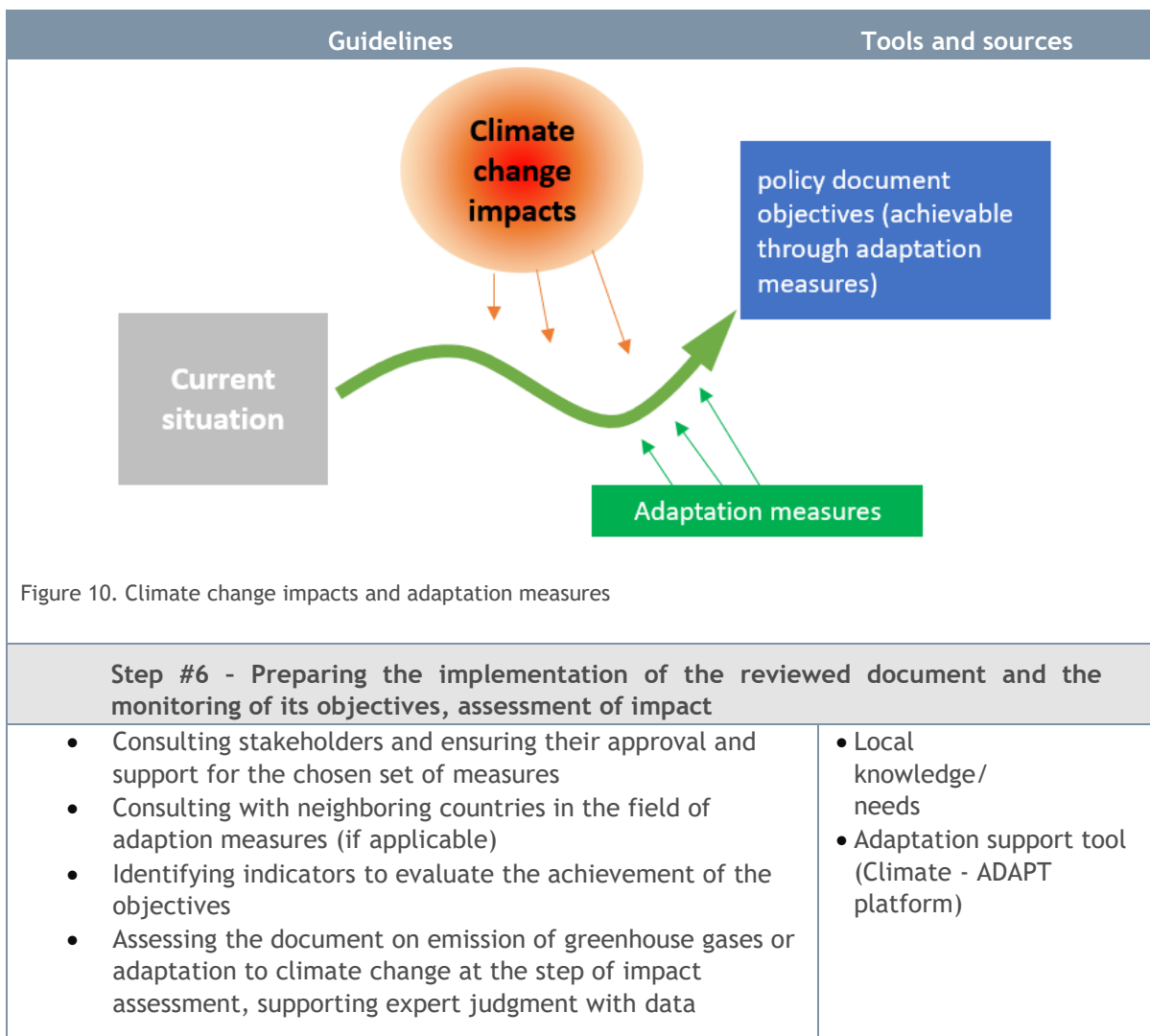


Figure 10. Climate change impacts and adaptation measures



7. Conclusions

- > The work package T4 aims to identify measures to be taken to better integrate CC-aspects in water management and, therefore, to give a better implementation of WFD, FD, DWD, RBMP at the local level using TEACHER-CE Toolbox CC-ARP-CE.
- > As a first step to achieve the above-mentioned objectives, the gaps identified in the previous deliverable have been consolidated and thematically organized in 6 groups:
 - > Knowledge / data and tool availability;
 - > Lack of adaptation measures;
 - > No CC- resilience test of measures;
 - > Planning / Communication / Management;
 - > Weak assessment of the document impact on CC (greenhouse emission/ adaptation);
 - > Weak description of the climate change issue.
- > Each gap has then been associated with tools developed within TEACHER-CE and the cross-fertilized projects, as a way to address it (see chapter 4). The most majority of gaps come from 2 groups:
 - > Knowledge / data and tool availability;
 - > Planning / Communication / Management.
- > The tools developed within TEACHER-CE and the cross-fertilized projects fill the gaps in the “Knowledge / data and tool availability” group particularly well, as this is often one of the primary objectives of the projects themselves.
- > The Gaps related to the Planning / Communication / Management processes were considered for the preparation of the main recommendations for improvement of existing policy documents.
- > The recommendations for improvement were completed with the outcomes from case studies for each Pilot Area (see the of factsheets from the deliverable D.T4.2). In each case study documents were identified, which may be improved by implementing TEACHER-CE Toolbox CC-ARP-CE an/or recommendations. The propositions were discussed within Forums to connect the key stakeholders to the project outcomes. Following key messages for improving policy documents to better address climate change issues have been identified:
 1. Use the potential of local spatial development plans;
 2. Prioritize the implementation of flood risk management measures in accordance with the EU Floods Directive to achieve equal safety and equal economic risks;



3. Better integrate water management and planning from the begin of a planning processes;
4. Provide more detailed predictions on climate change effects on water uses, considering extreme events;
5. Identify connections between fields of actions to maximize the cross-sectoral benefits;
6. Broaden the scope of CC adaptation documents to cover relevant;
7. Improve the efficiency of water uses for the goods of all sectors by regulation/controls;
8. Improve water retention capacity of a river basin;
9. Implement sustainable land use in entire river basin;
10. Raise awareness among the inhabitants or stakeholders to ensure a wise use of water resources, which leads to increase acceptance;
11. Enhance cooperating with stakeholders;
12. Develop a Science-based strategies;
13. Monitor implementation progress, contributions and changing conditions.
 - > Key messages operational implementation was facilitated by linking them to the TEACHER-CE tools. Furthermore, the step by step guideline develop in the D.T4.1.2 will assist the mainstreaming of the CC dynamics and its effects in the planning process of policy documents directly or indirectly associated to water management (see chapter 6).
 - > As such the TEACHER-CE provide an applicable strategy to improve the water management planning process in its key element - the local planning level. It is designed to address gaps identified in policy documents. Therefore, its implementation enable local stakeholders to better address climate change issues.



>

8. References

References to the Chapter 3

- > White paper - Adapting to climate change: towards a European framework for action {SEC(2009) 386} {SEC(2009) 387} {SEC(2009) 388}, COM/2009/0147, available on European Union web site: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52009DC0147>
- > COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS An EU Strategy on adaptation to climate change, COM/2013/0216, available on European Union web site: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52013DC0216>
- > COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change, COM/2021/82 final, available on European Union web site: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:82:FIN>
- > Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law'), available on European Union web site: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R1119>
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References to the Chapter 5

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- > The Climate ADAPT platform - Sharing Adaptation Knowledge For a Climate-Resilient Europe, available at the address: <https://climate-adapt.eea.europa.eu/>
- > The Risk Supplement to the Vulnerability Sourcebook Guidance on how to apply the Vulnerability Sourcebook's approach with the new IPCC AR5 concept of climate risk, available from the Climate - ADAPT platform database: <https://climate-adapt.eea.europa.eu/metadata/guidances/risk-supplement-to-the-vulnerability-sourcebook-guidance-on-how-to-apply-the-vulnerability-sourcebook2019s-approach-with-the-new-ipcc-ar5-concept-of-climate-risk>

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