Interreg

EUROPEAN UNION

Danube Transnational Programme

CAMARO-D

Concept for a Transnational Land Use Development Plan (LUDP)

06/2019

Project co-funded by European Union funds (ERDF, IPA)

Contents

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1. Introduction

The development of holistic land use planning for river catchment areas comprises a number of interdependencies between land use practices and water resources. These linkages are characterized through the effects of anthropogenic activities, land cover alterations and land degradation on ground water resources, water quantity, surface run off, water quality and water pollution. It can be argued that the status of water resources reflects the sustainability of land use practices that are implemented in the catchment area. Through the assessment of land use practices in pilot areas it has been noticed that they are framed by the topographic and climate conditions and most importantly by cultural, political, technological and economic factors, which differ from country to country. The Danube region is not homogenous and considering the mix of factors, the development of a blueprint methodology for integrated land use planning should adhere to local and regional differences.

The Danube region has a great diversity of landscapes that are the result of both natural processes and the long history of human land use. Many problems of land use are specific to particular areas, not only because of their differing physical environment but also because of local and cultural social conditions.

Watershed management is a dynamic and continually readjusting process. Thus it requires a multidisciplinary and flexible approach.

The successful establishment of function oriented land use management is based on scientific research, which is able to attract stakeholder involvement and create room for strategic policy and decision making.

2. Planning area

With more than 800,000 km^2 or 10 % of continental Europe, the Danube River Basin extends over the territories of 19 countries. The Danube River Basin is home to 83 million people with a wide range of cultures, languages and historical backgrounds. It is considered as the most international river basin in the world. In the CAMARO-D project 9 countries of the Danube region with 14 project partners are participating.

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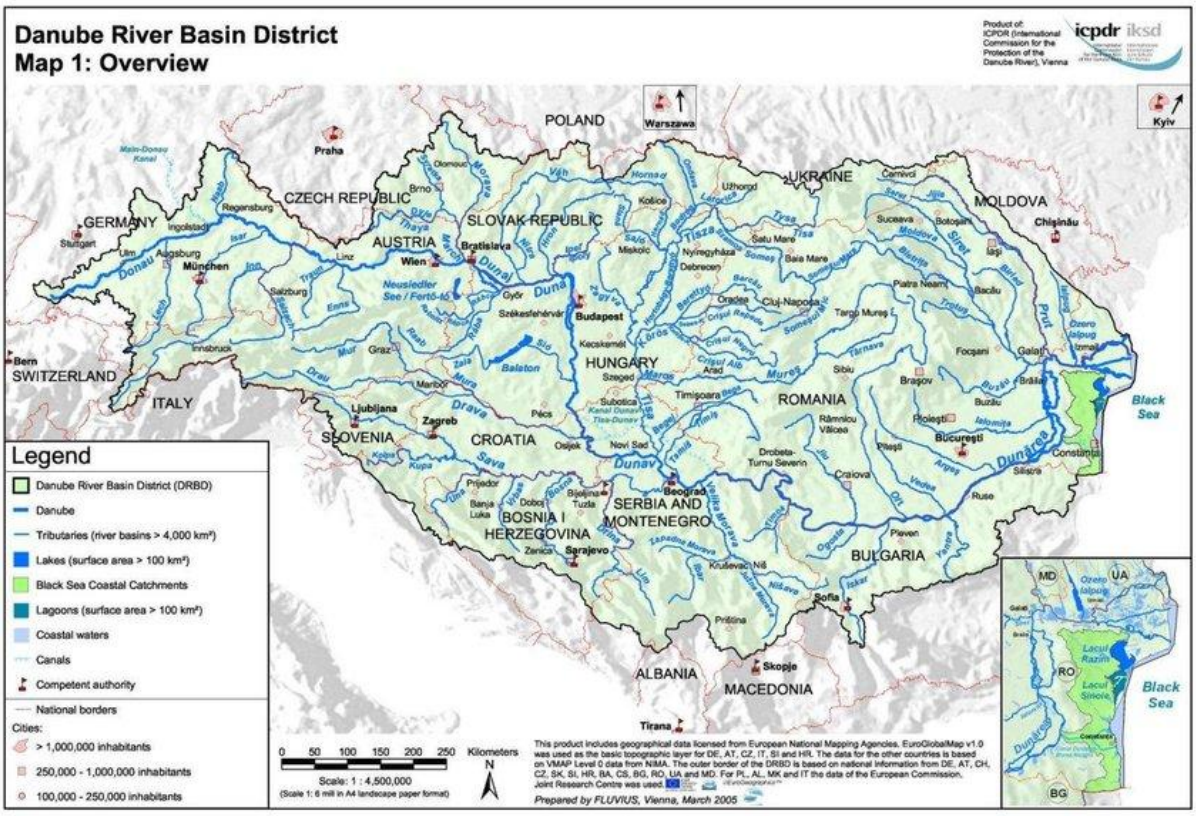

Fig. 1: Danube River Basin (ICPDR, 2016)

CAMARO-D aims at the coordination and harmonization of different function-oriented land use practices against the background of water management. It also provides initial steps for a transnational catchment-based cooperation.

The methodology used in the project identifies existing pressure on water resources and relates them to different land use practices and related policies. The project participants investigated these linkages while engaging in collaboration with local population, institutions and governmental authorities. During this process specific problems regarding the relation between land use practices and water management were detected, which built the foundation for the development of watershed based interventions. Pilot areas in partner countries throughout the Danube river basin were assessed and both direct and indirect interventions were implemented according to three clusters, respectively three types of water bodies – groundwater, torrents and small rivers as well as rivers and accumulation lakes.

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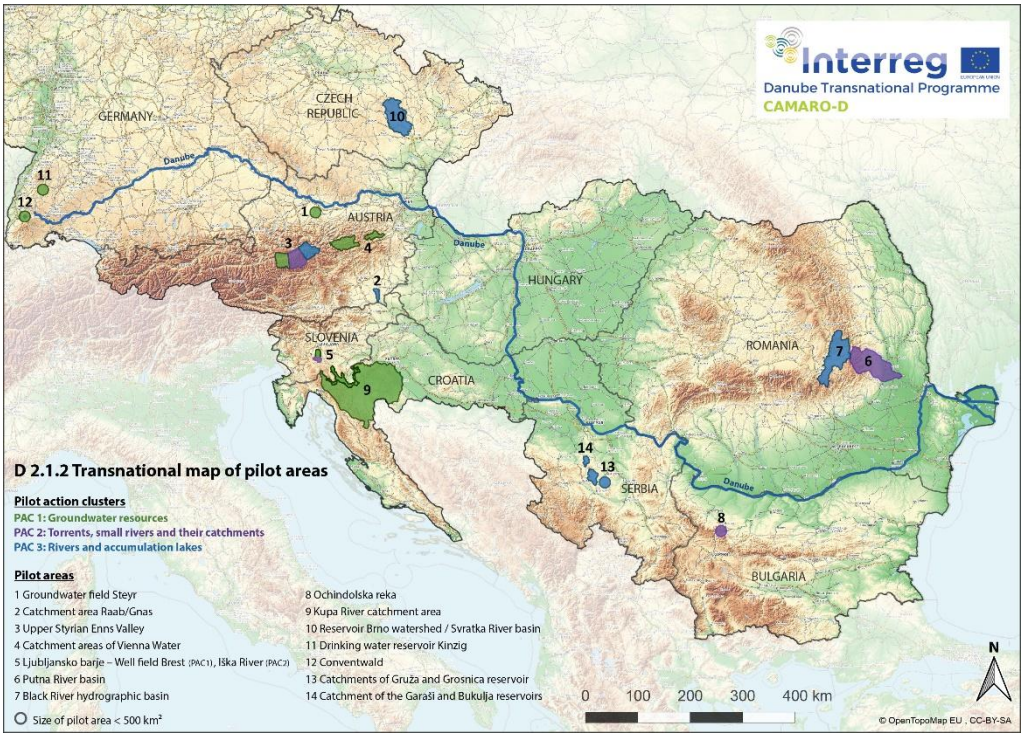

Fig. 2: Transnational map of pilot areas

The three pilot action clusters are a central element of the pilot activities which were conducted in CAMARO-D. Therefore, three manuals for practitioners in the sphere of water and land-use management were elaborated. The clusters highlight the relation of different land uses with the relevant types of water bodies (groundwater, torrents and small rivers, rivers and accumulation lakes), allowing to delineate best practices in the various contexts, always with a transnational aspect.

This transnational approach means that certain “problems” were identified in several countries of the Danube River Basin and the respective best practices were elaborated by the whole project consortium. In the course of developing the three cluster-manuals which – according to the application form – concentrate on transnational issues, the partnership elaborated 12 transnational best practice manuals (BPMs), some of them covering even more than one cluster and two of them being applicable for all clusters (table 1). This concerns the manual regarding the control of invasive plant species and the manual on awareness raising. The latter meets the need to also include indirect

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measures and thus puts the emphasis on the question: how is it possible to communicate with the relevant target groups & stakeholders and how can they be involved in the relevant process and convinced that their contribution is needed? For certain issues it also seems important to include national experiences to show the wide range of possible solutions, which are also applicable in other countries.

<table>
<tr><th>CLUSTER 1
Groundwater resources</th><th>CLUSTER 2
Torrents and small rivers</th><th>CLUSTER 3
Rivers and accumulation lakes</th></tr>
<tr><td>Groundwater protection through targeted silviculture</td><td rowspan="2">Tailored forest management in torrential watersheds</td><td>Adapted agriculture for optimal surface water and soil protection under climate change</td></tr>
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Table 1: Overview of CAMARO-D Best practice manuals

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3. Land use types and their interdependences with water management

3.1. Arable agriculture

Soil erosion can occur due to unsustainable agricultural practices such as inadequate tillage methods at the wrong time or planting of inappropriate agricultural crops. Improper drainage, ploughing steep slopes in downhill direction and use of heavy machinery on arable land result in soil compaction and soil erosion. Soil compaction creates disturbance on the morphological structure of soil resulting in increased surface water runoff. The uncontrolled use of pesticides causes a decrease in soil and ground water quality along with a minimal or no crop rotation. Furthermore, buffer zones are not always present between rivers and arable land, which disrupts the structure of river banks.

The uncontrolled use of pesticides and fertilizers, liquid manure and fertilizers in intensive agriculture increases pollution of water resources and degradation of groundwater quality. This may affect groundwater sources designated for drinking water supply. There are regulation regimes for proper cropland management in drinking water protection zones (DWPZ) and sanitary protection zones, in order to protect drinking water, but groundwater pollution is still possible. The ineffective implementation and enforcement of existing regulations for DWPZ influences drinking water supply, restrains sustainable drinking water management and leads to a deterioration of water quantity and quality.

Inadequate cultivation of arable land leads to increased soil erosion, surface water runoff and related flood risk. The main problems are related with abandoned and degraded farmland, or vice versa areas with intensive grazing and crop farming.

Surface and diffuse sources of water pollution are linked to inadequate agricultural land use and agricultural cultivation technologies. Nitrogen input predominantly results from agricultural land via sub surface waters, drainages, and general outflows. The active phosphorus mainly comes from municipality wastewaters, but total phosphorus is also

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caused by arable land during erosion events. This also affects surface water and leads to eutrophication.

Land use changes - leading to erosion, land degradation and soil compaction - and climate change (trends and extreme events) decline water retention capacity and increase the risk of flash floods and drought.

There are further risks for wetlands out of watercourses in terms of silting by eroded material. Protection of wetland is an important part of nature conservation and guarantees the conservation of soils as well as water quality.

3.2. Forestry

Forest ecosystems can be described as excellent land-cover for the protection of groundwater resources and can provide efficient and sustainable preservation. Forest ecosystems with high-level water protection functionality provide (1) good infiltration conditions for precipitation water, (2) storage capacity for the water infiltrated in the soils and also on plant surfaces, (3) snow storage capacity, (4) prevention or mitigation of erosion processes like mudslides, rock-fall or snow-avalanches, (5) stabilization of soil and humus layers and (6) filtration of precipitation water. The whole set of forest ecosystem functions for the achievement of groundwater protection has to be protected or restored in a sustainable way.

Inadequate forest management practices (e.g. clear cuts) or forest dieback due to bark beetle infestations cause forest ecosystem destabilization, reduced nutrient uptake from soils and increased soil mineralization, hence nitrate export to groundwater resources and their turbidity are increased.

Conifer-monocultures (e.g. Norway spruce plantations) often are instable, especially regarding climate change impacts. Additionally, they accelerate soil acidification and nitrogen saturation. Furthermore, increasing concentrations of dissolved organic carbon is a serious issue for drinking water management. As stability and resilience are the

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most important features of forest ecosystems within the DWPZ, an autochthonous set of tree species should be established.

The use of heavy machinery leads to soil compaction, decreased soil morphological structure and increased surface runoff, so that groundwater quantity can be negatively influenced, especially under water saturated or unfrozen conditions. The increased surface runoff leads to high risk of soil loss, respectively erosion dynamics and subsequently to a higher probability of flash floods. Furthermore, the use of forest machinery poses a potential negative impact on water resources in case of accidental mineral oil spills.

In some areas selective browsing damages caused by artificially elevated wild ungulate populations can endanger or hinder the regeneration dynamics of the forests and hence can destabilize whole forest ecosystems.

The extensive construction of forest roads can influence the hydrological behavior of whole watersheds in a negative way and may cause site specific negative effects on surface water runoff.

In some countries there is a lack of regulations and further legal restrictions, for example for inadequate practices like soil milling, the use of heavy forest machinery or clear cut applications. Deforestation is a stressor for soil erosion. It decreases the holdup capacity of the catchment area, which can lead to a fast water flow and ultimately to an increasing flood risk. Trees on the river banks contribute to the stability of the bank and reduce erosion. Therefore, reforestation of such areas needs to be planned and long term monitoring conducted in order to ensure the role of forests within DWPZ or within torrential watersheds concerning erosion control, especially on steep slopes.

Homogenous forest ecosystems within the Water Protection Zones are instable due to rapid expansion of bark-beetle infestations and exposure to strong winds. The health condition of forests is closely related to water conditions.

The clear cutting technique, frequently utilized in forest management, coupled with the cultivation of mono cultures (such as Norway spruce), leads to the loss of biodiversity, which opens room for invasive plant species. The influence of invasive plant species on

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runoff behavior and water balance in torrents and forests surrounded has become more important in recent years.

Regeneration of forests in the process of erosion and torrent control is assessed as a cheap and effective measure. The regeneration processes need to be managed and directed to ensure future adaptation and sustainability. The natural transformation and succession processes have to be observed and maintained according to the long-term forest management goals. Vital and stable regeneration of all tree species within forest ecosystems is important for their sustainability and for their adaptation under climate change conditions, which increases their role for protection of water resources.

Forest fires influence water quality and increase erosion risks on steep slopes in the watersheds. Forest fires are nowadays the main natural hazard affecting Southern Europe. Climate change is expected to cause more droughts, higher temperatures and an increase in windy periods, which will raise the number and severity of fires. Due to already observed climate change impacts the forest fire risk increased also in the northern part of Europe. Additionally, large fires hamper biodiversity conservation and have a great influence on water quality.

3.3. Grassland and alpine pastures

Due to livestock grazing the intensive cultivation of grassland and alpine pasture is causing changes in biodiversity, landslide hazards, erosion, surface water runoff, soil degradation and eutrophication.

On sustainably managed alpine pastures, erosion phenomena are kept to a minimum. Water supply on alpine pastures is not always guaranteed or the type of spring tapping must be improved. Groundwater protection needs adequate alpine pasture management (undamaged closed vegetation cover, grazing adapted to plant growth, appropriate number of grazing animals on the site). The storage capacity of farm manure, the condition of wastewater treatment plants, and the application of nitrogenous farm manure can influence groundwater quality negatively.

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Uncultivated or poorly maintained pastures provide favorable conditions for invasive plant species, especially within the montane zone. There is a lack of directives for implementation and appropriate management practices for the elimination of alien plant species. On grassland and in wet meadows, the interdependency of cultivation and water management is complex. Changes in land use may influence the soil water balance, excessive use of pesticides or fertilizers, heavy machinery and intensive cultivation exert negative influence on soil water balance and biodiversity. Invasive plant species spread in protected wetland areas and along the edges of watercourses and impair river bank protection measures or lead to erosion phenomena.

Fertilizers or the application of pesticides on grasslands impair water quality. Pastures are vulnerable in terms of inappropriate grazing. Intensive grazing causes soil compaction and thus impairs the infiltration capacity of soils. Soil erosion on grassland occurs due to unsustainable cultivation (e.g. inadequate grazing or intensive movement of livestock on waterlogged soil). Sustainably cultivated grassland is able to prevent erosion.

3.4. Urbanization and spatial planning

Increased pressure from urbanization, industrial and commercial sites, road infrastructure, ski resorts and other touristic facilities impairs water resources due to insufficient waste water management, accidental spills, and increased surface water run off on sealed surfaces and a widespread lack of regulations concerning strategic spatial planning. Legislation regulating industrial activities is widely insufficient regarding avoidance of water pollution.

One of the project goals is to introduce catchment oriented (spatial) planning in flood risk management and water resources protection which is in compliance with the flood policy outlined in the EU Floods Directive and the EU Water Framework Directive. Regarding spatial planning, however, there is a gap between the organization of spatial planning (along administrative units) and the planning area of water management

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stakeholders (catchments and river stretches). A new approach for controlling river floods by means of "making space for water" instead of exclusively implementing engineering solutions is proposed, and thus also spatial planning instruments can be used to reduce vulnerability against flooding. Conserving and restoring river floodplains is regarded as one central element of the flood risk management plans which were introduced for areas of potentially significant flood risk until the end of 2015, as demanded by the EU Floods Directive. In order to organize (spatial) planning at catchment level two planning options can be realized: regional planning as a regulatory planning approach and voluntary cooperation of stakeholders at catchment level.

River floods usually do not stop at administrative borders. As trans-boundary phenomena within river basins even small flood events frequently cross municipal or provincial borders, whereas large flood events may affect several countries, as in the case of recent European flood events in Central Europe (2013) and in the Balkan region (2014). Although river floods are triggered by natural events (e.g. heavy rainfall, snow melting), human activities (e.g. settlement development, structural flood protection) have significant impacts on downstream effects of flooding. Contrary to the catchment and river basin orientation of water management, the focus of spatial planning measures for flood risk prevention in many countries is still at the local planning level, in most cases the municipal level. This applies both for planning laws and planning practice whereas flood hazard information is widely available at a regional scale.

Usually, in the upper river stretches of mountain areas, where the main drinking water supply sources are located, the pressure on water resources due to a lack of human interventions is low. The implementation of corresponding regulations and legal requirements are the basis for water quality protection in water protection zones (WPZ) where economic and recreational activities are forbidden but often not properly controlled. Some WPZs are not maintained in compliance with the legislation and the related river basin management plans.

The change of the hydrological regime in rivers is caused by various factors including the modification of river morphology (e.g. river training, torrent corrections, sills in the

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river course, small melioration systems), the change of agricultural land and marshes to urban areas and the presence of hydraulic facilities and reservoirs. Additionally, climate change impacts (intensive rains, flash floods, draughts) significantly influence surface and groundwater not only affecting the quantity but also water quality.

Regarding flood protection spatial planning is effective in preventing land uses with high potential flood damages to be realised in flood prone areas.

Urbanized territories have the most significant impact on water resources due to the expansion of settlements, high land take for industrial and commercial areas as well as single family housing, road infrastructure and the status of sewage systems and purification plants. Furthermore, surface runoff due to urbanization increases the risk of both river floods and flash floods.

Recreational facilities, tourism and municipal waste water management, septic tanks and lack of sewage systems are potential sources of water pollution. Furthermore, water pollution is caused by hazardous waste disposal and respective treatment infrastructure, legal and illegal dump sites as well as gravel and sand extraction.

4. The role of land use planning in water management

Within the DPSIR (Drivers, Pressures, State, Impacts and Responses) Framework, the interventions to manage the impacts of human action or to induce the required system changes (which is the main purpose behind any plan, e.g. improve the environment, mitigate the effects of climate change, increase water retention, protect people and property from floods etc.) can:

1. Eliminate, reduce or prevent pressures from occurring
2. Compensate and/or mitigate the impacts
3. Restore the previous state or influence the transformation to a new state, and
4. Modify, substitute or remove the drivers.

The water related land use planning could be focused on the same response paths within the DPSIR Framework.

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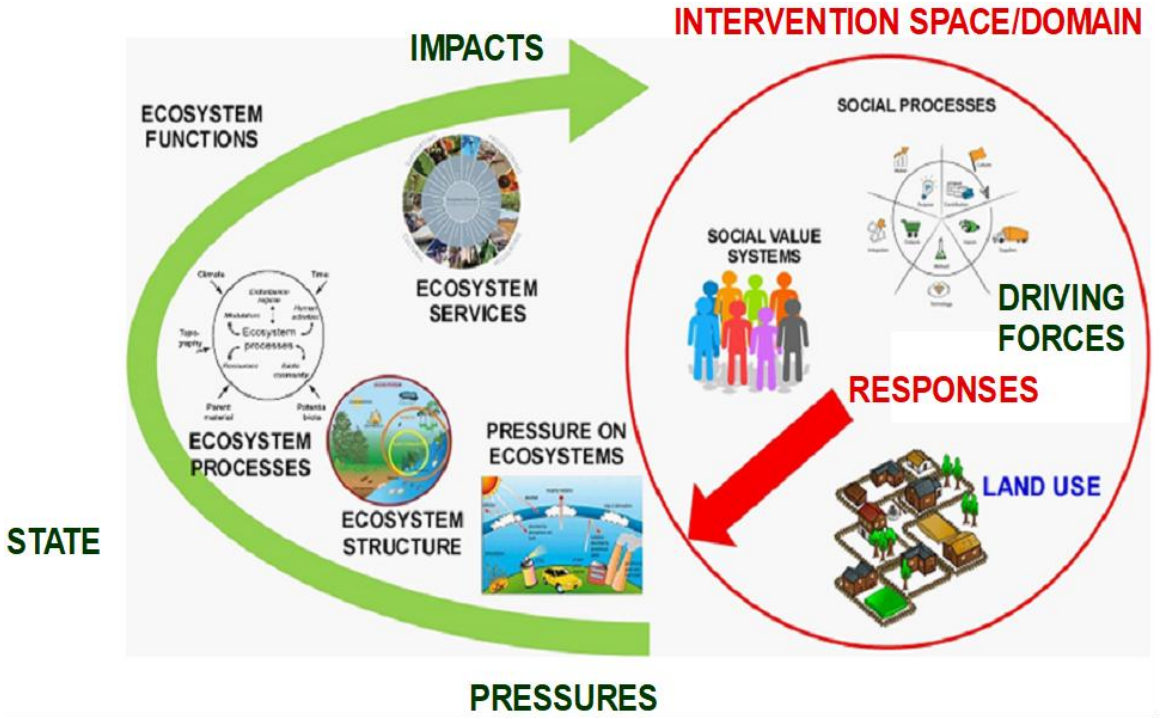

Fig. 3: DPSIR Framework in the context of ecosystem based land use planning framework

The effectiveness of water related land use plans is a function of social value systems and social processes in any given society and territory, but can also, in the long run induce change in both social value systems and social processes if applied with diligence and expertise.

Interestingly when put in context of ecosystem based causal paths within the DPSIR Framework the feedback mechanism tends to be positive in nature and can generate restoration of ecosystem functions and increase the value of benefits delivered to society as a result of the implementation of the plan.

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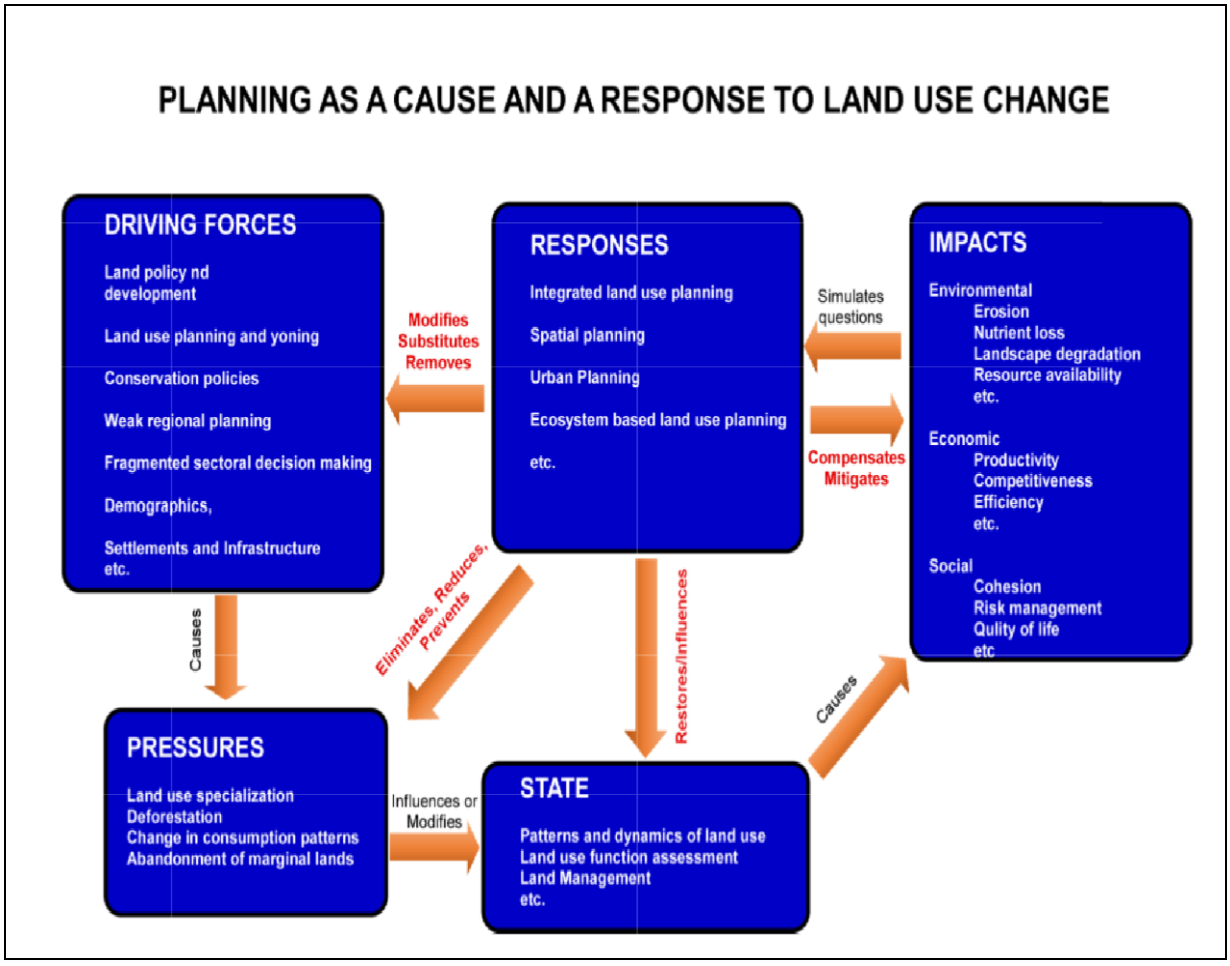

Fig. 4: DPSIR Framework applied to water related land use planning.

Land use planning and water management should be coordinated since the two are connected. The identification and prioritization of land use planning-related issues is usually an iterative process, with priorities emerging during the situation assessment baseline and future scenario analysis. During this process, understanding improves around these issues, particularly as they relate to specific problems and zones in the basin. In some cases, causal relationships are explored to describe the base and intermediate causes of an issue. Important considerations in assessing the priority of an issue include:

- the current social, economic or ecological severity of impact associated with the issue

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- the future expected severity of the issue under changing circumstances
- the uncertainty associated with current understanding or future implications
- the feasibility and the degree to which water related basin wide land use planning can address the issue.

These priority issues are used in three distinct ways in the basin strategy process:

- to refine the substantive principles on which the remainder of the process will be based, in order to reflect the specific nature of the basin planning challenges and opportunities
- to guide the focus for the basin visioning and objective setting process
- to indicate the thematic areas of focus (systems) that must be developed as part of the basin planning process, which will eventually be rolled out into land use plans.

5. How to implement the Land Use Development Plan (LUDP)

5.1. Determination of planning area

The LUDP should be applicable at various scales reaching from small local catchments (e.g. local surface water runoff, small drinking water catchments) to larger river basins or river stretches. The different sizes of pilot action areas in CAMARO-D can provide an indication for that. The contents of the LUDP can be adapted to the size of the planning area accordingly: from detailed measures like priority zones up to strategies and guidelines.

When selecting the planning area, those areas should be prioritised which have a strong spatial relation to “Protected Areas” (due to EU Water Framework Directive, Art. 4) and/or “Areas of Potential Significant Flood Risk (APSFR)” (due to EU Floods Directive, Art. 5).

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PROTECTED AREAS UNDER WFD (ART. 4):

1. Areas designated for the abstraction of water intended for human consumption under Article 7;
2. Areas designated for the protection of economically significant aquatic species;
3. Bodies of water designated as recreational waters, including areas designated as bathing waters under Directive 76/160/EEC;
4. Nutrient-sensitive areas, including areas designated as vulnerable zones under Directive 91/676/EEC and
5. Areas designated as sensitive areas under Directive 91/271/EEC; and
6. Areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection, including relevant Natura 2000 sites designated under Directive 92/43/EEC and Directive 79/409/EEC.

AREAS OF POTENTIAL SIGNIFICANT FLOOD RISK (APSFR) UNDER FLOODS DIRECTIVE (Art. 5):

On the basis of a preliminary flood risk assessment as referred to in Article 4, Member States shall, for each river basin district, or unit of management referred to in Article 3(2)(b), or portion of an international river basin district lying within their territory, identify those areas for which they conclude that potential significant flood risks exist or might be considered likely to occur.

IMPORTANT: Additionally to these areas mentioned above also other endangered areas ("Hot spots" relating to risks identified in CAMARO-D: erosion, soil compaction, floods, water pollution, surface runoff, invasive plant species, groundwater recharge, surface and groundwater interaction) have to be taken into consideration.

The size of the planning area is to be determined in such a way that in all planning phases the requirements of water management, hydro-ecological and physiographical interdependences as well as land use influences can be considered in the catchment area.

When defining the planning area, the relevant influences and impacts of the tributaries and other connected water resources (e.g. groundwater) must also be taken into account and the processing depths be determined.

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5.2. Process steps

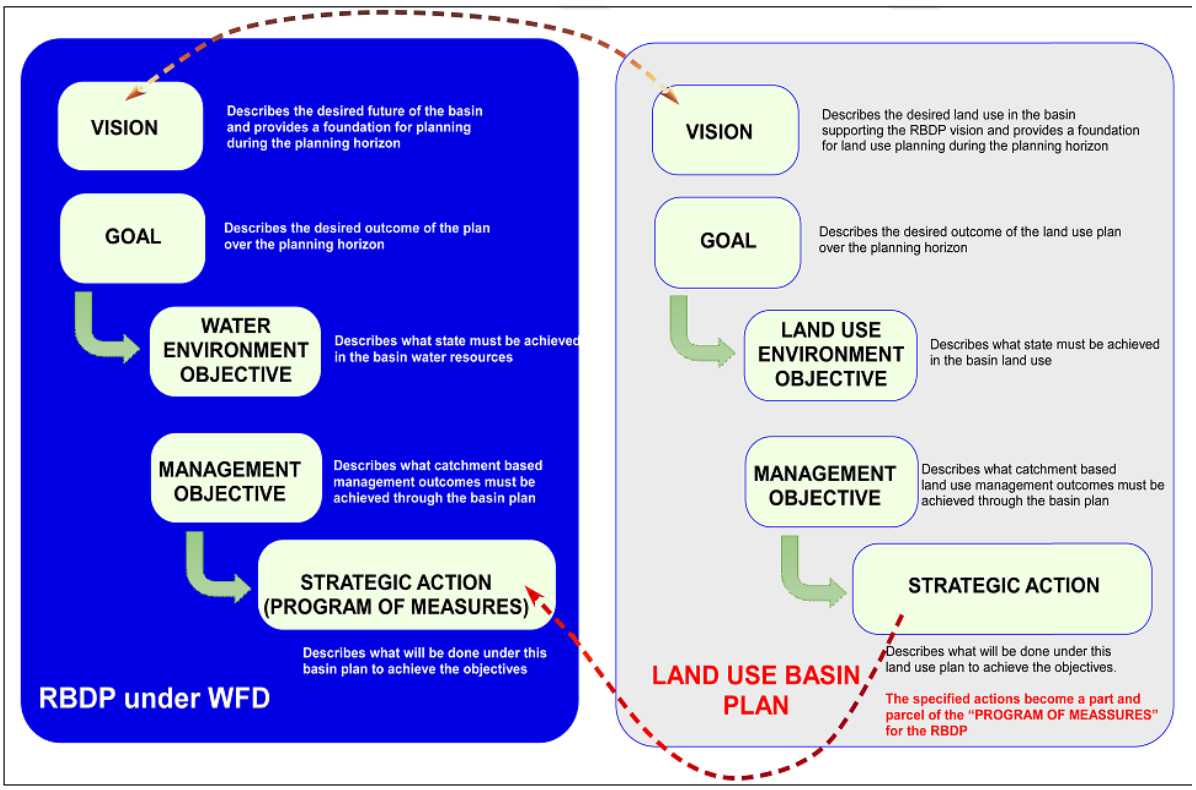

Fig. 5: Process steps of LUDP (Source: GUIDR)

Based on the „Guideline for watercourses development and risk management concepts" (BMLFUW, 2016) in Austria the following steps for implementation of LUDP were developed:

1. Preliminary study
2. Inventory
3. Definition of goals and objectives
4. Concept of measures.

5.2.1. Preliminary study

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- Distinction of the scope of work in the following process steps (inventory, definition of goals, concept of measures) based on existing data (especially of the River Basin Development Plan and flood risk management plans, additional studies and surveys, regional/sectoral plans, local land use plans etc.).

  When determining the scope of processing, spatial and content differentiation has to be made. This means that, depending on the data situation and specific **risks**, spatial focal points and different intensities of processing can be determined for the relevant streams or water resources. If measures for the main risks in the catchment area /planning area are already developed (e.g. in best practice manuals), these preliminary steps can be omitted.

- Development of a realistic time table

- Definition of the responsible institutions for the development of LUDP, who should be involved and how (project lead, project coordination etc.)? – Remark: According to the **type of water resources in the respective catchment area** (Cluster 1: groundwater resources, Cluster 2: torrents/small rivers or Cluster 3: rivers and accumulation lakes) and the risks, which were identified as well as the **actual land use respectively vegetation cover**, the relevant **stakeholder groups**, which should be involved in the planning process, can be seen in the **LUDP-xls-table**.

- Review and analysis of relevant coordination requirements of LUDP with other stakeholders in the planning area (tasks/staff/time resources of the respective governmental institutions within the planning process, assignment of external experts etc.) according to the previous mentioned issue

- Estimation of costs

- Review and analysis of relevant aspects for communication in the planning area (Status of information and public participation, acceptance by the population, definition of target groups etc.) – Remark: in the **LUDP-xls-table the awareness**

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raising possibilities and relevant stakeholder groups as well as relevant strategies/policies and funds/subsidies in this context are mentioned (in the last column)

5.2.2. Inventory

Review of existing data bases for the:

- Analysis of existing **risks** and management gaps
- Definition of goals and objectives/development of an integrative guideline
- Definition of the necessary measures: Concept of measures (**BPMs**).

Development of a digital map (GIS-coordination) with all relevant issues (e.g. ortho-photos, water network, drinking water protection zones, Natura 2000 areas, laser scan, local land use plans) – as a basis for LUDP.

Data which are still missing for the development of the necessary measure bundles (**BPMs**) have to be gathered.

5.2.3. Definition of goals and objectives

Based on an analysis of the most relevant / important existing risks and gaps (e.g. erosion, soil compaction, floods, water pollution, surface runoff, invasive plant species, groundwater recharge, surface and groundwater interaction) at catchment level respective **goals** (desired outcome of the land use plan over the planning horizon) and **objectives** (desired state and management outcomes in the basin) have to be defined.

Development of an integrative guideline (**strategic action**): analysis of the sectoral need for development and action as well as analysis of sectoral development potentials / obstacles and combination by means of an interdisciplinary coordination process towards common coordinated development goals.

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5.2.4. Concept of measures

According to the defined risks in the whole planning area target-oriented measure bundles can be selected from the **CAMARO-D Best Practice Manuals (see LUDP xls-table)** to provide an overview of a common coordinated concept of future desirable measures. If necessary, the proposed measures (BPMs) have to be adapted according to existing risks and management gaps. Synergies and interdependencies between different measures have to be considered in detail and defined in their basic outlines and spatially fixed as well as necessary steps for implementation for certain areas have to be defined.

Priority setting, time sequence, cost and financing issues as well as the necessary implementation strategies (planning, steps, possible obstacles etc.) are to be defined. Remark: According to the selected risks, which have to be mitigated, the **responsible stakeholder groups** and **relevant strategies/policies** and **possible funds/subsidies** – especially at EU level - are listed in the **LUDP-xls-table**. Detailed information about existing policies/strategies/tools on national/regional/local level can be taken from the **stakeholder toolkits (D.T3.2.3)** and the **guiding principles for adapted inclusions (O.T4.3)** elaborated at national level.

The concept of measures must be coordinated with the administrative bodies responsible for the risk management plans and the river basin management plan in the country, with other affected units (e.g. responsible for spatial planning, nature conservation, agriculture, and forestry) and further stakeholders within the framework of one or more workshops.

Implementation

The bundles of specifically selected measures (derived from the BPMs according to the LUDP xls-table) have to be implemented in the *"Programme of measures" of the River Basin Management Plans* and in the *Flood risk management plans*.

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6. LUDP Table

LUDP - Cluster 1						
Risks	**Land use / vegetation type**	**Measures (BPMs)**	**Responsibility/Stakeholder**	**Strategies/Policies**	**Funds/Subsidies**	**Awareness raising**
Erosion	Forest	Groundwater protection through targeted silviculture	Water suppliers, forest, land owners, Local/Regional/National Authorities, Municipalities, chambers of agriculture and forestry	Forest Act Forest Development Plan National Forest Strategies and Action plans EU Commission/ DG Environment, DG Agriculture- soil strategy, forest strategy, Forest management plans, Strategies for Prevention of Drought, Land Degradation and Desertification	Individual contracts between water suppliers and foresters, Natural disaster funds,	<u>Stakeholder:</u> Agricultural chambers Forest Services Water suppliers farmers, foresters Leagues for Nature Protection general public, (gardeners) farmers, foresters, hunters experts, alpine pasture managers (farmers), land owners, municipalities,

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	(Mountain) Grassland	Mountain grassland management towards groundwater protection	Water suppliers, farmers, Alpine pasture responsible persons, Local/Regional/National Authorities, Municipalities, district office, chambers of agriculture and forestry	WFD DWD Council Directive 91/676/EEC National Water Acts Federal Province State laws Ordinances for drinking water protection areas	EU (e.g. Rural Development Programme)	chamber of agriculture and forestry, district authorities schools, universities etc. <u>Strategies/Policies:</u> information campaigns, direct involvement of stakeholders in decision and management processes <u>Funds/Subsidies:</u> State government EU (e.g. Rural Development Programme)
	Invasive plant species	Control of invasive plant species	Environment protection authorities, municipalities, Nature Protection Association, NGOs	EU Biodiversity Strategy to 2020 EU Strategy on Invasive Alien Species EU Regulation No. 1143/2014 Convention on Biological Diversity International Plant Protection Convention Habitat Directive WFD Bern, Bonn and Ramsar Convention The Convention on Biological Diversity	EU Commission financial support: Life, Horizon 2020 projects, cohesion funding, Rural Development Programme (Compliance with the fertiliser guidelines), Forest Ecological Programme incl. LEADER, ELER Regional and state funding	

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Soil compaction /soil quality/	Forest	Groundwater protection through targeted silviculture	Forest Services and authorities, hunters Water suppliers, Forest owners, Local/Regional/National Authorities, Municipalities	Forest Act Forest Development Plan National Forest Strategies and Action plans EU Commission/ DG Environment, DG Agriculture- soil strategy, forest strategy, Forest management plans, Strategies for Prevention of Drought, Land Degradation and Desertification	Individual contracts between water suppliers and foresters, EU, national or regional funds for the application of state-of-the-art BMPs beyond the existing legal frame	<u>Stakeholder:</u> Agricultural chambers Forest Services Water suppliers farmers, foresters Leagues for Nature Protection general public schools, universities etc. <u>Strategies/Policies:</u> information campaigns, direct involvement of

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	(Mountain) Grassland	Mountain grassland management towards groundwater protection	Local/Regional/National Authorities, Municipalities, Agricultural authorities Water suppliers Alpine inspector farmers	WFD DWD Council Directive 91/676/EEC National Water Acts Federal Province State laws Ordinances for drinking water protection areas, Biodiversity Act, NATURA 2000	EU (e.g. Rural Development Programme, Operational programme Environment), LIFE, Leader, Interreg	stakeholders in decision and management processes Funds/Subsidies: Federal government EU (e.g. Rural Development Programme)
Floods	Forest	Groundwater protection through targeted silviculture	Forest Services and authorities Water suppliers, Local/Regional/National Authorities, Hydraulic engineering authority	Forest Act Forest Development Plan Floods Directive	Individual contracts between water suppliers and foresters, EU Disaster Fund, Interreg projects, Rural Development Programme, Life projects, national initiatives	

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	River banks and surroundings (with flood risk)	Hydrotechnical measures mitigating flood risks & establishing flood forecasting maps	Ministries of Environment and Energy, Ministry of Construction and Physical Planning; National Protection and Rescue Directorates; ; local and regional government units	Water Framework Directive, Floods Directive, Water Management Strategies; Water Acts; Act on Protection against Natural Disasters; River Basin Management Plan ; measures for protection against floods within spatial plans of different levels (national, regional, local); Flood Risk Management Plan	EU and state funds	
Water pollution	Forest	Groundwater protection through targeted silviculture	Forest Services and authorities Water suppliers, forest owners, Local/Regional/National Authorities, Municipalities, NGOs,	Water Act, Spatial planning instruments on national and regional level River basin management plans	Individual contracts between water suppliers and foresters, State and municipal budget, LIFE, Interreg, Environmental Operational Programme	<u>Stakeholder:</u> Agricultural chambers Forest Services Water suppliers farmers, foresters Leagues for Nature

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	(Mountain) Grassland	Mountain grassland management towards groundwater protection	Agricultural authorities Water suppliers Alpine inspector farmers	WFD DWD Council Directive 91/676/EEC National Water Acts Federal Province State laws Ordinances for drinking water protection areas	EU (e.g. Rural Development Programme)	Protection general public schools, universities etc. <u>Strategies/Policies:</u> information campaigns, direct involvement of stakeholders in decision and management processes <u>Funds/Subsidies:</u> Federal government EU (e.g. Rural Development Programme)
	Agriculture	Restrictions for drinking water quality in agricultural land	Agricultural authorities Agricultural Chambers Water suppliers farmers, Ministries of Environment, Energy and Spatial planning, Municipalities,	WFD DWD Council Directive 91/676/EEC National Water Acts Federal Province State laws Ordinances for drinking water protection areas	Programs for the protection of groundwater Rural Development Programme, EU, national or regional funds for the application of state-of-the-art BMPs beyond the existing legal frame	

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	Settlement / commercial / industrial areas, Infrastructure	Wastewater treatment	Municipalities, cities, counties, waste companies, local and regional authorities	Urban Wastewater Directive Waste Framework Directive Sewage Sludge Directive WFD National Water Acts Ordinances for wastewater treatment	EU, national or regional funds World Bank co-financing Programmes/projects for groundwater protection	<u>Stakeholders:</u> Water suppliers Waste disposal and management companies Farmers general public research institutions etc. <u>Strategies/Policies:</u> information campaigns, direct involvement of stakeholders in decision and management processes

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Surface runoff	Forest	Groundwater protection through targeted silviculture	Water suppliers, forest, land owners, Local/Regional/National Authorities, Municipalities, chambers of agriculture and forestry	Forest Act Forest Development Plan National Forest Strategies and Action plans EU Commission/ DG Environment, DG Agriculture- soil strategy, forest strategy, Forest management plans, Strategies for Prevention of Drought, Land Degradation and Desertification	Individual contracts between water suppliers and foresters, Natural disaster funds, EU, national or regional funds for the application of state-of-the-art BMPs beyond the existing legal frame	<u>Stakeholder:</u> Agricultural chambers Forest Services Water suppliers farmers, foresters Leagues for Nature Protection general public schools, universities etc. <u>Strategies/Policies:</u> information campaigns, direct involvement of stakeholders in

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	(Mountain) Grassland	Mountain grassland management towards groundwater protection	Agricultural authorities Water suppliers Alpine inspector farmers	WFD DWD Council Directive 91/676/EEC National Water Acts Federal Province State laws Ordinances for drinking water protection areas	EU (e.g. Rural Development Programme), EU, national or regional funds for the application of state-of-the-art BMPs beyond the existing legal frame	decision and management processes <u>Funds/Subsidies:</u> Federal government EU (e.g. Rural Development Programme)
Surface and groundwater interaction	Forest	Groundwater protection through targeted silviculture	Forest Services and authorities foresters, hunters Water suppliers, Municipalities	Forest Act Forest Development Plan	Individual contracts between water suppliers and foresters, EU (e.g. Rural Development Programme)	<u>Stakeholder:</u> Agricultural chambers Forest Services Water suppliers farmers, foresters Leagues for Nature Protection general public schools, universities etc. <u>Strategies/Policies:</u>
	(Mountain) Grassland	Mountain grassland management towards groundwater protection	Agricultural authorities Water suppliers Alpine inspector farmers, Municipalities	WFD DWD Council Directive 91/676/EEC National Water Acts Federal Province State laws Ordinances for drinking water	EU (e.g. Rural Development Programme)	

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				protection areas		information campaigns, direct involvement of stakeholders in decision and management processes <u>Funds/Subsidies:</u> Federal government EU (e.g. Rural Development Programme)
	Agriculture	Restrictions for drinking water quality in agricultural land	Agricultural authorities Agricultural Chambers Water suppliers farmers, Municipalities	WFD DWD Council Directive 91/676/EEC National Water Acts Federal Province State laws Ordinances for drinking water protection areas, Nature Protection Acts	Regional programs for the protection of groundwater Rural Development Programme	

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Invasive Plant Species	Forest	Groundwater protection through targeted silviculture	Forest Services and authorities foresters Water suppliers	Forest Act Forest Development Plan EU Biodiversity Strategy to 2020 EU Strategy on Invasive Alien Species EU Regulation No. 1143/2014 Convention on Biological Diversity International Plant Protection Convention Habitat Directive	Individual contracts between water suppliers and foresters	
	Invasive plant species	Control of invasive plant species	Federal authorities Mountain and Nature Rescue Services Nature Protection Association farmers, foresters, gardeners general public	Action Programmes EU Biodiversity Strategy to 2020 EU Strategy on Invasive Alien Species EU Regulation No. 1143/2014 Convention on Biological Diversity International Plant Protection Convention Habitat Directive	Rural Development Programme LEADER, Life+, ELER	Training courses for e.g. road railway maintenance services, municipality employers, waste management associations, chambers of agriculture & forestry, water supervision bodies, experts, landscape planners, mountain and nature guards

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Groundwater recharge & quantity	Forest	Groundwater protection through targeted silviculture	Forest Services and authorities foresters, hunters Water suppliers	Forest Act Forest Development Plan WFD GWD	Individual contracts between water suppliers and foresters	<u>Stakeholder:</u> Agricultural chambers Forest Services Water suppliers farmers, foresters Leagues for Nature Protection general public schools, universities etc. <u>Strategies/Policies:</u> information campaigns, direct involvement of stakeholders in decision and management processes <u>Funds/Subsidies:</u> Federal government EU (e.g. Rural Development Programme)
	Agriculture	Restrictions for drinking water quality in agricultural land	Agricultural authorities Agricultural Chambers Water suppliers farmers	WFD GWD DWD Council Directive 91/676/EEC National Water Acts Federal Province State laws Ordinances for drinking water protection areas	Regional programs for the protection of groundwater Rural Development Programme	

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	Settlement / commercial / industrial areas, Infrastructure	Hydropower plants	Ministries, public institutions for energy and environment protection Water suppliers local and regional authorities Energy companies Hydrology engineers	EIA and SEA Directives, Habitats and Birds Directives, Renewable Energy Directive, EU energy targets Groundwater Directive, Flood Directive, Water Framework Directive, Water Act, Water Management Strategy, River Basin Management Plans, Programmes for construction of water regulation and protection facilities Acts and regulations related to renewable energy	National (state budget funds) and international funds (EU funds, loans of international banks), investments.	<u>Stakeholders:</u> Water suppliers Energy supply companies Hydrology experts national, regional and local authorities general public research institutions etc. <u>Strategies/Policies:</u> information campaigns, direct involvement of stakeholders in decision and management processes
other risks (Forest fires)	Forest	Tailored forest management in torrential watersheds	Ministries of Agriculture and Forests foresters Services for fire safety Civil protection services	program for the protection of forests against fires (e.g. Bulgaria) Forest management plans		Trainings with the involved stakeholders

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LUDP - Cluster 2						
Risks	**Land use / vegetation type**	**Measures (BPMs)**	**Responsibility/Stakeholder**	**Strategies/Policies**	**Funds/Subsidies**	**Awareness raising**
Erosion	Forest	Tailored forest management in torrential watersheds	Forest Services and authorities foresters, hunters Individual land owners, Mmunicipalities, National authorities (erosion, torrent and avalanche control, Ministries of agriculture, environment, forest and water)	Forest Act Forest Development Plan National Forest Strategies and Action plans EU Commission/ DG Environment, DG Agriculture- soil strategy, forest strategy, Forest management plans, Strategies for	Individual contracts between water suppliers and foresters State budget, Rural development programme	Stakeholder: Agricultural chambers Forest Services farmers, foresters Leagues for Nature Protection general public schools, universities etc. Strategies/Policies:

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				Prevention of Drought, Land Degradation and Desertification		information campaigns, direct involvement of stakeholders in decision and management processes. <u>Funds/Subsidies:</u> Federal government EU (e.g. Rural Development Programme)
	Settlement / commercial / industrial areas, Infrastructure	Practical Guide to Spatial Planning in Catchments and River Stretches	Regional planning and nature protection authorities, water management authorities Water associations, water cooperatives	Spatial planning instruments on regional level Flood risk management plans (Hazard zone maps) Strategies for Prevention of Drought, Land Degradation and Desertification	State budget, LIFE+ (e.g. for renaturation projects along rivers)	
	River banks (areas with flood risk)	Hydrotechnical measures mitigating flood risks & establishing flood forecasting maps	Regional planning authorities, municipalities, land users /owners, forest authorities National authorities (erosion, torrent and avalanche control, Ministries of agriculture,		LIFE+ (e.g. for renaturation projects along rivers)	

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			environment, forest and water)			
	River banks	Beaver Management	Ministries of Environment NGO's Land owners (Fishery, Forestry, Agriculture) Forest services	Beaver management plans Natura 2000	Rural development programme, LIFE+	
	Invasive plant species	Control of invasive plant species	State authorities (Ministry of environment), Nature Protection Services, Forest services, Research institutions	EU Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive	Rural Development Programme LEADER, Life+, ELER, Interreg, National and Regional initiatives	Training courses for e.g. road railway maintenance services, municipality employers, waste management associations,

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				alien species, EU species list, Nature Protection Acts, Biodiversity Act and Strategy, Forest Act and Strategy, NATURA 2000		chambers of agriculture & forestry, water supervision bodies, experts, landscape planners, mountain and nature guards, Research institution
Soil compaction / soil quality	Forest	Tailored forest management in torrential watersheds	Forest Services and authorities foresters, hunters Individual land owners, Municipalities, National authorities (erosion, torrent and avalanche control, Ministries of agriculture, environment, forest and water)	Forest Act Forest Development Plan National Forest Strategies and Action plans EU Commission/ DG Environment, DG	State budget, Individual contracts between water suppliers and foresters, Rural Development programme	Stakeholder: Agricultural chambers Forest Services farmers, foresters Leagues for Nature Protection general public

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				Agriculture- soil strategy, forest strategy, River Basin Management Plans, Flood Risk Management Plans, Forest management plans		schools, universities etc. <u>Strategies/Policies:</u> information campaigns direct involvement of stakeholders in decision and management processes. <u>Funds/Subsidies:</u> Federal government EU (e.g. Rural Development Programme)
Floods	Forest	Tailored forest management in torrential watersheds	Forest Services and authorities foresters, hunters Individual land owners, Mmunicipalities, National authorities (erosion, torrent, flood, and avalanche control, Ministries of agriculture, environment, forest, spatial planning and water) Chamber of agriculture and forestry, Research institutions	Forest Act Forest Development Plan National Forest Strategies and Action plans EU Commission/ DG Environment, DG Agriculture- soil strategy, forest strategy, River Basin	State and municipal budget, Individual contracts between water suppliers and foresters, Rural Development programme, Interreg, LIFE+, Operational programme Environment	

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				Management Plans, Flood Risk Management Plans, Forest management plans, Spatial planning Act, Spatial municipal plans		
	Settlement / commercial / industrial areas, Infrastructure	Practical Guide to Spatial Planning in Catchments and River Stretches	Regional planning and nature protection authorities, water management authorities Water associations, water cooperatives, Spatial planning ministries, Municipalities, individual landowners, River Basin Directorates, Ministry of Environment and Water, Ministry of Interior	Water Framework Directive, Floods Directive, Spatial planning Acts, Environment protection Act, Water Act, Flood risk management plans (Hazard zone maps)	State and municipal budget, LIFE+ (e.g. for renaturation projects along rivers), Interreg, Environmental Operational Programme, European Regional Development Fund,	

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	River banks (areas with flood risk)	Hydrotechnical measures mitigating flood risks & establishing flood forecasting maps	Regional planning and nature protection authorities, water management authorities Water associations, water cooperatives, Spatial planning ministries, Municipalities, individual landowners, River basin directorates, Water Management Companies	Water management strategies and programmes, Forest Act	State and municipal budget, LIFE, (e.g. for renaturation projects along rivers), Interreg, Environmental Operational Programme, Water funds, Private investors	
	River banks	Beaver Management	Ministries of Environment Beaver manager Mountain and Nature Rescue Service general public, farmers, foresters, land owners hydroelectric power management experts	Spatial planning Acts Flood risk management plans (Hazard zone maps) Water management strategies and programmes, Beaver management plans Natura 2000	Rural development programme, LIFE	

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	Invasive plant species	Control of invasive plant species	State authorities (Ministry of environment), Nature Protection Services, Forest services, Research institutions	EU Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species, EU species list, Nature Protection Acts, Biodiversity Act and Strategy, Forest Act and Strategy, NATURA 2000	Rural Development Programme LEADER, Life+, ELER, Interreg, National and Regional initiatives	Training courses for e.g. road railway maintenance services, municipality employers, waste management associations, chambers of agriculture & forestry, water supervision bodies, experts, landscape planners, mountain and nature guards

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Water pollution	River banks (areas with flood risk)	Hydrotechnical measures mitigating flood risks & establishing flood forecasting maps	Regional planning and nature protection authorities, water management authorities Water associations, water cooperatives, Spatial planning ministries, Municipalities, individual landowners	Water Act, Spatial planning instruments on national and regional level River basin management plans, Strategies for management of contaminated sites	State and municipal budget, LIFE, Interreg, Environmental Operational Programme	<u>Stakeholder:</u> Agricultural chambers Forest Services farmers, foresters Leagues for Nature Protection general public schools, universities etc. <u>Strategies/Policies:</u> information campaigns direct involvement of stakeholders in decision and management

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						processes. <u>Funds/Subsidies:</u> Federal government EU (e.g. Rural Development Programme)
Surface runoff	Forest	Tailored forest management in torrential watersheds	Forest Services and authorities foresters, hunters Individual land owners, Mmunicipalities, National authorities (erosion, torrent and avalanche control, Ministries of agriculture, environment, forest and water)	Forest Act Forest Development Plan National Forest Strategies and Action plans EU Commission/ DG Environment, DG Agriculture- soil strategy, forest strategy, spatial	Individual contracts between water suppliers and foresters State and municipal budget, Rural development programme, Operational programme Environment	

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				municipal plan, Forest management plans		
	Settlement / commercial / industrial areas, Infrastructure	Practical Guide to Spatial Planning in Catchments and River Stretches	Regional planning and nature protection authorities, water management authorities Water associations, water cooperatives, Spatial planning act, Water act, Municipal local plan, Environment protection act	Spatial planning instruments on local and regional level Flood risk management plans (Hazard zone maps)	State budget, LIFE+ (e.g. for renaturation projects along rivers), Operational programme Environment, Business plans of water suppliers, Rural development programme	

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	River banks (areas with flood risk)	Hydrotechnical measures mitigating flood risks & establishing flood forecasting maps	Regional planning authorities, municipalities, land users /owners, forest authorities National authorities (erosion, torrent and avalanche control, Ministries of agriculture, environment, forest and water)		LIFE+ (e.g. for renaturation projects along rivers)	
	Invasive plant species	Control of invasive plant species	State authorities (Ministry of environment), Nature Protection Services, Forest services, Research institutions	EU Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species, EU species list, Nature Protection Acts,	Rural Development Programme LEADER, Life+, ELER, Interreg, National and Regional initiatives	Training courses for e.g. road railway maintenance services, municipality employers, waste management associations, chambers of agriculture & forestry, water

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				Biodiversity Act and Strategy, Forest Act and Strategy, NATURA 2000		supervision bodies, experts, landscape planners, mountain and nature guards
Surface and groundwater interaction	Settlement / commercial / industrial areas, Infrastructure	Practical Guide to Spatial Planning in Catchments and River Stretches	Regional planning and nature protection authorities, water management authorities Water associations, water cooperatives	Water Act, Spatial planning instruments on regional level River basin Management Plans, Flood risk	State and municipal budget, LIFE, Interreg, Environmental Operational Programme	<u>Stakeholder:</u> Agricultural chambers Forest Services farmers, foresters Leagues for

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	River banks (areas with flood risk)	Hydrotechnical measures mitigating flood risks & establishing flood forecasting maps	Regional planning authorities, municipalities, land users /owners, forest authorities National authorities (erosion, torrent and avalanche control, Ministries of agriculture, environment, forest and water)	management plans	State and municipal budget, LIFE, Interreg, Environmental Operational Programme	Nature Protection general public schools, universities etc. Strategies/Policies: information campaigns, direct involvement of stakeholders in decision and management processes. Funds/Subsidies: State budget EU (e.g. Rural Development Programme, Transnational programs etc.)

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other risks (Forest fires, Bark Beetle, Sleet)	Forest	Tailored forest management in torrential watersheds	Ministries of Agriculture, Environment and Forests Forest services Services for fire safety, Ministry of Interior, Research institutions	program for the protection of forests against fires (e.g. Bulgaria) Forest management plans, Forest Act, National Forest Strategies and action plans Forest management plans	State and municipal budget, LIFE, Interreg, Environmental Operational Programme, Rural development programme	Trainings with the involved stakeholders, Demonstration of forest fire alerting system and look out towers for fire prevention

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LUDP - Cluster 3						
Risks	**Land use / vegetation type**	**Measures (BPMs)**	**Responsibility/Stakeholder**	**Strategies/Policies**	**Funds/Subsidies**	**Awareness raising**
Erosion	Agriculture	Adapted agriculture for optimal surface water and soil protection under climate change	Ministries of Agriculture Agricultural authorities Agricultural Chambers Farmers, local authorities,	Nitrates Directive and Action Plans Sewage Sludge Directive, River basin management plans, Territorial Development Policy, Nature protection strategies, Environmental protection programmes, Agricultural and rural	State budget, EU (e.g. Rural Development Programme), Life+, Interreg, Environmental Operational Programme, Transnational and Cross-border cooperation programmes, World Bank and other international donors	<u>Stakeholder:</u> Agricultural chambers farmers Leagues for Nature Protection general public schools, universities etc. <u>Strategies/Policies</u> Dialogue between the different groups, local authorities/practitioners; policy makers/local
	Agriculture	Conversion from arable land to grassland mitigating soil erosion				

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				development strategies, Sustainable development strategies, Water management strategies		authorities/practitioner Funds/Subsidies: Federal government EU (e.g. Rural Development Programme)
	Settlement / commercial / industrial areas, Infrastructure	Practical Guide to Spatial Planning in Catchments and River Stretches	Regional planning and nature protection authorities, water management authorities Water associations experts general public	Spatial planning instruments Flood risk management plans (Hazard zone maps)	LIFE+ (e.g. for renaturation projects along rivers)	
	River banks	Beaver management	Ministries of Environment Beaver manager Mountain and Nature Rescue Service general public, farmers, foresters, land owners	Beaver management plans Natura 2000, Bern Convention, Fauna-Flora Habitats Directive, Biodiversity	Rural development programme, damage compensations (local)	

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			hydroelectric power management experts, land owners	Act, Environmental Protection Act		
	Invasive plant species	Control of invasive plant species	State authorities Mountain and Nature Rescue Services Nature Protection Association Water associations, farmers, foresters, gardeners land owners	EU Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species, EU species list, Nature Protection Acts, Biodiversity Act and Strategy, Forest Act and Strategy, NATURA	Rural Development Programme LEADER, Life+, ELER, Interreg, National and Regional initiatives	Training courses for e.g. road railway maintenance services, municipality employers, waste management associations, chambers of agriculture & forestry, water supervision bodies, experts, landscape planners, mountain and nature guards

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				2000		
Soil compaction /soil quality/	Agriculture	Adapted agriculture for optimal surface water and soil protection under climate change	Ministries of Agriculture Agricultural authorities Agricultural Chambers Farmers	EU Soil Directive, Nitrates Directive and Action Plans Sewage Sludge Directive State laws, Hydraulic Engineering Administration	EU (e.g. Rural Development Programme), GAP	<u>Stakeholder:</u> Agricultural chambers farmers Leagues for Nature Protection general public schools, universities etc. <u>Strategies/Policies</u> Dialogue between the different groups, local authorities/practitioners; policy makers/local authorities/practitioner <u>Funds/Subsidies:</u> Federal government
	Agriculture	Conversion from arable land to grassland mitigating soil erosion				
Floods	Agriculture	Adapted agriculture for optimal surface water and soil protection under	Ministries of Agriculture Agricultural authorities Agricultural Chambers Farmers, Research Institutes of Hydrology and Water	Nitrates Directive and Action Plans Sewage Sludge Directive Federal Province State	EU (e.g. Rural Development Programme), State investments Subsidies from EU programs - Rural Development Programme, World Bank and other	

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		climate change	Management, Water Basins Administrations	laws	international donors Government programme for financial support of small-scale and middle scale farmers	EU (e.g. Rural Development Programme)
	Agriculture	Conversion from arable land to grassland mitigating soil erosion				
	Settlement / commercial / industrial areas, Infrastructure	Practical Guide to Spatial Planning in Catchments and River Stretches	Regional planning and nature protection authorities, water management authorities Water associations, experts	Spatial planning instruments on regional level Flood risk management	State budget, LIFE(e.g. for renaturation projects along rivers)	

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	River banks (areas with flood risk)	Hydrotechnical measures mitigating flood risks & establishing flood forecasting maps	general public, Spatial planning and water management authorities; municipalities, hydraulic engineering administration	plans(Hazard zone maps)		
	River banks	Beaver management	Ministries of Environment Beaver manager Mountain and Nature Rescue Service general public, farmers, foresters, land owners hydroelectric power management experts, Research Institutions	Beaver management plans Natura 2000, Biodiversity Act; Environmental Protection Act; Conservation of Natural Habitats of Wild Flora and Wildlife Act; Water	Rural development programme, LIFE, Environment Operational Programme	

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				Act		
Water pollution	Agriculture	Adapted agriculture for optimal surface water and soil protection under climate change	Ministries of Agriculture, Ministry of environment Agricultural authorities Agricultural Chambers Farmers, land owners, local/regional/national	Nitrates Directive and Action Plans Sewage Sludge Directive State laws, Territorial Development Policy ,	State budget, State investments, OP "Environment", Rural Development Programme, LIFE programme, transnational cooperation programmes, World Bank and	Stakeholder: Agricultural chambers farmers Leagues for Nature Protection general public

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	Agriculture	Conversion from arable land to grassland mitigating soil erosion	authorities, municipalities, water associations and cooperatives, Water Basins Administrations	Water Act, Natura 2000, River basin management plans, Flood risk management plans, Nature protection strategies, Environmental protection programmes, Agricultural and rural development strategies, Sustainable development strategies, Water management strategies	other international donors	schools, universities etc. Strategies/Policies: Dialogue between the different groups, local authorities/practitioners; policy makers/local authorities/practitioner Funds/Subsidies: Federal government EU (e.g. Rural Development Programme)
Surface runoff	Agriculture	Adapted agriculture for	Ministries of Agriculture, Ministry of Environment,	EU Water Framework Directive, Drinking	State budget, EU (e.g. Rural Development	

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		optimal surface water and soil protection under climate change	Agricultural authorities Agricultural Chambers Farmers, Research Institutes of Hydrology and Water Management	Water Directive, Nitrates Directive and Action Plans Sewage Sludge Directive Federal Province State laws, Nature Protection Acts , Territorial Development Policy	Programme), OP "Environment", Transnational and Cross-border cooperation programmes, World Bank and other international donors	
	Agriculture	Conversion from arable land to grassland mitigating soil erosion				
	Settlement / commercial / industrial areas, Infrastructure	Practical Guide to Spatial Planning in Catchments and River Stretches	Regional planning and nature protection authorities, water management authorities Water associations, experts spatial planning authorities; municipal officials for local land use planning; individual landowners	Spatial planning instruments on local and regional level Flood risk management plans(Hazard zone maps)	State budget, LIFE (e.g. for renaturation projects along rivers)	

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Surface and groundwater interaction	Agriculture	Adapted agriculture for optimal surface water and soil protection under climate change	Ministries of Agriculture Agricultural authorities Agricultural Chambers Farmers, land users, e.g. farmers, water suppliers, municipalities, district authorities and offices, NGOs, Ministry of Water and Forestry Ministry of Environment Research Institutes of Hydrology and Water Management	EU Water Framework Directive, Nitrates Directive and Action Plans Sewage Sludge Directive, State laws, Water Act, Ramsar Convention, Climate change Adaptation Strategy 2020+,	EU (e.g. Rural Development Programme, Environmental Operational Programme), World Bank and other international donors	
	Settlement / commercial / industrial areas, Infrastructure	Practical Guide to Spatial Planning in Catchments and River Stretches	Regional planning and nature protection authorities, water management authorities Water associations, experts general public	Spatial planning instruments on regional level Hazard zone maps Flood risk management plans	LIFE (e.g. for renaturation projects along rivers)	

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Invasive plant species	Invasive plant species	Control of invasive plant species	Mountain and Nature Rescue Services Nature Protection Association farmers, foresters, gardeners, municipalities, Chamber of agriculture and forestry, district authorities, NGOs, research institutions, Hydraulic Engineering Administration, water cooperatives, garden centres, plant trade, local population (garden owners), road maintenance service	EU Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species, EU species list, Nature Protection Acts, Natura 2000, Biodiversity Strategy, regional/local strategies, guidelines, ordinances	Rural Development Programme LEADER, Life, ELER, private initiatives at local/regional level (schools, local population)	Training courses for e.g. road railway maintenance services, municipality employers, waste management associations, chambers of agriculture & forestry, water supervision bodies, experts, landscape planners, mountain and nature guards

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Other risk: Cyanobacterial blooms and toxins in drinking water supply reservoirs	Agriculture	Adapted agriculture for optimal surface water and soil protection under climate change	Ministry of Agriculture, Forestry and Water Resources, local authorities, local stakeholder groups (land owners, hunting and fishing organizations, sports and recreation groups, etc.)	Nature protection strategies, Environmental protection programmes, Agricultural and rural development strategies, Sustainable development strategies, Water management strategies	State budget, EU (e.g. Rural Development Programme), OP "Environment", Transnational and Cross-border cooperation programmes	

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