Interreg CENTRAL EUROPE
European Union
European Regional Development Fund
PROLINE-CE

Interreg
EUROPEAN UNION
Danube Transnational Programme
CAMARO-D

Joint project Mid-Term Conference

June 12th to 13th, 2018

Ljubljana city center

Slovenia

Proceedings:
Agenda
Discussion
Pictures
Abstracts
~~Participant lists~~

TAKING
COOPERATION
FORWARD

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

REPUBLIC OF SLOVENIA
GOVERNMENT OFFICE FOR DEVELOPMENT AND EUROPEAN COHESION POLICY

PROGRAMME
MID TERM CONFERENCE
June 12th & 13th 2018, Ljubljana, Slovenia

Tuesday, 12 June 2018

19:00	**WELCOME RECEPTION for Mid-term conference of PROLINE-CE and CAMARO-D projects (location: Cekin manor, park Tivoli)**

Wednesday, 13 June 2018

MID TERM CONFERENCE (Location City Hotel, Ljubljana)

08:30 – 09:00	**Registration**
09:00 – 09:20	**Conference Opening – Welcome Addresses**

Representatives of
Ljubljana Municipality
Faculty of Natural Sciences and Engineering
Faculty of Civil and Geodetic Engineering,
JP Vodovod-Kanalizacija (Water Utility Ljubljana)
Slovenian Water Agency

09:20 – 10:30	**Session 01 – Projects and pilots**

Presentation of the projects **PROLINE-CE** and **CAMARO-D**
Hubert Siegel (Federal Ministry of Sustainability and Tourism, Forest Department, Vienna, AT – Lead Partner)

PROLINE-CE: Preliminary results of the Pilot Actions and outlook
Barbara Čenčur Curk (University of Ljubljana, Faculty of Natural Sciences and Engineering, Ljubljana, SI)

CAMARO-D: Preliminary results of the Pilot actions and outlook
Renate Mayer (Agricultural Research and Education Center Raumberg-Gumpenstein, Raumberg, AT)

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10:30 – 11:00	**Coffee Break**

11:00 – 12:00	**Session 02 - Main Outputs and preliminary results**

Presentations and discussion

PROLINE-CE: Work-package T3 "Synopsis – Vision and Guidance"
Guido Rianna (Euro-Mediterranean Centre on Climate Change Foundation, IT)

PROLINE-CE: Work-package T4 "Advancement - Strategic Positioning and Commitment"
Elisabeth Gerhardt (Federal Research and Training Centre for Forests, Natural Hazards and Landscape, Vienna, AT)

CAMARO-D: Work-package T3 "Visionary Danube"
Prvoslav Marjanović *(Jaroslav Cerni Institute, Belgrade, RS)*

CAMARO-D: Work-package T4 "Progressive Danube"
Albena Bobeva (Executive Forest Agency, Sofia, BG)

Potential synergies of **PROLINE-CE** & **CAMARO-D** and other **EU projects**
Barbara Čenčur Curk (University of Ljubljana, Faculty of Natural Sciences and Engineering, Ljubljana, SI)

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12:00 – 12:45	**Related EU projects**
Presentations and discussion	**DriDanube** ("Drought risk in the Danube Region" – Danube Transnational Programme) *Andreja Susnik/Gregor Gregorič (Slovenian Environment Agency, Ljubjana, SI)*
	AMIIGA ("Integrated Approach to Management of Groundwater quality In functional urban Areas" – CENTRAL EUROPE) *Joerg Prestor (Geological Survey of Slovenia, Ljubljana, SI)*
	FRAMWAT ("Framework for improving water balance and nutrient mitigation by applying small water retention measures" – CENTRAL EUROPE) *Anja Potokar (Limnos, Ljubljana, SI)*
	FAirWAY ("Farm systems that produce good Water quality for drinking water supplies" – HORIZON 2020) *Marina Pintar (University of Ljubljana, Biotechnical faculty, Ljubjana, SI)*

EU knowledge market

In front of the meeting hall there will be a place for EU projects booths (place for promotion material and roll-ups).

We encourage conference participants to use the time during coffee breaks and lunch for informal networking.

Participants, who are interested to use this opportunity can apply via e-mail: PROLINE_CAMAROconference@prisma-solutions.at

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13:00 – 14:30	**Lunch**
14:30 – 17:30	**Panel Discussion PROLINE-CE and CAMARO-D**
14:30 – 15:00	**PROLINE-CE**
Presentations	Catalogue of Best management practices for drinking water protection *Josip Terzić (Croatian Geological Survey, Zagreb, HR)*
	Action Plan Barbara Čenčur Curk (University of Ljubljana, Faculty of Natural *Sciences and Engineering, Ljubljana, SI)*
	Preliminary work for GOWARE *Guido Rianna (Euro-Mediterranean Centre on Climate Change Foundation, IT)*
15:00 – 15:30	**CAMARO-D**
Presentations	Main outcomes of the Knowledge Base *Tomáš Dostál (Czech Technical University in Prague, Prague, CZ)*
	Transnational cluster-manual for practitioners *Renate Mayer (Agricultural Research and Education Center Raumberg-Gumpenstein, Raumberg, AT)*
	Approach towards GUIDR *Prvoslav Marjanović (Jaroslav Cerni Institute, Belgrade, RS)*
15:30 – 16:00	**Coffee Break**

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16:00 – 17:30	**Challenges for the protection of (drinking) water resources and mitigation of flood risk through the implementation of sustainable land use and water management**
Moderation	*Stefan Kollarits, PRISMA solutions, Mödling, AT*
Impulse presentations and panel discussions	**Climate Change impacts in agriculture–drought risk management** *Daniel Alexandru (National Meteorological Administration of Romania, Bucharest, RO)*
	Irrigation as a sustainable land use management measure in drinking water protection areas *Marina Pintar (University of Ljubljana, Biotechnical faculty, Ljubljana, SI)*
	Transboundary drinking water protection in Adriatic region *Mihael Brenčič (University of Ljubljana, Faculty of Natural Sciences and Engineering, Ljubljana, SI)*
	Initiatives of the EUSDR Water Pole towards flood risk mitigation *Károly Gombás (EUSDR PA5 HU coordinator, Hungary)*
	Hydrological ecosystem services of forests - Learning from Slovenian case studies *Urša Vilhar (Slovenian Forestry Institute, Ljubljana, SI)*
	Catchment-oriented Flood Risk Management: Possibilities and Limitations of Spatial Planning *Lukas Löschner (University of Natural Resources and Life Sciences, Vienna, AT)*

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Related discussion panel discussion

One of the main topics that the projects should tackle is the question how to avoid that solutions are the problems of the future.
Now that gaps are known, it is important to bring people together in order to improve the process. Decision makers have to be addressed, but often these are stakeholders with conflicts of interest. It is always a question of who will benefit/who will pay?
So the projects should find answers:

- Are there common interests?
- Are there synergies that can be created?
- Can we define measures allowing a stepwise implementation - Based already on existing studies, etc.

A project should define different principals, even formulated on different levels of detail and it should also try to define workflows how the different scales can be linked (regional, national, European). For this, eventually, the dialogue between different stakeholders is of utmost importance, this is why the projects have a multi-sectoral approach!

Within a project, different stakeholders can discuss in detail in a different surrounding - as a starting point to search for solutions.

For more information on the projects, please visit the project websites:

www.interreg-central.eu/proline-ce

www.interreg-danube.eu/camaro-d

PROGRAMME
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Welcome reception on June 12th

Welcoming words by the Lead-Partner of both projects CAMARO-D and PROLINE-CE

More than 100 participants

Moderated panel discussion in the afternoon

ANNEX

Abstracts for both midterm-conference and panel discussion

Particpant list

- 01_PROLINE-CE_CAMARO-D_ABSTRACT_HubertSiegel.pdf
- 02_PROLINE-CE_ABSTRACT_PA_BarbaraCencur.pdf
- 03_CAMARO-D_ABSTRACT_PA_RenateMayer.pdf
- 04_PROLINE-CE_ABSTRACT_GOWARE_Guido_Rianna.pdf
- 05_PROLINE-CE_ABSTRACT_WP4_ElisabethGerhardt.pdf
- 06_CAMARO-D_ABSTRACT_GUIDR_Marjanovic.pdf
- 07_CAMARO-D_ABSTRACT_WP4_AlbenaBobeva.pdf
- 08_PROLINE-CE_CAMARO-D_ABSTRACT_Synergies_Cencur.pdf
- 09_DriDanube_ABSTRACT_Susnik.pdf
- 10_AMIIGA_ABSTRACT_Prestor.pdf
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- 12_Fairway_ABSTRACT_Marina Pintar.pdf
- Paneldiscussion_01_JosipTerzic.pdf
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- Paneldiscussion_12_LukasLoeschner.pdf

PROLINE-CE & CAMARO-D

TWO PROJECTS IN DIFFERENT PROGRAMS CONNECTED BY A COMMON MESSAGE

Hubert SIEGEL[1], Elisabeth GERHARDT[2] and Gudrun SCHRÖMMER[3]

GENERAL AIMS

The main objective of **PROLINE-CE** (Efficient Practices of Land Use Management Integrating Water Resources Protection and Non-structural Flood Mitigation Experiences) is the improved protection of drinking water resources as well as protection against floods/droughts in an integrated land use management approach. This encompasses

- jointly developed methods and strategies towards an integrated and efficient approach of water management and proposed measures to adapt existing practices;
- minimized conflicts between drinking water resources protection and land use activities;
- integrated land-use management and a developed implementation strategy for effectively harmonized environmental standards in drinking water recharge areas to improve water- and soil quality and reduce flood/drought risks - tailored to different regional environment- and policy conditions (via pilot actions);
- extended cooperation networks and knowledge exchange between partner regions, sector players and different decision makers on policy level to minimize still existing knowledge gaps concerning integrated water- and land-use management, interdependency cycles environment-flood/drought and flood/drought prevention in Central Europe region; and
- improved effectiveness and sustainable use of capacities as well as efficient organisational structures of land use management and drinking water protection.

CAMARO-D (Cooperating towards Advanced MAnagement Routines for land use impacts on the water regime in the Danube river basin) aims at developing comprehensive recommendations towards a strategic policy for the implementation of an innovative transnational catchment-based "Land Use Development Plan" for the Danube River Basin. It will also provide important inputs for the further development of the EU Strategy for the Danube Region (EUSDR) and other relevant EU-policies. Its main goals are:

- Setting the frame for a harmonized transnational land use management system, taking into account the demands of water resources protection and flood prevention.
- Harmonizing and improving the protection of water resources against negative impacts of land use and climate change as well as reduction of flood risk.
- Bringing life to the project outcomes by developing a transnational "Land use Development Plan" as a driving force for a transnational land use management

INNOVATIVE SOLUTIONS

Previous project cooperations were focusing on land-use conflicts, climate change, water resources protection and ecosystem services. **PROLINE-CE**´s innovative approach will be:

[1] Hubert SIEGEL, Austrian Federal Ministry of Sustainability & Tourism, Forest Department, 1030 Vienna, Marxergasse 2; (email: hubert.siegel@bmnt.gv.at)
[2] Elisabeth GERHARDT, Austrian Research & Training Centre for Forests, Natural Hazards and Landscape, 1131 Vienna, Seckendorff-Gudent-Weg 8; (email: elisabeth.gerhardt@bfw.gv.at)
[3] Gudrun SCHRÖMMER, PRISMA solutions, 2340 Mödling, Klostergasse 18; (email: Gudrun.schroemmer@prisma-solutions.at)

- Synopsis of comprehensive experiences gained within previous projects and studies as a basis for determination of sustainable land use and best management practices for drinking water supply;
- Operationalization of best practice strategies in different pilot actions, clustered on a transnational scale by their thematic and geographic scope;
- Common methodology and vision for integrated water management as an overall frame for the implementation of best practices resulting in "GOWARE" (Guide towards Optimal WAter REgime);
- Transfer of PROLINE-CE results to policy level by means of DriFLU Charta, a joint declaration act signed by notable representatives; and
- Capacity building inside and outside of the programme area via several events and feedback loops for stakeholders with the possibility of public participation as well as different communication measures tailored to the needs of diverse target groups. The structured stakeholder involvement process will support the development of networks beyond the borders of disciplines, regions and countries.

CAMARO-D develops a transnational catchment-based "Land Use Development Plan" (LUDP) for an adequate coordination and harmonization of different function-oriented sustainable land use management activities. This new planning instrument provides the initial action to set framework conditions for transnational catchment-based cooperation and should therefore be integrated in existing River Basin Management Plans. Its operational implementation will be initiated and tested in practice within different Pilot Actions respectively Pilot Areas. Existing tools and models in some of the participating countries will be checked in terms of their transferability and further developed according to the needs in the respective pilot areas. For the relevant stakeholders and decision-makers an innovative transnational guidance for sustainable land use planning (GUIDR) will be developed as a practically oriented decision support tool. It will encompass a set of best practices for steering function-oriented land use activities and management, also regarding uncertain trends concerning climate change. By means of a tailored stakeholder toolkit decision makers will get support in mitigating different conflicts of interests and receive recommendations for implementation of optimized steering tools for regional development strategies and respective funding programmes. Additionally, target-oriented trainings at agricultural and forest related schools will be organized to guarantee a fruitful dissemination also to the future generation.
As this newly developed planning instrument (LUDP) demonstrates procedures for a sound water management on a transnational basis, it provides important inputs for the further development of EUSDR and other relevant policies.

REFERENCES

www.interreg-central.eu/Content.Node/PROLINE-CE

www.interreg-danube.eu/approved-projects/camaro-d

Keywords: drinking water protection, flood prevention, integrated land use management

PROLINE-CE

PRELIMINARY RESULTS OF THE PILOT ACTIONS AND OUTLOOK

Barbara Čenčur Curk [1]

ABSTRACT

The main objective of the PROLINE-CE is implementation of the existing strategies and management plans in order to improve the current situation in the land use management, drinking water sources protection and non-structural flood mitigation. In T2, best management practices for drinking water supply issues derived from Work Package T1 are reviewed in selected Pilot Actions.

Pilot Action presents activities performed at Pilot Site, such as study of gaps and best management practices of land use and flood protection measures for enabling drinking water protection. Implementation status of existing best management practices is identified. In case of lacks identified, possibilities of improvements are proposed. Thus, water supply management systems and best management practices should be strategically implemented in the Pilot Actions, in order to achieve a function-oriented land-use based spatial management for drinking water protection at the operational level. Measures and actions are analysed and proposed concerning mitigation of extremes and achieving a sustainable drinking water management.

Pilot Actions were selected in order to cover the broad range of possible conflicts regarding land use (forest practices, agriculture, urbanization, etc.) and flood management versus drinking water protection and management in different natural conditions: mountainous areas, plain areas and riparian strips. Therefore, the single Pilot Action is allocated in three clusters: mountain sites, plain sites and special sites - riparian strips (Figure 1 and Figure 2).

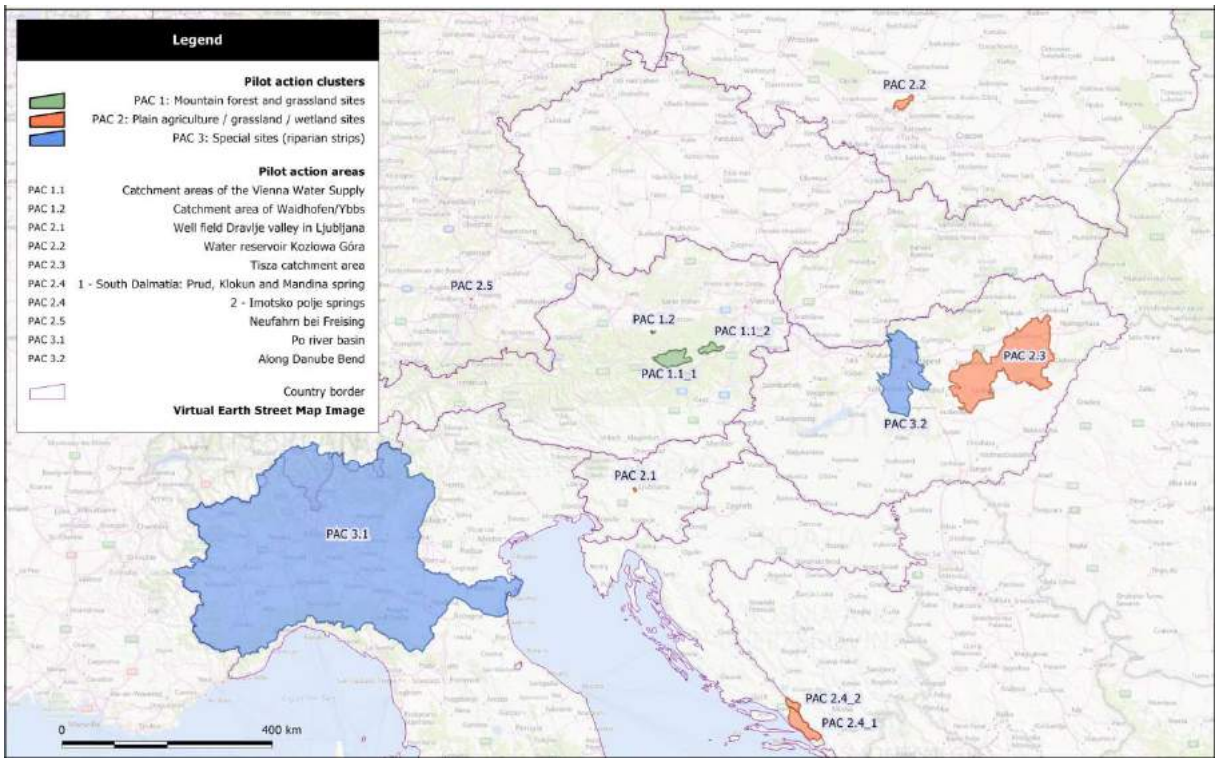

Figure 1: Pilot Action Areas

[1] **Barbara Čenčur Curk**, University of Ljubljana, Faculty of Natural Sciences and Engineering, Department of Geology, 1000 Ljubljana Kongresni trg 12 (email: barbara.cencur@ntf.uni-lj.si)

Cluster 1 - Austrian Mountain sites

Cluster 2 - Slovenian Plain Areas

Cluster 3 - Italian Riparian strips

Figure2: Clustered Pilot Areas (Cluster 1: mountain sites, Cluster 2: plain sites and Cluster 3: special sites - riparian strips)

For all Pilot Actions cost effective and environmental friendly risk management is a prerequisite for ensuring safety of drinking water, therefore mitigation measures will be developed and piloted, including ecosystem services of water bodies and wetlands. Drinking water sources along rivers are vulnerable to floods, more distant areas to droughts. Developed best practices for flood and drought risk management will be implemented and tested concerning their contribution to improvement of drinking water safety and effectiveness including ecosystem services as well as economic efficiency. According to the outcomes of the different Pilot Actions, an Action Plan for achieving best functional patterns of land use will be lined out. It shall contain the sequence of steps in order to reach a smooth steering of using different land cover types within CE. The revised best land use management practices are a basis for the improvement of policy guidelines in the respective regions.

Practical applicability during and after project implementation is guaranteed due to meeting the various stakeholders' needs that have been identified before. Pilot Actions cover manifold issues and conflicts between land uses, water supply and water protection needs. Thus they can be applied in order to generate similar results in other areas. The Action Plan generated is taking into account all those issues and lines out best practices identified and sets the basis for improvement of policy guidelines. By means of tailored workshops different target groups - also beyond the project partnership - become acquainted with this new strategic document.

Results of activities performed within Pilot Action are presented on the interactive web platform: http://proline-ce.fgg.uni-lj.si/

Keywords: Pilot activity, land use, flood protection measures, best management practices, drinking water protection

CAMARO-D

PRELIMINARY RESULTS OF THE PILOT ACTIONS AND OUTLOOK

Renate Mayer[1]

ABSTRACT

The Work package focus on three pilot action clusters which are the central part of activities in CAMARO-D project. Therefore the project partners work directly together in the following areas with focus on land use and vegetation cover with the thematic field of water management:

- **Protection of groundwater resources (Cluster 1)**
- **Torrents, small rivers & catchments – erosion, floods, soil compaction, surface runoff, invasive plant species, water pollution (Cluster 2)**
- **Rivers & accumulation lakes – erosion, floods, soil compaction, surface runoff, invasive plant species and water pollution (Cluster 3)**

The partner countries selected pilot areas representing the problems in the Danube Region.

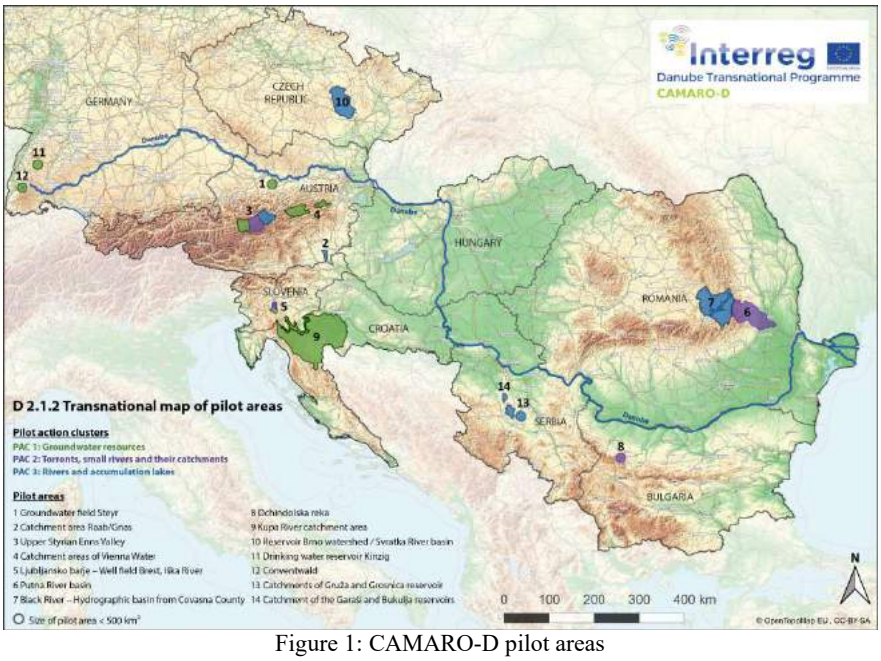

Figure 1: CAMARO-D pilot areas

Pilot actions which take place in the relevant areas are divided in direct and indirect interventions,

- Learning, testing, monitoring, implementation of best practice (hands on activities),
- Awareness activities in close cooperation with local public authorities, practitioners, research institutions and local / regional players (cluster and pilot specific trainings).

Aims:

- Strengthen transnational knowledge transfer–lessons learnt, dialogue, workshops with stakeholders and experts, promotion of best practice and implementation.
- Implementation of innovative measures and tools in daily workflows.

The target of the outcomes of pilot actions is the transnational comparability based on risks:

[1] **Renate Mayer**, Agricultural Research and Education Center Raumberg-Gumpenstein (email: renate.mayer@raumberg-gumpenstein.at)

Pilot actions Cluster 1:

Water quality as a resource of particular significance to the Danube Region, therefore various analyses related to key issues of water resources quality and quantity will be implemented. To address strongly present surface and groundwater pollution risk (e.g. identify vulnerable zones and re-evaluate the control of water quality and water levels), PP10 envisioned monitoring, numerous sampling and measurements of spring water and rainwater within the Kupa River catchment. The Lead Partner (Austrian Federal Ministry of Sustainability and Tourism) will elaborate a forest hydrotope model for the adequate adaptation of the actual forest management due to the drinking water protection zone Dietacherholz in Upper Austria. PP1 studies the groundwater level in the Enns wetlands and its relationship to plant species and soil types, as well as land use and its impact on water quality. At Mountain Stoderzinkenberg (limestone), the nutrient load of the leachate is analysed using lysimeters in relation to climate change. PP2 focuses on awareness-raising measures to minimise water pollution in limestone mountains (dolines) through water-friendly grazing (fencing) and sustainable grassland management in practice. Modelling of groundwater and surface water interaction in the Ljubljana Moor is planned by PP3&PP4 and analyses of stream water chemistry in Pilot Action Drinking reservoir „Kinzig“ (Germany) by PP12.

Pilot actions Cluster 2:

All Cluster partners take into consideration the problems with loss of biodiversity, erosion, surface runoff, soil degradation in the pastures, grassland and arable lands. In Ochindolska (BG), Putna (RO) and Iska (SL) rivers the problems are related with the abandoned and degraded agricultural lands whereas in Austria (Upper Styrian Enns valley) the intensive grazing (Alpine pastures) and increase in maize cultivation in wetlands (flood plains) have a great impact. All countries have long term experience in erosion control, but in some vulnerable areas the problem still exists. The erosion control strategy / programme is of great importance for future planning and better prevention. Austrian experiences could be transferred and used by other partners with similar problems.

In three pilot areas (BG, RO, and SL) climate change (trends and extreme events) can be identified influencing land use, water resources and water capacity retention. Some recommendations and measures for flood and drought risk prevention will be elaborated.

All pilot areas are torrent water catchments, where floods and river rising often occur and the nearby settlements are endangered. The torrentiality in BG, RO and AT is partially controlled through previously implemented technical measures and afforestation. In all countries, the risk planning and management documents are based on the EU Flood Directive.

All types of land use influence quantity and quality of surface runoff in the pilot areas. The vulnerability of water resources depends on climate changes at different degree. Climate change (trends and extreme events) and land use changes (erosion, land degradation, soil compaction, forest fires, etc.) decline water retention capacity and increase flood and drought risk in Slovenia, Bulgaria and Romania. Romania observes a decrease in water availability. Extreme events will become more frequent and in case of durable and intensive rain new floods could be expected. The main problems are flash floods and river risings which endanger settlements in all pilot areas. Transnational cooperation in this direction is an opportunity for improvement of some strategic and planning documents in forest and water sectors and a possibility for implementation of integrated management into practice.

a) Scheme of alerting forest fire system © EFA
b) Experimental work (Caciu-Bârseşti torrent), © ROMSILVA
c) Removal invasive plant species © AREC
d) Awareness raising actions in watershed “Ochindolska reka” © EFA

Pilot actions Cluster 3:

Soil erosion, invasive plant species and ***surface runoff***, ***soil compaction*** and ***water pollution*** are relevant in most of the pilot areas. Specific measures can be described (e.g. key studies to identify hot spots and testing of control measures, analyses on soil and land use, management and monitoring activities).

All partners implement ***public awareness activities*** within the pilot areas. Main actions are the development of recommendations for best management practices combined with trainings on site, field trips and practical guides. The different activities cover very well the problem solving approaches.

Direct pilot actions		
Risk type	**Measures**	**Pilot Areas**
Soil erosion	sustainable land use, assessment of wetland areas, monitoring and management of wetland areas	**All**
Floods	flood risk management and spatial planning	Upper Enns Valley and Black River
Soil compaction and soil quality	monitoring, controlling and management of wetland areas	Upper Enns Valley, Black River and Svratka River
Surface runoff	sustainable management, soil and land use analyses	Upper Enns Valley, Black River, Svratka, the catchments of Gruža and Grosnica reservoir and the catchment of the Garaši and Bukulja reservoirs
Invasive plant species	good management practices, analysis of wetland areas and potential retention capacity of wetlands	Upper Enns Valley, Black River and Svratka River
Water pollution	sustainability management, technical and scientific methods	Black River, Svratka River, the catchments of Gruža and Grosnica reservoir and catchment of the Garaši and Bukulja reservoirs

Indirect pilot actions		
Risk type	**Measures**	**Pilot Areas**
All	workshops, trainings, research activities, recommendation for best management practices and field visits	**All**

Figure 2: Cluster 3 Overview of transnational comparability

The comparison of the pilot areas revealed that a great deal of knowledge transfer is still necessary in order to be able to implement current measures for risk reduction in practice in accordance with the guidelines. Based on the information from outlining comparability templates, an exact compilation of the existing risks (*erosion, floods soil compaction, surface runoff, invasive plant species and water pollution*) in the pilot areas and measures derived from them (in and outside CAMARO-D) will be important for the development of the land use development plan (LUDP) to cover all the thematic fields at transnational level and compare with Danube and national strategies and directives. Through the compilation of activities in the respective catchment areas, further joint transnational actions can result.

Keywords: pilot actions, clusters, water management, risk prevention transnational comparability

WP3 "SYNOPSIS: VISION AND GUIDANCE"

HYDROLOGIC ECOSYSTEM SERVICES AS KEY STRATEGY FOR DRINKING WATER PROTECTION AND MITIGATION OF HYDROLOGICAL HAZARDS

Guido Rianna[1]

Ecosystem services, defined as "the benefits people obtain from ecosystems" (MA, 2005) received increasing interest after Millennium Ecosystem Assessment (MA) (2005), the former international effort to emphasize and promote the role and significance of ecosystems for human well-being.
In this perspective, all the different frameworks proposed to categorise and describe ecosystem services (e.g. MA,2005; TEEB, 2010; Haines-Young and Potschin, 2018) clearly recognizes *hydrologic ecosystem services* as the benefits to people produced by terrestrial ecosystem effects on freshwater. The pivotal reviews carried out by Brauman (2007; 2015) identify, to this aim, the four main "attributes": quantity, quality, location and timing (Figure 1) in which water resources can be influenced by different ecosystems and the associated services (Figure 2)

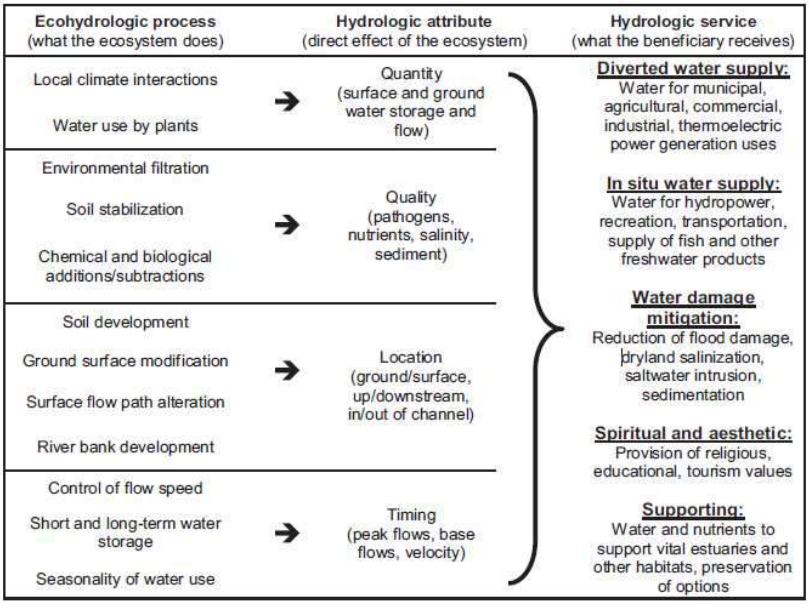

Figure 1 Relationship of hydrologic ecosystem processes to hydrologic services

On these grounds, WP3 is aimed to foster and develop measures and practices properly supporting drinking water protection and reducing, at the same time, the occurrence and magnitude of water-related disasters detecting an adequate trade-off between the two objectives.
To this end, desk review and expertise of different Project Partners will permit identifying the most suitable possibilities for funding ecosystems services (e.g. REDD+, Reducing emissions from deforestation and forest degradation Program) at national and transnational level. At the same time, it could entail mainstreaming the "Ecosystem services" concept into sectoral and horizontal policies enhancing the coherence among the different tools (e.g. biodiversity, climate changes, water security).
These efforts will permit achieving several key products:
- elaboration of a transnational, but tailored at national scale, plan for land-use management and its variation addressing, in effective way, drinking water protection and water related disasters induced by water excess or shortage (flood and droughts)

[1] GUIDO RIANNA, CMCC Foundation, REMHI Division (email: guido.rianna@cmcc.it)

- definition of recommendations properly targeted for operational (e.g. water suppliers) and spatial planning and management purposes (e.g. Municipalities or Regional Authorities) promoting a sustainable and safe utilisation of water resources.

All the findings and the developed approaches will then systematized CE Transnational Guide towards Optimal WAter REgime (GOWARE) conceived as the tool supporting project partners in preparing adequate information transfer to stakeholders and providing a plan for implementation of sustainable land use management in participating regions beyond lifetime.

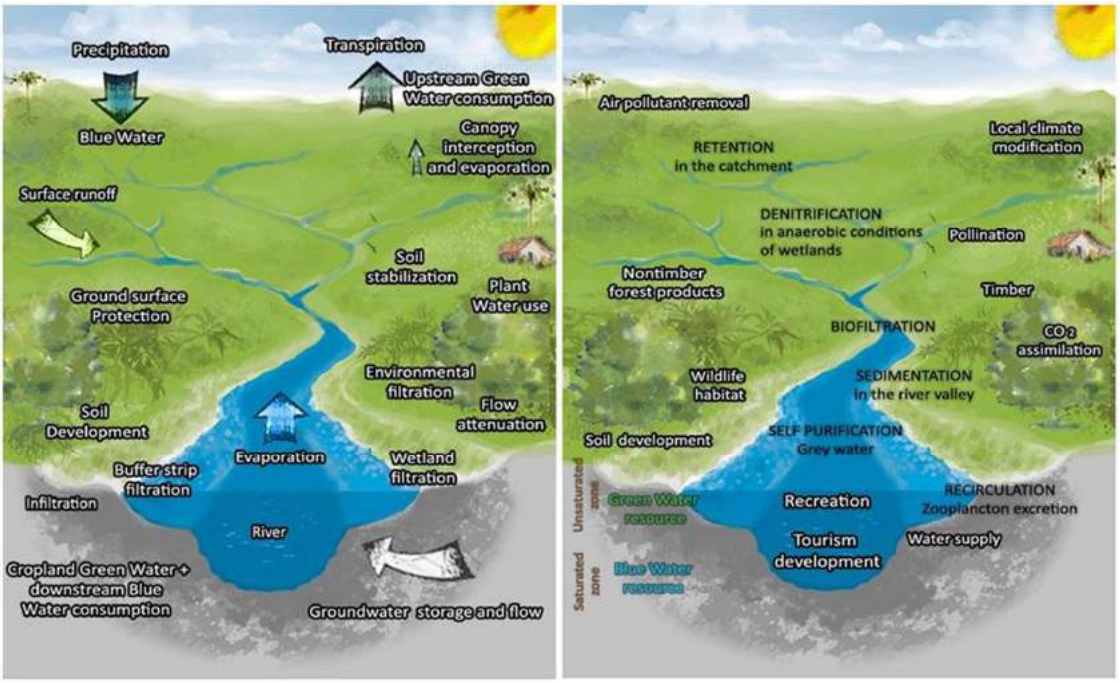

Figure 2: Ecohydrological flows and ecosystem services into a catchment. Left side: Conceptual diagram highlighting three main flows (precipitation, evapotranspiration and surface runoff) in the hydrological cycle. Right side: hydrologic services framework showing how ecohydrologic flows impact the ways people can use water at the catchment scale [from Taffarello et al., 2017]

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Keywords: ecosystem services, hydrological services, policies, water resources, hydrological hazards

PROLINE-CE: WORK PACKAGE T4

ADVANCEMENT – STRATEGIC POSITIONING AND COMMITMENT

Elisabeth Gerhardt [1]

ABSTRACT

The main output of Work Package T4 is the so-called **DriFLU Charta**. The abbreviation "DriFLU" stands for **"Drinking water/Floods/Land use"** combining the most important thematic issues within this project. It represents a commitment towards an optimized and effective land use and flood/drought management with efficient organizational structures regarding drinking water protection. To push the visibility of the activities conducted in PROLINE-CE and in order to bundle efforts towards and integrated land use und flood/drought management this joint declaration act will be signed by notable representatives of each participating country during the Final Conference in June 2019 in Vienna.

The DriFLU Charta will contain transnational guidelines regarding an efficient protection of drinking water resources. This objective should be achieved through the development of sustainable and appropriate land use and management measures aiming at the protection of drinking water resources and additionally at the mitigation as well as reduction of droughts and floods influencing these resources, under the challenges of climate change.

The transnational DriFLU Charta will be just a very understandable, focused and short paper with the main necessary measures concerning the different land uses: forestry, agriculture, urban, grassland, wetland and general recommendations. Within an Annex these mentioned issues will be explained more in detail to be as precise as possible.

Additionally each participating country will develop a national DriFLU Charta focusing on the specific issues and political respectively social background.

To foster the transnational transferability respectively usability of these recommendations an intensive **stakeholder involvement** will be conducted within this Work Package: On the one hand two Round Tables and Panel discussions on transnational level (the first ones on 12th/13th of June 2018 in Ljubljana back to back with the mid-term-conference) and on the other hand stakeholder operationalisation workshops on national level in each participating country for embedding relevant drinking water protection topics in national/regional strategies and policies.

The identified still existing shortcomings as well as challenges will lucidly showcase potential for future cooperation efforts. It is the responsibility of the existing partnership to bring the Charta objectives into life. After the project end, partner representatives will make efforts to monitor stakeholder actions regarding implementation of the signed commitment.

The initiated policy dialogue at regional and on European level will provide important inputs for the projects visibility, in compliance to the relevant strategies on EU level, like EUSDR, EUSALP, EU 2020 Strategy, 2030 Agenda for Sustainable Development (mainly to the Sustainable Development Goal SDG 6), EU

[1] Gerhardt Elisabeth, Federal Research and Training Centre for Forests, Natural Hazards and Landscape (BFW), Vienna, Austria (email: elisabeth.gerhardt@bfw.gv.at)

Strategy on Adaptation to Climate Change, EU Water Framework Directive (River Basin Management Plan 2021-2027) and EU Floods Directive.

Keywords: PROLINE-CE, drinking water protection, land use management, joint signed declaration act

WORK-PACKAGE T3 "VISIONARY DANUBE"

Prvoslav Marjanović[1], Marko Marjanović[1], Dragana Spasić[1] , Dragica Vulić[1]

ABSTRACT

Work package (WP) T3" Visionary Danube" is focused on two main activities:

ACTIVITY 5.1: DEVELOPMENT OF TRANSNATIONAL GUIDANCE

Based on the SWOT analysis, best practice reviews and pilot action cluster reports a guidance for the Danube region for sustainable land use planning (GUIDR) will be developed.

The development will be based on the respective water intervention type (protection of water resources or flood prevention) and focus on the improvement of water quality and enhancement of flood prevention (through the implementation of a function-oriented land use for a sound water management in an optimized quantitative and qualitative manner.)

There will be interfaces to soil protection, nature and water protection, management of invasive plant species and spatial planning (with relevance for water management issues) and relevant control mechanisms for funding programs.

This transnational decision support tool will serve as blueprint for applied protection of water resources and prevention of floods for the whole Danube basin.

All project partners will share their specific knowledge gathered also in the course of the CAMARO-D project to elaborate GUIDR.

GUIDR represents the initiation of practical implementation and feasibility, which can also be understood by all involved stakeholders.

ACTIVITY 5.2: APPLICATION OF GUIDR AND STAKEHOLDER TOOLKITS

Set-up of a coordinated framework for the recommendation reports

Reports of applicable recommendations in the field of agriculture, grassland management, forestry, spatial planning and water management for implementation

Initiation of practical implementation of GUIDR in the pilot areas

Recommended practical GUIDR implementation lineout

Stakeholder toolkits for different stakeholder groups (agriculture, grassland management, forestry, spatial planning and water management)

All WP T3 outputs will be presented within the framework of examples of best practice principles applicable in different settings and based on knowledge and understanding gained during the project.

In this manner the transfer of findings and knowledge will be possible and applicable throughout the Danube basin region.

[1] Prvoslav Marjanović, , Marko Marjanović, Dragana Spasić, Dragica Vulić, Jaroslav Černi Water Institute, Jaroslava Černog 80, 11226 Belgrade, Serbia, (email: Marjanovic.civil@gmail.com)

GUIDR and the corresponding tool-kit will be a common means for implementation throughout the project area.

It is emphasized that integration of identified gaps of current land use planning practice regarding water protection and flood risk prevention issues and the lessons learnt will be carried out at the pilot action cluster level.

GUIDR - Guidance for the Danube region for sustainable land use planning will be developed for decision makers as a decision support tool. The development will be based on the respective water intervention type and focus on the improvement of water quality and enhancement of flood prevention through the implementation of a function-oriented land use for a sound water management in an optimized quantitative and qualitative manner. The initiation of the practical implementation of GUIDR will be conducted in the respective pilot areas by means of bottom-up approaches to mitigate the different conflicts of interests and to develop prospects for action deliverables, being approached through the series of 2nd stakeholder workshops and trainings in selected pilot areas. The implementation of GUIDR in the pilot areas encompasses an operational description for the application of best management practices. This includes recommendations for implementation of steering tools for regional strategy development and funding programmes.

Within the adopted approach of work within WP T3 the focus is on credibility, legitimacy and prominence within ecosystem based land use planning and clearly understood roles of different role players (Figure 1) and distinct phases in the planning and implementation process (Focus of GUIDR) as shown in Figure 2.

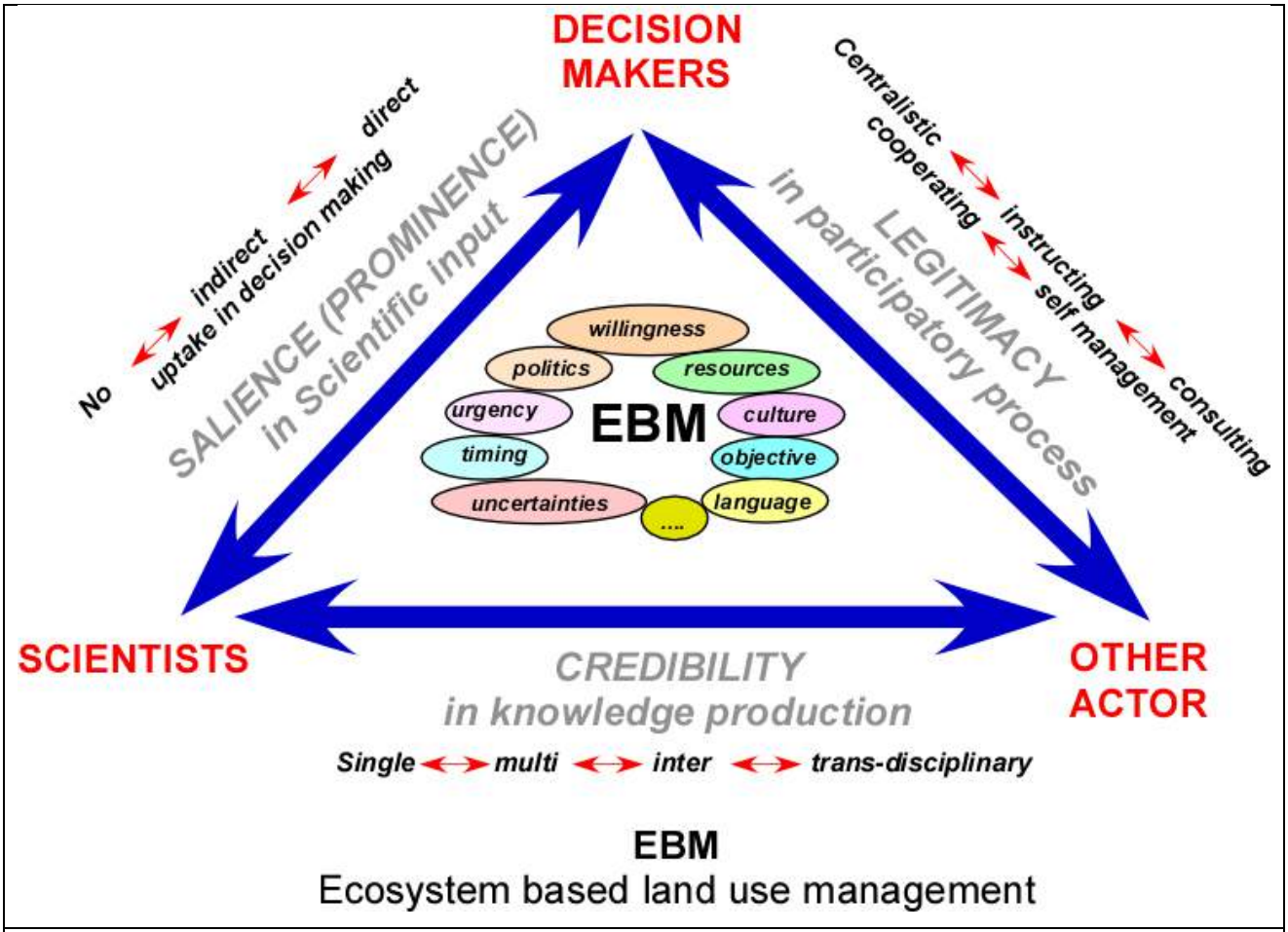

Figure 1. Interrelationships and focus of activities within WP T3

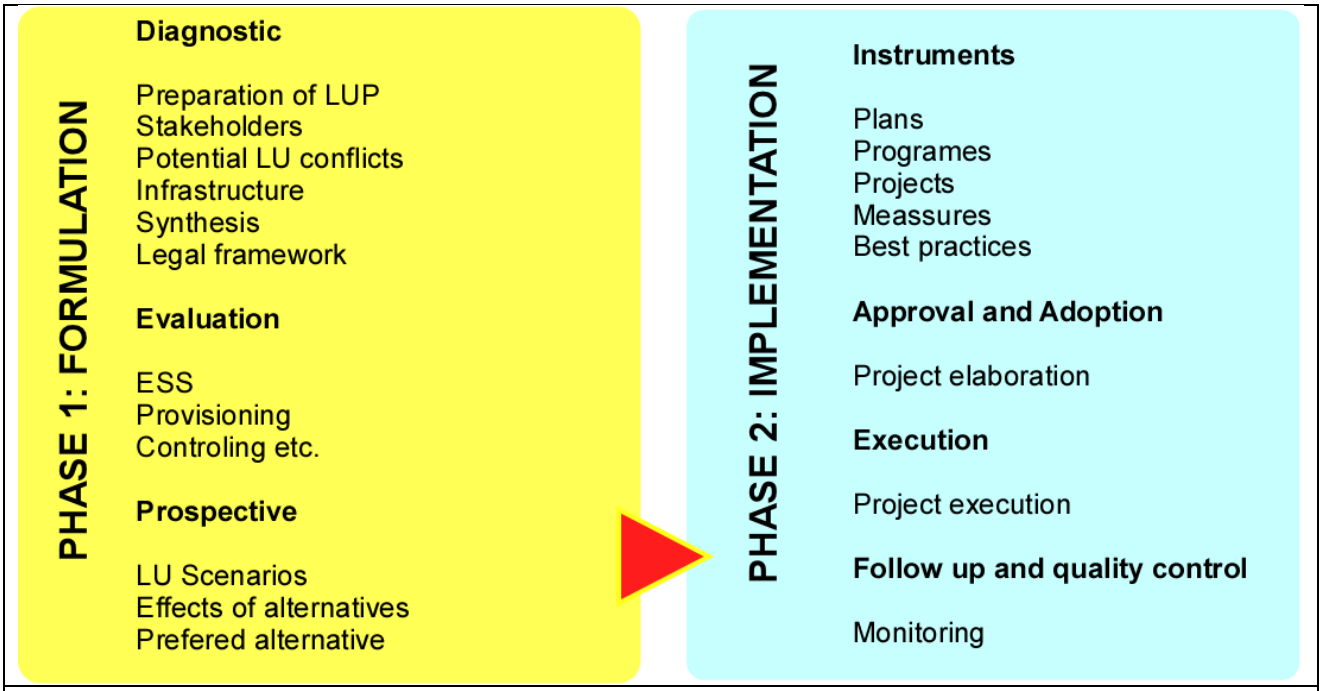

Figure 2. Planning phases and focus of GUIDR

Keywords: Ecosystem based sustainable land use planning, water quality protection, good practice

CAMARO-D
WORK-PACKAGE T4 "PROGRESSIVE DANUBE"
Concept for elaboration of "Land Use Development Plan" (LUDP) in Danube river basin

Bobeva A.[1], Rafailova E.[2]

ABSTRACT

Work package T4 "Progressive Danube" elaborates a common transferable catalogue with recommendations and joint standards in the Danube river basin for land use management with the overall purpose for protection of water resources and flood risk management.

The transnational strategy "Land Use Development Plan" (LUDP) will be developed in order to integrate the policy level and will serve as a strategy for function-oriented land use in Danube river basin. LUDP will be a strategic outline for sustainable protection of water resources and mitigation of flood risk and will contribute to an improved strategic decision process on policy level.

Based on the results of pilot actions within Clusters 1, 2 and 3 (WP T2) and through enhancing the communication between stakeholders and institutions, the final framework for a transnational catchment-based LUDP will be elaborated. The target groups and stakeholders will be consulted and involved in the development of the transnational LUDP as well as the development of the strategic outline for sustainable protection of water resources, integrated management and mitigation of flood risk. This involvement is actually given throughout the project duration, e.g. in the stakeholder trainings within the pilot action clusters, which serve as essential input for LUDP. Stakeholder workshops for knowledge transfer are essential for raising awareness and for active involvement of local population in decision making process and prevention activities. /Fig.1/

Fig. 1 Study visit about torrents and against afforestation of degraded lands, © ROMSILVA

Simulation game "danger zone map for protection floods", © AREC

[1] Bobeva A., Executive Forest Agency, blvd. Hristo Bptev 55, Sofia 1040, Bulgaria, stateforestryagency@gmail.com
[2] Ravailova E, Executive Forest Agency, blvd. Hristo Bptev 55, Sofia 1040, Bulgaria, erafailova@yahoo.com

Relevant institutions and decision makers will be addressed as target groups for the communication and implementation of the LUDP. This will guarantee the cross-regional and cross-sector coordination to achieve the best transnational implementation process. /Fig. 2/

Fig. 2 Cross-sectoral cooperation between water and forest authorities in drinking water protection areas in Bulgaria, pilot area – watershed "Ochindolska reka", © EFA

The transferable catalogue with recommendations, best solutions and joint standards for function oriented land use management will be proposed as decision support tool for politicians to expand their competences and to support them in decision making process.

To ensure the long-term partnership in the field of sustainable land use management, a Memorandum of Understanding about the further joint proceeding towards the implementation of LUDP will be signed.

All target groups and stakeholders will be invited to provide their contribution to the potential follow-up activities for water protection and mitigation of flood-risk management in the Danube River Basin.

Keywords: joint standards, stakeholders, land use development plan, land use management

POTENTIAL SYNERGIES OF PROLINE-CE & CAMARO-D AND OTHER EU PROJECTS

Barbara Čenčur Curk [1], Jerca Praprotnik Kastelic[2] , Elisabeth Gerhardt[3], Gudrun Schroemmer[4]

The following document intends to show possible synergies among PROLINE-CE and CAMARO-D projects. It is meant to present differences between both projects on the one hand and possible synergies on the other hand, taking into consideration the two project timelines. Even if at the first glance there are similarities concerning the structure of the project and approach on how to reach the deliverables and outputs, there are still considerable differences as it usually is the case with projects submitted in the same priority and dealing with a similar topic.

Both projects are aiming at the same goal – protection of natural resources (drinking water and water resources in general), which is also the priority of the Central Europe Programme (Priority 3, SO3.1 To improve integrated environmental management capacities for the protection and sustainable use of natural heritage and resources) and of the Danube Transnational Programme (Priority 2, SO2.1 Strengthen transnational water management and flood risk prevention).

The focus of PROLINE-CE project is protection of drinking water sources through integrated land use management and a developed implementation strategy for effectively harmonized environmental standards in drinking water recharge areas to improve water- and soil quality and reduce flood/drought risks within these areas. On the other hand, CAMARO-D project focus are land use impacts on the water regime in the Danube river basin with setting the frame for a harmonized transnational land use management system, taking into account the demands of water resources protection and flood prevention.

Despite different detailed focus of both projects, synergies of both projects can of course be identified, such as e.g. development of strategies how to address stakeholders in order to convince them about (1) the usefulness of applications of drinking water protection concepts (PROLINE-CE) and/or (2) management routines for land use impacts on the water regime (CAMARO-D), which can be adapted by the other pilot action. Synergies are also given by the expertise-extension provided through the fact that an extended circle of experts is working in similar thematic fields, which supports and opens new insights for both projects. This fact also supports the usefulness of a joint Mid-term Conference.

Two flowcharts should help to point out in a clear way that the synergy stands for the interaction/cooperation of both projects, producing a combined effect, which is greater than the sum of their separate effects. This can be clearly seen in the schematic presentation in Figure 1 pointing out, that cross fertilisation leads to a higher level as for “stand-alone projects”.

The second flowchart, showing the implementation of workpackage-outcomes between PROLINE-CE and CAMARO-D projects (Figure 2), presents, how outcomes from workpackages T1 and T2 from both projects implemented in work packages T3 and T4 of both projects will result in a higher level/ of these outcomes (full squares for T3 and T4 in Figure 2). In comparison, outcomes of T3 and T4 without synergies are presented as dashed square in Figure 2, clearly indicating lower level of outcomes.

[1] Barbara Čenčur Curk, University of Ljubljana, Faculty of Natural Sciences and Engineering, Ljubljana (email: barbara.cencur@ntf.uni-lj.si)
[2] Jerca Praprotnik Kastelic, University of Ljubljana, Faculty of Natural Sciences and Engineering, Ljubljana (email: jerca.praprotnik.kastelic@geo.ntf.uni-lj.si)
[3] Elisabeth Gerhardt, Federal Research and Training Centre for Forests, Natural Hazards and Landscape, Vienna (Elisabeth.Gerhardt@bfw.gv.at)
[4] Gudrun Schroemmer, PRISMA solutions, Mödling (gudrun.schroemmer@prisma-solutions.at)

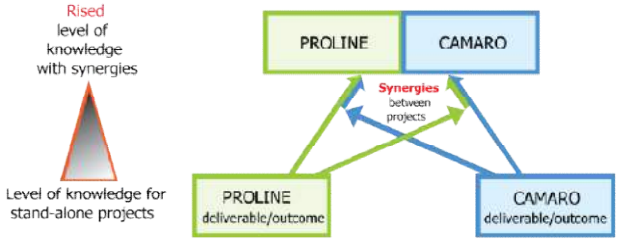

Figure 1: Synergy of PROLINE-CE and CAMARO-D projects, producing a combined effect (increased level of knowledge and outcomes), which is greater than the sum of their separate effects.

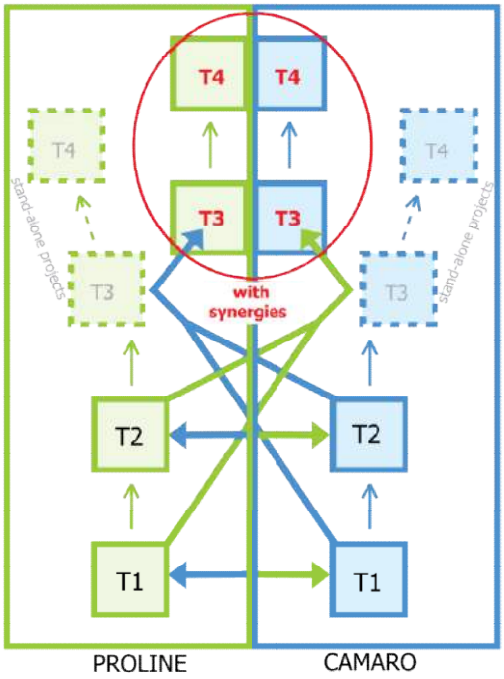

Figure 2: Flowchart of the implementation of workpackages outcomes between PROLINE-CE and CAMARO-D projects.

In the two projects, above all, the pilot actions differ significantly. Concerning possible synergies that are created for those partners involved in both projects, it can be stated that in fact there is a mutual benefit in both directions in the sense that lessons learnt in one project can immediately be practiced in the other project. This was for example the case for the organisation of the stakeholder workshops.

Such synergies are possible with many other current projects dealing with drinking water protection, water management and land use management, whereas applying project results from past project is capitalisation.

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Keywords: Synergies, PROLINE-CE, CAMARO-D

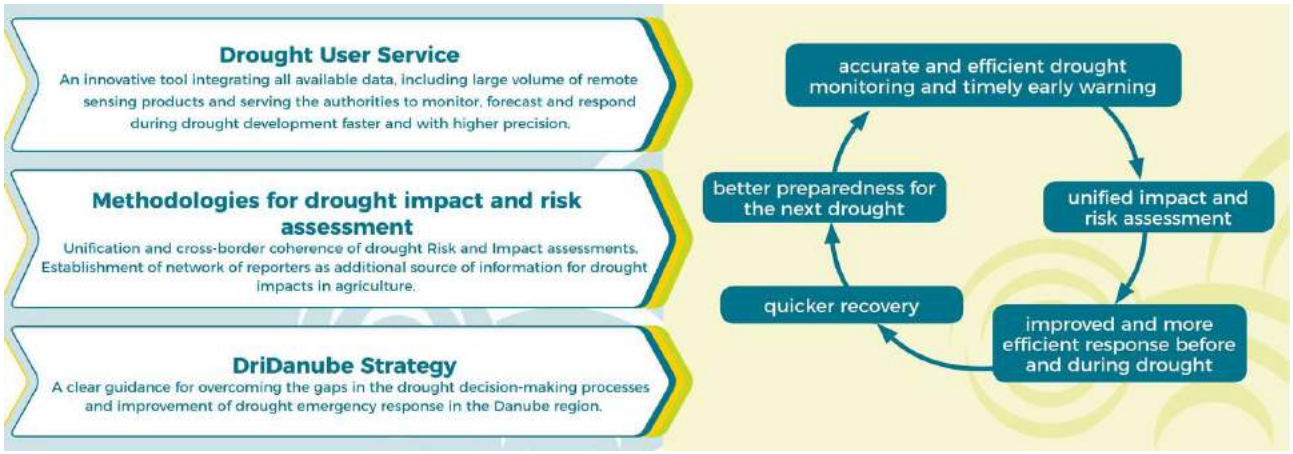
DriDanube

"DROUGHT RISK IN THE DANUBE REGION" – DANUBE TRANSNATIONAL PROGRAMME

ANDREJA SUŠNIK[1], GREGOR GREGORIČ[2], MAJA ŽUN[3] and ANDREJA MODERC[4]

DriDanube project, having on board 15 project partners and 8 associated strategic partners from 10 countries (Slovenia, Czech Republic, Slovakia, Austria, Hungary, Romania, Croatia, Bosnia and Herzegovina, Serbia and Montenegro), started its 2.5-year implementation in January 2017. It brings together institutions from different sectors: national hydrometeorological services, universities, scientific centres, a research institute and a non-governmental organisation. In the frame of Danube Transnational Programme Capitalisation Strategy, partnership also cooperates with consortium of partners included in sister DTP projects such as CAMARO-D and JoinTisza.

Project's main objective is to increase capacity of the Danube region to manage drought-related risks. In order to achieve that, project partnership is developing an operational interactive tool for better drought monitoring, a common methodology for drought impact assessment and yield forecast as well as a unified methodology for drought risk assessment. Aiming at improving drought response to become pro-active, the project is also preparing regional Strategy to improve drought emergency response (Picture 1).



Picture 1: Each of the expected outcomes targets a certain field of drought management and thus contributes to wholesome drought management in countries of the region and improved preparedness for next drought.

Half way into project implementation, partnership has achieved great progress towards reaching its goal. A prototype of Drought User Service (DUS), an interactive tool for better drought characterisation and early warning over entire Danube region, has been developed and includes a range of satellite datasets further processed into ready-to-use drought information, available to public online. This way, it will improve day-to-day work of end-users from farmers to national authorities in all aspects of drought management. With DUS prototype ready, a training on its use was held dedicated to drought monitoring experts within the partnership who will later on train national stakeholders.

[1] ANDREJA SUŠNIK, SLOVENIAN ENVIRONMENT AGENCY, VOJKOVA 1B, 1004 LJUBLJANA, SLOVENIA (email: andreja.susnik@gov.si)
[2] GREGOR GREGORIČ, SLOVENIAN ENVIRONMENT AGENCY, VOJKOVA 1B, 1004 LJUBLJANA, SLOVENIA (email: gregor.gregoric@gov.si)
[3] MAJA ŽUN, SLOVENIAN ENVIRONMENT AGENCY, VOJKOVA 1B, 1004 LJUBLJANA, SLOVENIA (email: maja.zun@gov.si)
[4] ANDREJA MODERC, SLOVENIAN ENVIRONMENT AGENCY, VOJKOVA 1B, 1004 LJUBLJANA, SLOVENIA (email: andreja.moderc@gov.si)

First step towards harmonized drought impacts assessment and forecast across the region was to collect historical drought impacts data for 1981-2016 period and crop yield data for 2010-2016 period on the area of participating countries. Since then, partnership has put great effort into establishing national reporting networks for early drought detection and its exact impacts on the field, consisting of on-field reporters on weekly state of soil and vegetation. Detected drought impacts on soil, agricultural crops, forests and grasslands are then displayed in a form of maps which will be further integrated into DUS. This way, drought impacts data collected through national reporting networks serve for systematic impact data collection and also for validation of satellite data. At the same time, general scheme of common methodology for drought risk assessment was prepared and, in addition to it, softwares for mapping of drought risk across Danube region are under development.

The final output of DriDanube project is the Strategy to improve drought emergency response in the Danube region. A starting point of its preparation was to see how drought is managed across the region and find common gaps and needs in each participating country. Therefore, with help of associated strategic partners and key stakeholders, countries' current status of drought monitoring, risk assessment and management were analysed. Turning out that drought policy framework across the region is dispersed and marked with diverse national policies not addressing drought directly, partnership set ground for synchronized and improved drought management by developing an optimal drought management model. It organises existing national institutions involved in drought monitoring and drought management into a unified institutional scheme for collective proactive implementation of national drought policies.

With main project outputs well into their final form, they are ready for testing through two pilot actions to provide much needed feedback on their usefulness. DUS prototype with integrated methodologies is going to be tested in Croatia, Czech Republic, Montenegro and Romania while proposed optimal drought management model is going to be tested method downscaled on river catchments of Tisa (Hungary) and Krivaja (Serbia). Based on findings derived from pilot actions, project's newly developed tool, methodologies and drought strategy will be further shaped and improved to help stakeholders in the field of drought monitoring and/or management across all Danube region become more efficient during drought emergency response and prepare better for next drought.

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http://www.interreg-danube.eu/dridanube

Keywords: DriDanube, drought risk, Danube region, Interreg, project

AMIIGA

INTEGRATED APPROACH TO MANAGEMENT OF GROUNDWATER QUALITY IN FUNCTIONAL URBAN AREAS

Joerg PRESTOR[1]

ABSTRACT

AMIIGA is a project pulling together 12 partners from 6 countries (Poland, Germany, Italy, Czech Republic, Italy, Slovenia, Croatia) of Central Europe, all sharing the objective of developing an integrated approach to the management of groundwater quality in Functional Urban Areas. AMIIGA project tackles the problem of groundwater contamination originating both from plumes and diffuse pollution of different sources, a common issue in Central Europe. 10 Associated Partners contribute to develop and carry out AMIIGA.

The AMIIGA territories cover different types of brownfield related contamination, as well as different types of groundwater bodies (porous aquifers of alluvial plains, fractured and karstic aquifers). This covers pollution by traditional industrial activities - chlorinated hydrocarbons, agriculture - pesticides and fertilizers and mining related pollution.

The project is developing a shared transnational management strategy to deal with groundwater contamination. Seven management plans, one for each Functional Urban Area, will be produced; they will include the definition and timeline of remediation targets, suggestions for adjusting measures in case of new laws or realignments of the remediation targets, a monitoring plan of effects of the measures set in place and financial and legal considerations for implementation. Relevant institutions (public bodies, regulating bodies, water authorities) and stakeholders are involved through the establishment of Regional Implementation Groups and through workshops and trainings. Good practices are identifying and sharing.

Seven Pilot Actions will test and demonstrate the innovative tools of AMIIGA and develop the Integrated Groundwater Management Approach. They are different for contaminants, hydrogeological characteristics and final outputs: • Remediation concept from drinking water perspective for diverse pollutants in Ljubljana (SI), • Distinction between site-specific and diffused contamination in Milan (IT), • Assessment of Natural Attenuation potential as a remediation option in Parma (IT), • In-situ biologically enhanced remediation in Novy Bydzov (CZ), • Passive GW treatment by bio-reactive wall in Jaworzno (PL), • Integral monitoring of remedial measures efficiency in Stuttgart (DE), • Solution for the inverse problem using the FOKS tools in Karst in Zadar (HR).

Innovative tools for characterization and prioritization of groundwater contamination sources will support decision making and strategies for groundwater management in Functional Urban Areas. AMIIGA is developing biological (Biological Molecular Tools - BMTs) and isotopic (Compound-Specific Stable Isotopes - CSIA) tools to make them suitable both in urban cores and their surroundings. Integrated AMIIGA approach will include also innovative remediation technologies, economically sustainable and based on biological process.

Pilot action of Ljubljana-Ig Functional Urban Area (Slovenia):

Despite the numerous protective measures, the quality of groundwater in the aquifer under the city is affected by numerous impacts that are not under control. Some pollutants originate from the distant past, others are (un)expected in groundwater. They are appearing as contaminations of different concentrations, as rapidly or slowly travelling clouds or sporadic phenomena, requiring coordinated action among stakeholders. In the

[1] Joerg PRESTOR, Geological Survey of Slovenia, Dimičeva ulica 14, 1000 Ljubljana (email: joerg.prestor@geo-zs.si)

case of Ljubljana, there are four most important sources and types of pollutants, which are also typical for many

other cities: industrial area (hexavalent chromium - Cr (VI)), urban core with sewage losses (nitrate – NO_3 and new emerging pollutants), urban landfill of non-hazardous waste (boron - B), and the hinterland of the city with a cloud of pollution from the old gravel pit (desethylatrazine - DAT) (Figure 1). At present, pollution with desethylatrazine seems to be the most difficult problem from the point of view of remediation, since the maximum concentrations of the pollutant have moved to a depth of 15 to 30 m, and the mass of the pollutant and the concentration are decreasing extremely slowly over the span of decades.

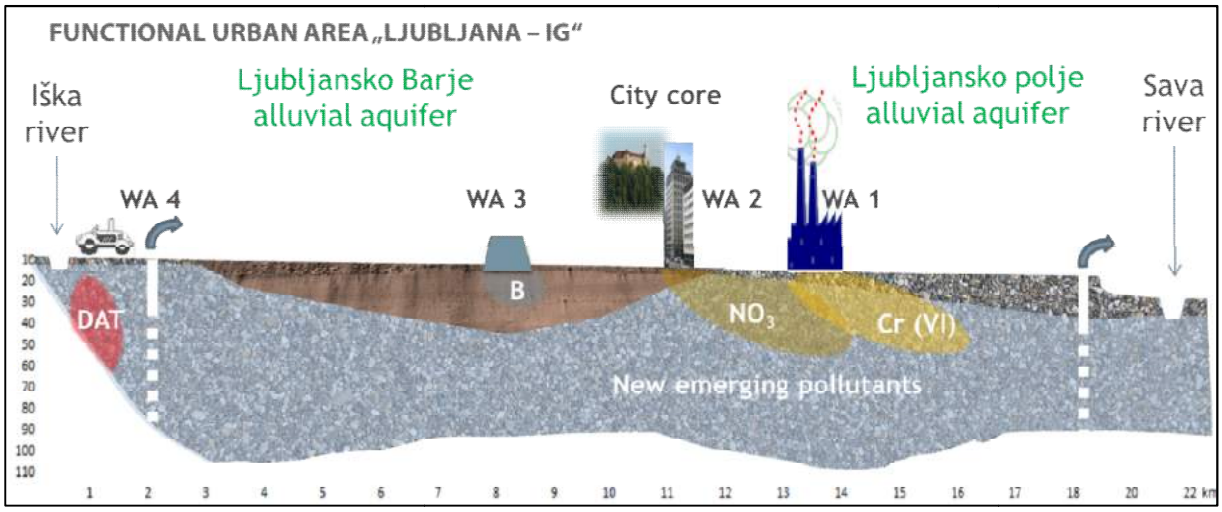

Figure 1. Pilot action Functional Urban Area Ljubljana-Ig (Slovenia) - schematical cross-section along the alluvial aquifer.

Keywords: groundwater quality, industry, agriculture, mining, management plan

SMALL RETENTION – BIG DEAL!

FRAMEWORK FOR IMPROVING WATER BALANCE AND NUTRIENT MITIGATION BY APPLYING SMALL WATER RETENTION MEASURES (FRAMWAT)

Tomasz Okruszko[1], Primož Banovec[2], Alenka mubi Zalaznik[3], **Anja Potokar[4]**, Mateja Škerjanec[5] and Sabina Bokal[6]

Human activities and climate change have caused an increase in the frequency of extreme climate events, including floods and droughts (Cambridge University, 2012). So far, the majority of water management and flood protection measures lack innovation and follow more traditional approaches without taking into account valuable ecosystem services provided by nature in the landscape settings. Thus, there is a common need to systematically implement natural (small) water retention measures (N(S)WRM) in order to improve the water retention in the catchment, limit the spread of pollution and enhance favourable conditions for natural environment and biodiversity.

The project "Framework for improving water balance and nutrient mitigation by applying small water retention measures (FramWat)" supports the idea of using landscape features to help solving environmental problems within the Central European water bodies in a sustainable way. It aims to strengthen the common regional framework for flood, drought and pollution mitigation by increasing the buffer capacity of the landscape. Project partners will develop methods that translate existing knowledge about the N(S)WRM approach into river basin management practice. This will result in improved water balance, decreased sediment transport and enhanced nutrient re-circulation. The project will provide decision makers with the appropriate tools for incorporating N(S)WRM into the next cycle of River Basin Management Plans (RBMPs). Moreover, it will offer guidance and raise awareness about the importance of horizontal integration of different planning frameworks.

FramWat will create a set of outputs to be used by water authorities. A valorisation method (VM) based on a multi-criteria analysis of topographical, hydrological, meteorological and economic data will be developed. The VM will be incorporated into the GIS tool for identifying locations in river basins where N(S)WRM are needed. Users will be able to populate the GIS tool with their own data and review the resulting maps and statistics. A methodology will be developed to help stakeholders assess the effectiveness of the system of measures in river basins. Five pilot actions to test the effectiveness of N(S)WRM will be applied in six pilot catchment areas: Aist (Austria), Bednja (Croatia), Tisza (Hungary), Kamniška Bistrica (Slovenia), Slaná (Slovakia) and Kamienna (Poland). One of the main outputs will also be guidelines on how to plan, construct and maintain complex N(S)WRM in different conditions within the Central Europe. Based on the guidelines, the results of the pilot actions and stakeholders' input, six action plans on integrating N(S)WRM into RBMPs will be developed. Lastly, trainings on the GIS tools and on assessing the effectiveness of N(S)WRM will build the capacities of all involved partners and stakeholders.

The project is co-funded by the Interreg CENTRAL EUROPE Programme and joins together nine partners from Austria, Croatia, Hungary, Poland, Slovakia and Slovenia. Project began in July 2017 and is expected to be completed by the end of June 2020.

[1] Tomasz Plruszko, Warsaw University of Life Sciences, Nowoursynowska 166, 02-787 Warszawa, Polland
[2] Primož Banovec, University of Ljubljana, Faculty of Civil and Geodetic Engineering, Jamova 2, 1000 Ljubljana, Slovenia
[3] Alenka mubi Zalaznik, Limnos Ltd., Pozarnice 41, 1351 Brezovica pri Ljubljani,
[4] Anja Potokar, Limnos Ltd., Pozarnice 41, 1351 Brezovica pri Ljubljani, Slovenia (anja@limnos.si)
[5] Mateja Škerjanec, University of Ljubljana, Faculty of Civil and Geodetic Engineering, Jamova 2, 1000 Ljubljana, Slovenia
[6] Sabina Bokal, Global Water Partnership Central and Eastern Europe, Jeseniova 17, 833 15 Bratislava, Slovakia

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Keywords: natural small water retention measures, river basin management plans, nature-based solutions, flood protection, pollution mitigation

FARM SYSTEMS THAT PRODUCE GOOD WATER QUALITY FOR DRINKING WATER SUPPLIES - FAIRWAY

INFORMATION ABOUT H2020 PROJECT

MARINA PINTAR[1]

GENERAL INFORMATION

FairWAY project (https://www.fairway-project.eu) has stared on 01.06.2017 and will finish on 31.05.2021. It has been applied to call H2020-RUR-2016-2 to the topic RUR-04-2016 Water farms-improving farming and its impact on the supply of drinking water, where multi-actor approach of projects has been required.

It is coordinated by Gerard Velthof from Stichting Wageningen Research (Netherlands). In the project, 22 partners are involved and 13 case studies (Figure 1) are included all over Europe. The project consists of nine work packages as follows: WP1 Project management; WP2 Multi-Actor pratforms and case studies; WP3 Monitoring and indicators; WP4 Review of measures and oractices; WP5 Review of decision support tools t diminish pollution of water resources; WP6 Legal policy and governance; WP7 Integration and recomendadtions at EU level; WP8 Disseminationa and communication; and WP9 Ethics requirements. FairWay project cooperates with a sister project WaterProtect (https://water-protect.eu/) which has been lounced based on the same topic.

BACKGROUND

Safe drinking water is vital for human health. Diffuse pollution of nitrogen and pesticides from agriculture is the main obstacle to meet drinking water quality targets. Policies to protect drinking water resources have not achieved a consistent effectiveness in all member states.

OVERALL OBJECTIVE

The overall objective of the FAIRWAY project is to review current approaches and measures for protection of drinking water resources against pollution caused by pesticides and nitrate from agriculture, and to identify and further develop innovative measures and governance approaches for a more effective drinking water protection, together with relevant local, regional and national actors.

[1] Marina PINTAR, University of Ljubljana Biotechnical faculty, Jamnikarjeva 101, 1000 Ljubljana, Slovenia (email: marina.pintar@bf.uni-lj.si)

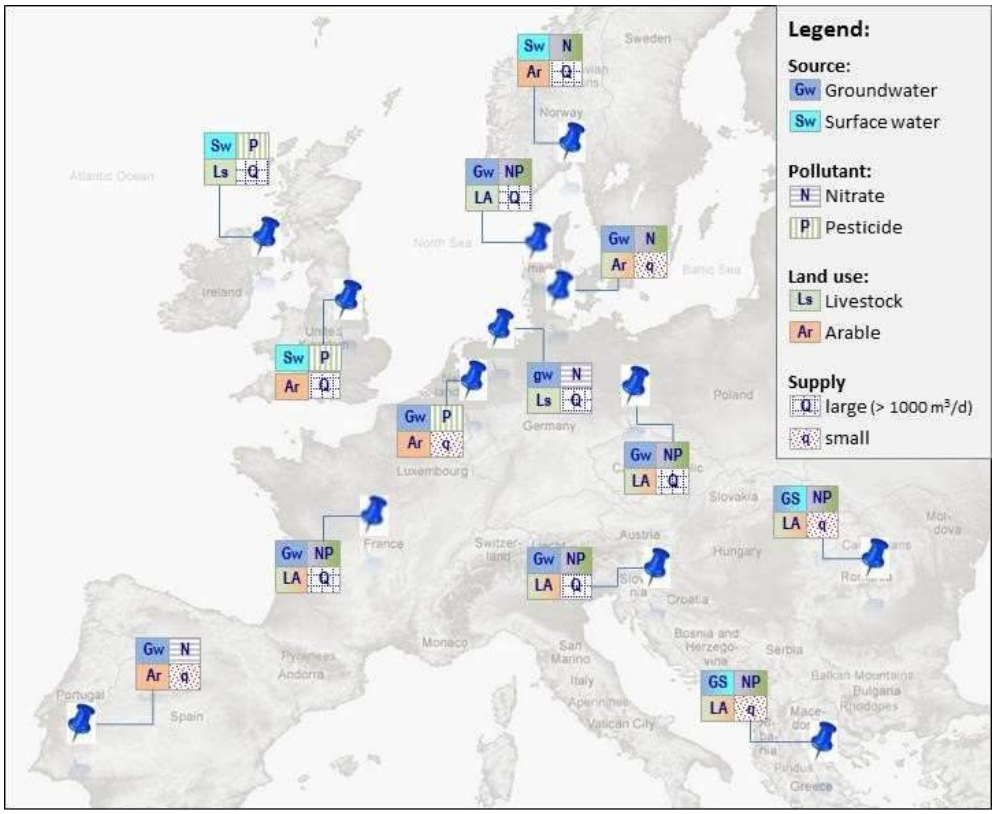

Figure 1: Overview of the case study sites in the project FAIRWAY

SPECIFIC OBJECTIVES

Specific objectives of FAIRWAY are: (i) to increase the scientific understanding of the relationship between agriculture and drinking water protection; (ii) to increase the understanding of the social, technical and economic barriers to practical implementing of measures; (iii) to deliver innovative measures and tools to overcome these barriers; (iv) to develop protocols and data-sets for monitoring of farming practices and water quality, and to increase awareness and involvement of farmers and other citizens in the monitoring of water supplies; (v) to develop effective governance approaches for small to large water supplies; (vi) to identify key strategies and good practices for drinking water protection and assess the implications of these options for policy and practice.

Keywords: multi-actor platforms, indicators, decision support tools, governance, policy

CATALOGUE OF BEST MANAGEMENT PRACTICES FOR DRINKING WATER PROTECTION

Josip Terzić[1], Jasmina Lukač Reberski[1], Ivana Boljat[1], Matko Patekar[1] and Ivona Baničeк[1]

ABSTRACT

The protection of drinking water resources regarding land-use management and flood protection is an environmental challenge common to all countries in Central Europe (CE) and has a specific transboundary and transnational relevance. The existing diverging levels of best management practices implementation are a common problem in the region which additionally emphasizes the lack of integrated sustainable solutions.

The PROLINE-CE deliverable D.T1.3.4 "Transnational catalogue of strategies and measures to be integrated into existing policy guidelines" represents a conversion of lessons learnt from the first national stakeholder workshops held in May and June 2017 by Project Partners and their Associated Partners. The workshop participants included local, regional and national public authorities, infrastructure and service providers, higher education and research facilities, interest groups and NGOs and also general public. These stakeholder targeted events identified the leading problems in land use and flood management in relation to drinking water protection via SWOT analysis reflection, interactive dialogue between stakeholders and project partners, as well as accenting problems that relevant stakeholders experience in their daily business.
Gaps and measures (best management practices) were collected on a national level by the Project Partners who assessed their relevance in respect to cost, time, sustainability, water protection functionality and limitations. In total, a set of 38 measures have been selected and elaborated by Project Partners, as seen in D.T1.3.4, based on their significance and overall impact in the CE region regarding its most pronounced issues in various land-use categories. General (all) land uses, agriculture and forest-related measures are the most dominant ones which is to be expected due to their widespread presence in European countries (**Table 1**). The majority of the proposed best management practices are non-structural.

The compilation of the catalogue emphasized the need for further effort in effective long-term management which would include financial stimulus for good practices, adaptation scenarios and funding for climate change research and a more engaged approach to awareness raising activities.

The expected project results include the development of an implementation strategy for effectively harmonized environmental standards in the drinking water recharge areas of the participating regions that shall improve water- and soil quality and reduce flood/drought risks. It will be demonstrated in the "GOWARE" (Guide towards Optimal WAter REgime) which aims to provide an overall frame for the implementation of best practices. The application of selected best practices in pilot cases allows their operationalisation and supports drinking water protection implementation in recharge areas. The transfer of results to policy level will be made certain by the joint declaration act about drinking water protection, floods and land use titled DriFLU Charta.

[1] Croatian Geological Survey, Department of Hydrogeology and Engineering Geology, Ulica Milana Sachsa 2, 10000 Zagreb, Croatia (email: jterzic@hgi-cgs.hr)

Table 1. Most notable best management practices from the D.T1.3.4. "Transnational catalogue of strategies and measures to be integrated into existing policy guidelines"

Most relevant best management practices	Forest installation rules in floodplain of drinking water resources protection area
	Establishment of buffer strips
	Increasing the efficient use of water in agriculture and adapting to CC and crop irrigation to achieve optimum yields
	Encouraging organic farming
	Preservation of existing (permanent) grasslands
	Wetland restoration
	Climate change adaptation and resilience
	Evaluating effects of Soil Protection Plans on water bodies
	Assessing flood impacts on drinking water supply systems and on water bodies
	Joined and integrated management of drinking water resources (horizontal and vertical cooperation)

Forest
Agriculture
Grassland
Wetland
General / all

Keywords: PROLINE-CE, land-use management, best management practices, drinking water protection, stakeholder input

PROLINE-CE

ACTION PLAN

Barbara Čenčur Curk [1]

One of the main outputs of the PROLINE-CE project is Action plan for adaptation of existing land use and flood/drought management practices. It will be done on the basis of outcomes from three pilot action clusters: mountain forests and grasslands; plains: agriculture, grass/wetland and 'riparian strips.

Optimal forest and grassland management measures focusing on the needs of water supply and protection against flooding are implemented pilotary in selected mountainous areas. It is foreseen to initiate negotiations with stakeholders and set up respective contracts with private land owners considering Best Practice Guides.

Beside floods, conflicts between land use activities and drinking water protection in plains are inevitable and affect drinking water quality and quantity. Selected Pilot Actions (PA) face high pressure by land use due to agriculture. For all those PAs cost effective and environmental friendly risk management is a prerequisite for ensuring safety of drinking water, therefore mitigation measures will be developed and piloted, including ecosystem services of water bodies and wetlands.

Drinking water sources along rivers are vulnerable to floods, more distant areas to droughts. Developed best practices for flood and drought risk management will be implemented and tested concerning their contribution to improvement of drinking water safety and effectiveness including ecosystem services as well as economic efficiency. An enhanced water monitoring and modelling system will be elaborated for optimal decision making processes along rivers, also considering climate extremes.

According to the outcomes of the different pilot actions, an action plan for achieving best functional patterns of land use will be lined out. It shall contain the sequence of steps in order to reach a smooth steering of using different land cover types within CE. The revised best land use management practices are a basis for the improvement of policy guidelines in the respective regions. The needs for action identified lead to formulation of specific tasks for the improvement of policy guidelines in the respective regions. The needs for action identified lead to formulation of specific tasks for an appropriate action schedule.

Keywords: Action plan, Best management practices, drinking water protection

[1] Barbara Čenčur Curk, University of Ljubljana, Faculty of Natural Sciences and Engineering, Ljubljana (email: barbara.cencur@ntf.uni-lj.si)

WP T3 "SYNOPSIS: VISION AND GUIDANCE"

THE ROAD TOWARDS CE-GOWARE

Guido Rianna[1]

Building upon outcomes of Work Packages T.1 and T.2, WP T3 is aimed to outline a common methodology and a vision for integrated management of landscapes ensuring the appropriate quality and quantity of the water resources and the protection against water-related hazards in the participating regions.
Such goal is primarily pursued recognising the hydrologic ecosystem functions provided by the different landscapes and supporting the associated services through the identification, development and implementation of tailored best practices.

The several findings will be summarized in a CE Transnational Guide towards Optimal WAter REgime (CE-GOWARE), ideally resulting in improved local/regional/national planning documents. It will include recommendations properly targeted for operational (e.g. water suppliers) and spatial planning and management purposes (e.g. Municipalities or Regional Authorities) promoting a sustainable and safe utilisation of water resources which takes due account of services provided by the different ecosystems.
GOWARE vision will support project partners in preparing adequate information transfer to stakeholders and will provide a plan for implementation of sustainable land-use management in participating regions beyond project lifetime.

Figure 1 example of floodplain/water retention basin [http://nrcsolutions.org/floodwater-detention; credit:Sasaki]

The achievement of this objective entails the carrying out of different key activities. Desk reviews and expertise of Project Partners will permit defining potential public services of sustainable and functional land use management regarding the pilot action clusters and identifying the most effective measures and possibilities of funding hydrologic ecosystem services. They will permit the operational definition of essential management adaptation measures for protection of drinking water resources and against

[1] GUIDO RIANNA, CMCC Foundation, REMHI Division (email: guido.rianna@cmcc.it)

hydrological hazards and the pinpointing of locally tailored recommendations for institutional and organizational structures.

Moreover, it worth stressing that the accomplishment of these tasks will benefit from outputs and hints also provided by CAMARO-D (Cooperating towards Advanced MAnagement ROutines for land use impacts on the water regime in the Danube river basin) funded within the Interreg Danube Transnational Programme including several partner among those in PROLINE partnership and aimed to develop a river-catchment-based Land Use Development Plan for a sustainable protection of water resources and mitigation of flood risk.

Keywords: ecosystem services, hydrological services, policies, water resources, hydrological hazards

MAIN OUTCOMES OF THE KNOWLEDGE BASE

Tomas Dostal[1], Josef Krasa, Miroslav Bauer, David Zumr, Barbora Jachymova, Jan Devaty

INTRODUCTION

The Knowledge base is one of two Outputs of Work Package T1 – registered O.T1.2 – Danube Investigative. Knowledge base summarizes results of four main activities, concluded by deliverables DT114, DT122, DT123 and DT 133 (see in References), which covered full content of mentioned introductory Work Package.
The goal of the work package was to summarize basic problems of Danube catchment, to define and describe them, to classify and also spatially evaluate them, to discuss them with stakeholders and to list and select the Best Management Practices into complex catalogue.

KNOWLEDGE BASE CONTENT

Knowledge base is the final output of the first thematic work package (WP T1 – Investigative Danube) of CAMARO-D project. Knowledge base concludes results and outcomes, collected within WP T1, into complex material. It first brings brief overview of major current environmental problems of Danube catchment, focusing on three targets of CAMARO-D project (water quality, flood risk, and soil/landscape functioning). All challenges and negative practices are evaluated by CAMARO-D expert teams separately in five land management segments: water management; spatial planning; forestry; agriculture; tourism.
Knowledge base then summarizes legislation conditions within individual Danube countries, related to expert fields of agriculture, forestry and spatial planning. The reviews were mainly focused on recent situation in national and EU legislation and policy within each CAMARO-D country, in order to improve catchment management situation, to provide better water quality and runoff-retention conditions.
Finally, knowledge base gives brief overview of selected Best management practices (BMP) in four land management segments: arable agriculture, grassland management, forestry and spatial planning. The list is based on the transnational gap-analysis, BMP-analysis and SWOT-analysis about current land use practices and their impacts on water management and it encompasses stakeholder needs and requirements concerning legislation, funding systems, financial instruments, the role of decision makers and knowledge transfer.
Knowledge base (Output 3.2) is a structured summary. It is complex output material of WP T1 (WP 3). For detailed information on individual segments of expertise and materials worked out within WP T1 readers are asked to address individual specific documents available at http://www.interreg-danube.eu/approved-projects/camaro-d

CONCLUSIONS

The presented knowledge base is formulated based on surveys and reviews performed on several scales by stakeholders of various backgrounds and interests. The analysis of the actual environmental problems and environmental management challenges in the Danube basin reflects the general perspectives of the managers, experts, researches, as well as stakeholders who work and live in the landscape (e.g. farmers, industry, local administration, etc.). One of the main merits of the report is the comparison of the views on the environmental state of the Danube basin as perceived by different groups of stakeholders.

[1] Czech technical University in Prague, Faculty of Civil Engineering, Dept. of Irrigation, Drainage and Landscape Engineering; Thakurova 7, Praha 6, 16629, Czech Republic, (email: dostal@fsv.cvut.cz)

Generally, Knowledge base concluding and summarizing results of one year of work of 22 expert teams from 9 CAMARO-D countries can give information support and directions of further effort in CAMARO-D project by defining most effective routing to achieve improvements in target areas.

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- DT112 Nine GAP-analyses reports about current land use practices and their impacts on water management
- DT113 Nine analyses report of existing policy instruments/strategies resp. governance and cross compliance synergies on national/regional levels and their current practical implementation
- DT114 Transnational synthesis status quo report on Danube basin level
- DT115 List of stakeholders in involved countries for questionnaires and further involvement
- DT121 Nine national review reports of existing best management practices (BMP)
- DT122 Transnational review report of existing best management practices (BMP)
- DT123 Four transnational best management practice catalogues (Agricultural, Forestry, Grassland and Spatial planning)
- DT131 – Questionnaire for Stakeholder investigation with methodology of SWOT evaluation of results
- DT132 Nine SWOT analyses based on the outcomes of the questionnaires and the stakeholder workshops
- DT133 Evaluation and transnational conclusions of SWOT analyses

Keywords: knowledge base, water quality, best management practices, flood risk, SWOT analysis

CAMARO-D WP T2 Explorative Danube

TRANSNATIONAL CLUSTER MANUALS FOR PRACTITIONERS

Renate Mayer[1]

Transnational comparability of risk minimisation measures

Within the three clusters, the pilot actions are initialized in the pilot regions. The transnational comparability for best solutions was identified in a common approach. The usability for the implementation of risk minimisation measures are summarised in the three cluster reports.
As next step we prepared a template for each cluster: "Transnational Cluster Manual for Practitioners".
In order to ensure that the most important risks and problems for the Danube Region are covered, an exact risk list (cluster-specific) is drawn up once again. Data is now collected country by country.
For the selection of the practitioners' manuals, an exact list of stakeholders is necessary.

Occupational group / Institution	Role, function in general / in CAMARO	Competencies, responsibilities	Obligations / legal basis	Advisory facilities (information, training)	Funds for protection of water resources / adequate land use against pollution, floods, erosion...
Farmers	Land use, arable farming , management of wetland areas	Land use management, Natura 2000 wetland areas, protection against erosion, change of crops, ...		Chamber of Agriculture who supports funding submission (e.g. ÖPUL), ÖWAV trainings, CAMARO-D stakeholder process	Afforestation measures (Rural development programme), Life+, Leader, ÖPUL, ...
Farmers in water protection zones (WPZ)	Management of farmlands within WPZ	Farm land under the target values of groundwater protection (drinking water protection)	Contracts with the water supplier, spreading rules for fertilizers and pesticides, Nitrate Action Plan	Chamber of Agriculture who supports funding submission (e.g. ÖPUL), ÖWAV trainings, CAMARO-D stakeholder process	
Forest owners (within WPZ)	Forest Management	Practical implementation of forest management measures to protect groundwater resources	Forest Act, DWPZ-Degree, CAMARO-D catalogue of BMP	Forest authorities: support funding submission, trainings CAMARO-D stakeholder process	Water Works for the related municipalities
Water suppliers (part of the municipalities Steyr and Dietach)	Water supply stakeholders with the highest degree of interest for integral drinking water protection strategies	Provide drinking water in an adequate quality and quantity, host of all activities in relation to integral water protection management	DWPZ Degree, definition of principles for land use in water protection areas of City of Vienna and the municipalities Steyr and Dietach	ÖVGW Trainings, CAMARO-D stakeholder process	Percentage of water price dedicated to watershed protection
Forest administration of Upper Austria	ASP1 in CAMARO-D	Overall funding activities for foresters in the province, common target definition for forest management	Consultation tasks, CAMARO-D stakeholder process	dialogue with forest owners, overall communication activities	Part of the overall obligations for the forest service
Spatial planning consultants	Development of local land use concepts, local land use plans, building regulation plans for municipalities	Consideration of DWPZs in the planning process	Spatial planning laws (federal states)		None
Municipalities	Local spatial planning authority; issuing of local planning instruments		Spatial planning laws (federal states)		
Provincial spatial planning authorities	Development and issuing of state and regional planning instruments		Spatial planning laws (federal states)		None
Regional planning associations	Development of regional planning instruments		Spatial planning laws (federal states)		none
Water associations and water cooperatives	Intermunicipal organization of water-related issues (e.g. flood protection measures)		Federal Water Act		Funds for realising flood protection measures

Figure 1: Draft Stakeholder list Austria, Cluster 1

[1] **Renate Mayer**, Agricultural Research and Education Center Raumberg-Gumpenstein (email: renate.mayer@raumberg-gumpenstein.at)

National "Best practice manuals" for risk minimization

Within the pilot reports the actions carried out are described in detail. The best solutions are presented and the management concepts for risk minimisation in the pilot catchment areas are adapted. The Cluster Manuals for practitioners are designed to implement the best solutions.
Each PP collected existing and /or recommended "best practice manuals" (BPM) / handbooks related to direct /indirect interventions in the pilot area with a short description or content structure, e.g.:

- LP1: Evaluation of measures for reduction of soil loss in cropland on field and catchment scale); Raab
- LP2: Forest management adaptation concepts for securing sustainable protection of groundwater resources-Steyr
- PP1: Water shed management and catchment hydrology, run-off/ infiltration behavior of soil-plant units, Enns river
- PP2: Interdependencies between karst groundwater and grassland management (alpine pastures)
- PP3, PP10: land-use and groundwater interdependencies in Kupa river catchment
- PP4: Ljubljansco barje -water field Brest & Iska river: groundwater interactions with land-use
- PP5: Know how transfer and promotion stakeholder
- PP6, PP7, PP8: Forestry measures, silvicultural practices to reduce the risk in torrential watersheds
- PP9: Reduction of disaster risks in torrential watershed of Ochindolska River
- PP10: Flood prevention and groundwater
- PP11: Interdependences between land use and groundwater quality/flood dynamics (reservoir Brno watershed)
- PP12: Adaption of tree species within the Danube basin with high nitrate seepage
- IP-PP1 Land use and groundwater quality in Gruža and Grošnica

Transnational "Best practice manuals" for risk prevention
The relevant manual drafts which are suitable / adaptable for at least two project partner countries to provide adequate transnational BPMs for each cluster will be selected in the second pilot cluster coordination meeting.

Draft examples (in Bulgaria):

Afforestation activities for erosion and torrent control


Figure 2: Direct seeding in watershed "Ochindolska reka" © EFA

Forest fires prevention measures after the fire in small river catchments


Figure 3: Burned forest lands, 12-16 April, 2017 – SFE Mezdra © EFA

Further steps

After the 2nd cluster meeting and common selection of the transnational BPMs, the draft designs will be further elaborated. The respective transnational "Practitioner Handbooks" must be valid for at least two partners from different Danube countries and must demonstrate the requirements for implementation relevant to the Danube region.

Keywords: Best practice manuals for risk prevention, risk list, stakeholder list, practitioners handbook

TITLE

WORK-PACKAGE T3 "VISIONARY DANUBE"

APPROACH TOWARDS GUIDANCE FOR SUSTAINABLE LAND USE PLANNING (GUIDR)

Prvoslav Marjanović[1], Marko Marjanović[1], Dragana Spasić[1] , Dragica Vulić[1]

ABSTRACT

Sustainable land use planning as a function of water management (floods, water security, invasive species, land use regulations, intermunicipal cooperation, integration of water retention into local land use planning, , forestry, agriculture, grassland management, policy framework, etc) is the main topic of the Gudance document being prepared within the WP T3. The intention is to provide support to decision makers in the planning process and to initiate required changes in the planning process in the regional context within the Danube basin.

Setting guidelines for land use management to maximize catchment water retention and protection of water sources and for integration into regional land use planning instruments, the development of the transnational guidance based on experiences from pilot activities carried out within the project has the objective to contribute to consolidation and strengthening of institutional arrangements at national and local level.

The approach towards the development of the GUIDR is based on the steps focused on optimisation of land use planning and management (Figure 1) and functional dependence between land use planning and land use change (Figure 2)

Figure 1

[1] Prvoslav Marjanović, , Marko Marjanović, Dragana Spasić, Dragica Vulić, Jaroslav Černi Water Institute, Jaroslava Černog 80, 11226 Belgrade, Serbia, (email: Marjanovic.civil@gmail.com)

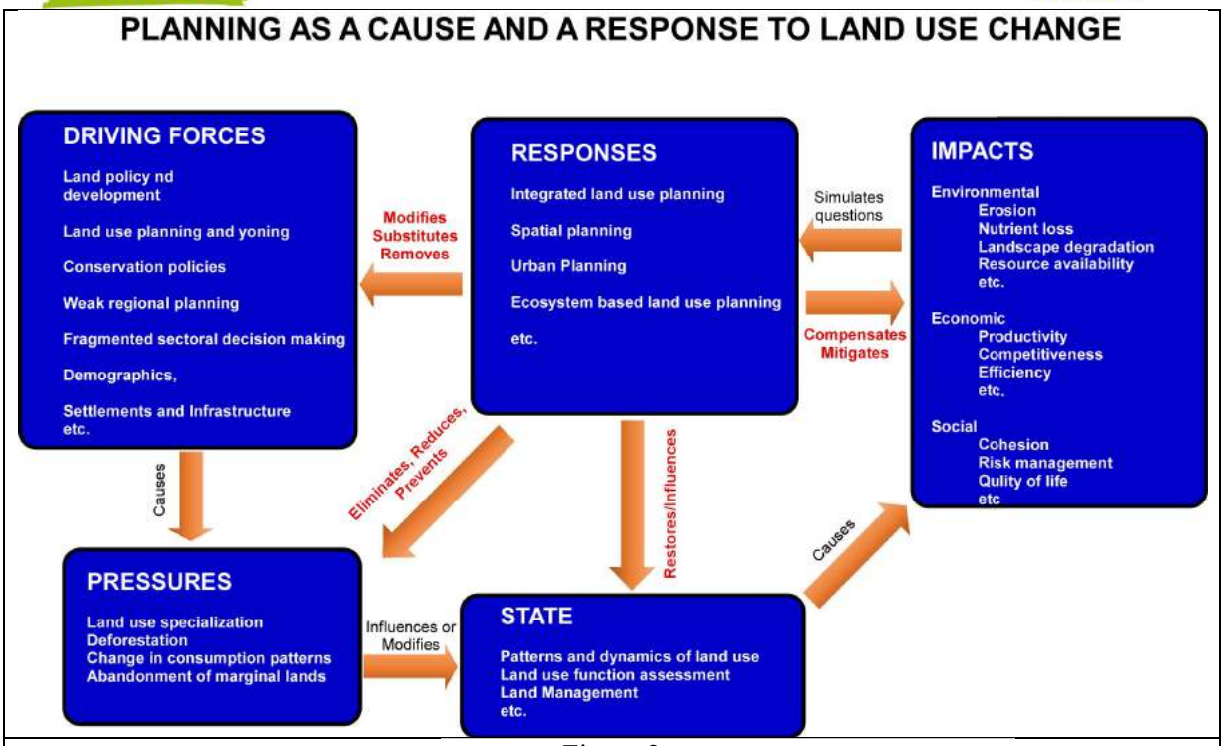

Figure 2

The main characteristic of the GUIDR is that it is focused on defined "intervention space and associated best practices within the context of ecosystem based land use planning delivering ecosystem services for the benefit of human societies. (Figure 3). In this manner Sustainable land use planning guidance becomes a key instrument in managing land use for the benefits of society.

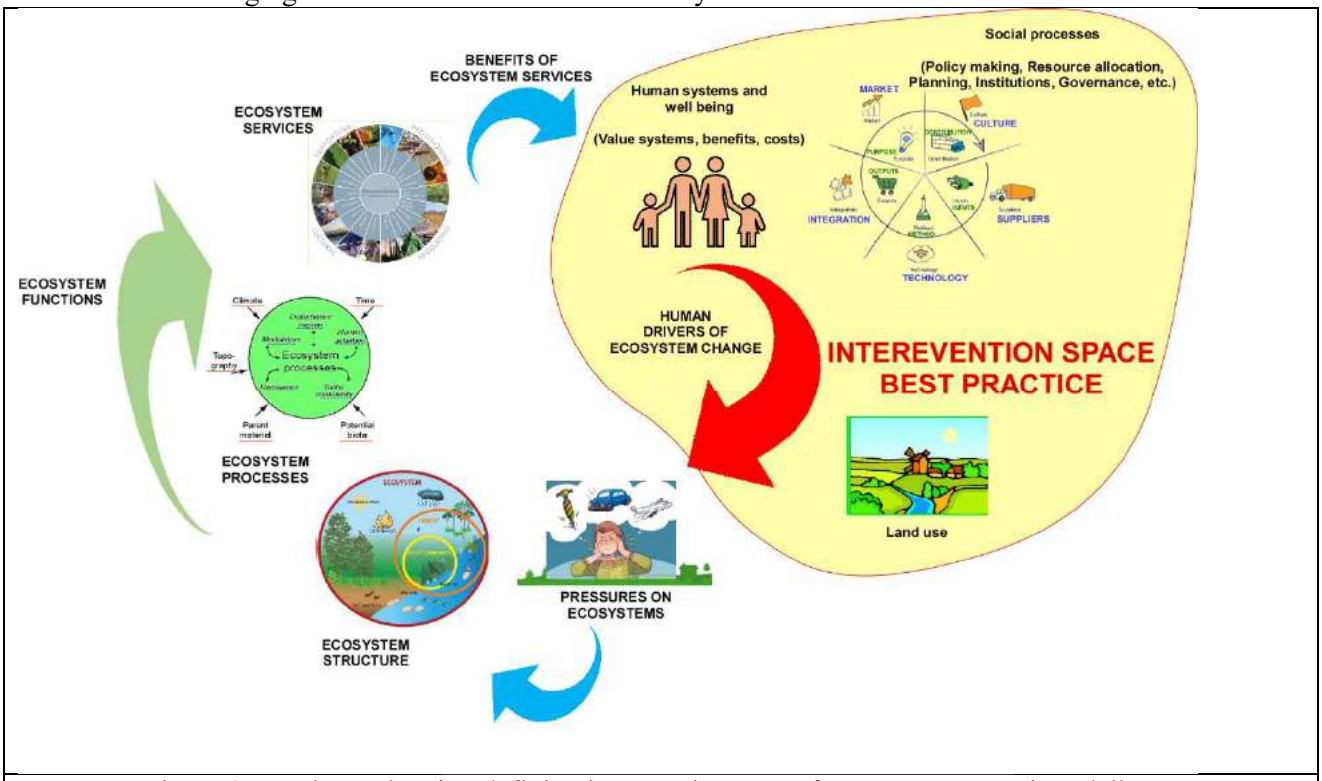

Figure 3. Land use planning defining intervention space for ecosystem services delivery

Keywords: Ecosystem based sustainable land use planning, water quality protection, good practice

CLIMATE CHANGE IMPACTS IN AGRICULTURE

DROUGHT RISK MANAGEMENT

Daniel Alexandru[1], Dr. Elena Mateescu[2] and Andreea Popescu[3]

The climate is changing globally and in Europe. The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2013) concluded that the warming since the mid-20th century has predominantly been due to greenhouse gas emissions from human activities, in particular the combustion of fossil fuels, agriculture and other changes in land use.

There has been a steady increase over the last five years in national adaptation strategies and plans. By September 2016, 20 of EU Member States had adopted a national adaptation strategy and 12 (of which nine are Member States) had developed a **national adaptation plan**. Most progress regarding action plans has been reported for freshwater management, flood risk management, **agriculture** and forestry, with a focus on mainstreaming adaptation in these national sectoral policy areas.

Also, in Romania, the effects climate change has had and will have a significant impact on the evolution of natural conditions, agriculture and biodiversity are the areas most vulnerable to climate change, given dependent climatic conditions and the negative ecological, economic and social issues. Thus, may cause drought and reduce the potential for degradation of biological farmland soil. From an economic perspective, this phenomenon causes the decrease to total compromise agricultural production, with significant implications on food security of the population. In social, drought condition generates poverty, especially among the rural population, mainly dependent on agricultural activities.

Drought is a major natural hazard having different definitions depending on the type of impact or socio-economic activity which is affected. From the meteorological point of view, a drought period is defined by a significant deficit in the precipitation regime. Pedological drought refers to a significant deficit in the soil moisture. For agriculture, drought is defined by parameters affecting crops growth and production.

In Romania, drought-affected areas have expanded over the past decades. The most affected areas are in the South and South-East of Romania, but the entire country has felt the effects of extensive pedological drought, especially in the last 30 years. These extreme weather events cause a significant economic loss in agriculture, transport, energy supply, water management, etc., and global climate models indicated that the frequency and intensity of these events can only be expected to increase.

Along with precipitation, in the agro-meteorological drought other parameters, like soil moisture, potential evapotranspiration, and real evapotranspiration, become important too. Hydrological drought affects river stream flow and has an impact on providing the population with water for the social and economic activities.

In Romania, approximately 14.7 million ha of agricultural land (of which 9.4 million hectares of arable land), soils are affected by drought for long periods and in consecutive years on an area of approx. 7 million hectares of arable land (48%) or excess moisture in the rainy years (about 4 million hectares). Drought is the limiting factor affecting crop production on the largest surface extension and intensity of this type of risk reduction causing fluid annual agricultural production by at least 30-50%.

[1] Daniel Alexandru, National Meteorological Administration Romania, daniel.alexandru@meteoromania.ro
[2] Dr. Elena Mateescu, National Meteorological Administration Romania, elena.mateescu@meteoromania.ro
[3] Andreea Popescu, National Meteorological Administration Romania, andreea.stoica@meteoromania.ro

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Keywords: climate change, agriculture, drought, impact, adaptation plan

IRRIGATION AS A SUSTAINABLE LAND USE MANAGEMENT MEASURE IN DRINKING WATER PROTECTION AREAS

Marina PINTAR[1]

Fertile river plains in Slovenia have ideal conditions for agricultural production. But the question arises how agriculture affects the quality of groundwater that is intended for drinking water supply. Two important ecosystem services are covered in the same area: namely food production and clean fresh water provisioning (Glavan et al., 2015).

In the research on the Drava River plain in Slovenia has been determined how changes in the management of agricultural land (cultivation technics, fertilisation, type of crop, crop rotation) influence on the leaching of nitrogen from the soil profile. Different scenarios of potential agricultural land management have been created to run Soil and Water Assessment Tool (SWAT) model. The most drastic effect on the increase of nitrogen leaching showed vegetable production technology, followed by cereals. Effects of grassland production may lead to 76 to 98 % reduction in nitrogen loss from soil profile in comparison to current practices (Glavan et al., 2015).

In 2011, the National Assembly of the Republic of Slovenia (hereinafter: the Assembly) adopted a Resolution on the strategic orientations for the development of Slovenian agriculture and food industry until 2020 - Zagotovimo.si hrano za jutri, where are set out the following strategic objectives for the development of agriculture and food production:
- ensuring food security through the stable production of safe, high-quality and affordable food,
- increasing the competitiveness of agriculture and food,
- sustainable use of production potentials and provision of agriculture and related public goods and
- ensuring coherent and socially sustainable rural development (in cooperation with other policies).

Irrigation is an effective measure to increase food security. Based on the Resolution, in 2017, the Assembly adopted Irrigation and Water Use Plan for Irrigation in Agriculture in the Republic of Slovenia until 2023 and the Program of Measures for the Implementation of the Irrigation and Plan for Irrigation in the Republic of Slovenia until 2023 (Načrt…, 2017).

In Slovenia we have now 10.723 ha (or 2.3 % of agricultural land in use) of irrigation systems and additional 2815 ha are planned by 2023 (Načrt…, 2017) with the aim of ensuring food security with the stable production of safe, high-quality and consumer-accessible food. There are 221,355 ha (10.29 % of agricultural land) potentially suitable for irrigation (Pintar et al., 2012) in Slovenia, among which 42,367 ha or 19 % of all agricultural land suitable for irrigation is in the water protection areas. Arable land covers 90 % of this area (Načrt…, 2017).

The frequent occurrence of droughts resulting from climate change has a major impact on agriculture, whose primary task is to ensure adequate supply of food to the population, but in doing so, also carry out an environmental function that is to maintain the quality of water, soil, air and biodiversity. That is why irrigation systems should be planned particular carefully in water protection areas. Increased nitrate concentration in groundwater is mostly caused by the application of mineral and organic fertilizers. It is necessary to emphasize that proper irrigation reduces the adverse impact on the quality of underground water (the risk of contamination of groundwater with pollution from agriculture).

[1] prof. dr. Marina PINTAR, University of Ljubljana, Biotechnical faculty, Jamnikarjeva 101, 1000 Ljubljana (email: marina.pintar@bf.uni-lj.si)

In drought years, groundwater is usually more polluted. Plants are always fertilized in advance (only with drip irrigation the plant can be provided with nutrients continuously). Plants can accept nutrients only in dissolved form by the roots, so fertilizers must dissolve in soil water. We need to take care of the proper water regime in the soil. Reliance on rain is not always successful. There could be no rain or it could be more precipitation than the soil can hold it. Then water with dissolved nutrients flows into groundwater what causes pollution. If only as much water is added as can be retained in the soil, what is the basic rule of proper irrigation, the nutrients dissolve, but remain in the soil profile available for the plants uptake. During possible rainy event later on that would cause the water to flow through the soil profile to the groundwater, this water contains less nutrient residues as in non-irrigated case.

Maintaining the active role of the root system supporting the green cover prevents the leaching of nitrate into the groundwater. Where irrigation is applied, the root system is more developed and plants more efficiently exploit the available nutrients. Technological solutions allow also applying liquid fertilizers by drip irrigation system - fertigation and thus more successful exploitation of nutrients by plants. We also can connect irrigation with a more appropriate way of fertilizing plants. The results from research on Ljubljansko polje (Slovenia) confirm that fertigation and improved irrigation scheduling can be an effective way of minimizing nitrate leaching, and should be considered for vegetable production in or close to groundwater protection zones (Zupanc et al., 2011).

To provide farmers with relevant information and expertise for proper irrigation and to establish Decision Support System for Irrigation as a support tool for farmers, several projects are underway in Slovenia (e. g. LIFE ViVaCCadapt, TriN, URAVIVO).

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KEYWORDS: nitrate leaching, proper irrigation

TRANSBOUNDARY DRINKING WATER PROTECTION IN ADRIATIC REGION

Mihael BRENČIČ[1], Barbara ČENČUR CURK[1] and Consortium of DRINK ADRIA project

ABSTRACT

Drinking water protection zones are crucial measures for the protection of the recharge and contributing areas of drinking water resources. They are implemented as spatially zoned areas where prohibitions, limitations and measures are emplaced. Their design principles are based on the natural characteristics of the aquifers, surface and artificial bodies as well as on the technical characteristics of the capturing facilities. Protection practices are related also to the state and regional legislation. In the frame of DRINK ADRIA project financed by IPA Adriatic Cross-Border Cooperation Programme we have analysed current protection practices of the drinking water resources in the eight states of Adriatic and Ionian area; Albania, Bosnia and Herzegovina, Croatia, Greece, Italy, Montenegro, Slovenia and Serbia. In the region several cross-border drinking resources are present and practically no practice for such drinking resources protection is present. Analysis was based on the expert knowledge, extensive questionnaires and direct communication between members of the team and other experts. Comparison of the criteria for the establishing protection zones, legislation and implementation practices, and design practices were done (e.g. Fig. 1). Based on this comparative analysis we have proposed guidelines for the protection of cross-border drinking water resources based on the principle of acceptable compatibility. The principle supposes if similar protection measures according to the national legislation are implemented in the both sides of the state border dividing the recharge area of cross-border drinking water resource this is acceptable. According to our knowledge this is first ever systematic and comparative study of drinking water protection practices among different states in the region as well as probably in the wider area.

Keywords: groundwater, surface water, artificial water bodies, drinking water, transboundary water resources

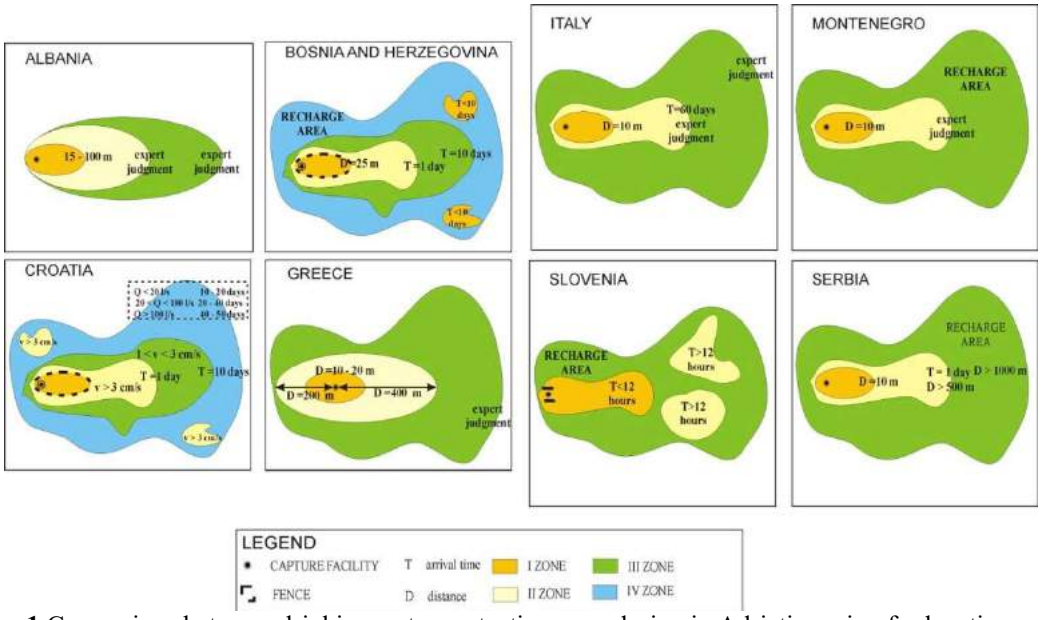

Figure 1 Comparison between drinking water protection zone design in Adriatic region for karstic aquifers.

[1] Department of Geology, Natural Sciences and Engineering Faculty, University of Ljubljana, Aškerčeva cesta 12, 1000 Ljubljana (email: mihael.brencic@ntf.uni-lj.si)

INITIATIVES OF THE EUSDR WATER POLE TOWARDS FLOOD RISK MITIGATION

Károly Gombás[1], Viktor Oroszi[2] and Balázs Horváth[3]

HEADER

The presentation will give an overview about the EU Strategy for the Danube Region in general and the Pillar-II water pole itself, especially PA5 environmental risks and PA4 water quality priority areas. The working process and the tools for enhancing the basin-wide collaborative activities will be introduced together with the topic-relevant programs and joint projects.

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Keywords: environmental risks, water quality, EU Strategy for the Danube Region, EUSDR PA5/PA4

[1] EU Strategy for the Danube Region PA5 – environmental risks priority area HU coordinator (email: gombas.karoly@eduvizig.hu)
[2] EU Strategy for the Danube Region PA5 – environmental risks priority area HU senior expert (email: viktor.oroszi@mfa.gov.hu)
[3] EU Strategy for the Danube Region PA4 – water quality priority area HU coordinator (email: horvath.balazs@ovf.hu)

HYDROLOGICAL ECOSYSTEM SERVICES OF FORESTS – LEARNING FROM SLOVENIAN CASE STUDIES

Urša Vilhar[1]

Slovenian Forestry Institute, Večna pot 2, SI – 1000 Ljubljana, Slovenia, ursa.vilhar@gozdis.si

The importance of hydrological ecosystem services in multifunctional forests is increasing due to different environmental impacts, extreme weather events and land use changes. Slovenia represents a hydrologic speciality in Europe due to abundant water supply and very diverse water regime in a relatively small area (Bricelj, 1994). High percentage of forested area in Slovenia beneficially influences water supply, balancing runoff dynamics and being a habitat for different plant and animal species. Forests with their dense crowns, litter and deep rooting systems critically influence on water, soil and nutrient fluxes in the river basins (Pilaš in sod., 2011). Forest soils have great water storage capacity and diminish surface water runoff which reduces the soil erosion risk. The importance of hydrological ecosystem services of forests in the changing environment is increasing in the frame of sustainable forest management and protection of quantity and quality of drinking water. Water in forest is part of forest ecosystem and integrated water resources management should be implemented in integrated forest management on watershed level.

Several case studies on provisioning hydrological ecosystem services by close-to-natural forest management and protection against erosion are presented, ranging from silver fir – beech forests in Dinaric Alps to urban floodplain forests and anthropogenic spruce monocultures in headwater areas of experimental watersheds. Several indicators are proposed for hydrological ecosystem services of forests: capture and store of rainfall and moisture, regulating run-off and river flow, maintenance / improvement of water quality and decreased levels of pollutants and sediments. We present stand – level water balance and drought stress in managed and old-growth forests and gaps using forest hydrology model BROOK90 (Vilhar in sod., 2005; Vilhar in sod., 2010). Second, throughfall and rainfall interception by urban forests is presented and the ways in which urban forest management affect the amount of throughfall produced (Kermavnar in Vilhar, 2017; Vilhar, 2017) and drinking water protection services (Vilhar in Simončič, 2012; Vilhar in sod., 2015b; Vilhar, 2017). Finally, the influence of rainfall interception by forest on runoff in two small experimental watersheds in Pohorje mountains is presented, where systematically conversion of large areas of anthropogenic spruce monocultures to more natural mixed forests has started already in early 50s of the last century (Vilhar in sod., 2015a; Vilhar, 2016).

Our findings inform water resource managers, land-use planers, forest managers and future research on measuring and estimating indicators for hydrological ecosystem services in forests. Results of this forest hydrology studies could help the implementation of hydrology-oriented sylvicultural measures and improved integrated water resources management on watershed level according to Slovene and EU legislation (The Drinking Water Directive (Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption), 1998; Directive of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy, 2000; The Groundwater Directive 2006/118/EC, 2006; The Floods Directive 2007/60/EC, 2007)

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Keywords: forest hydrology, indicators, parameters, multifunctional forest management, integrated water resources management

CATCHMENT-ORIENTED FLOOD RISK MANAGEMENT: POSSIBILITIES AND LIMITATIONS OF SPATIAL PLANNING

LÖSCHNER, LUKAS[1], SEHER, WALTER[1] and SCHINKINGER, KURT[1]

CATCHMENT ORIENTATION

Riparians of fluvial systems are inextricably linked by the gravitational flow of water. Flood control schemes (e.g. dikes or levees) aimed at protecting vulnerable areas, as well as the intensification of land uses (e.g. land development, soil sealing or drainage of wetlands) accelerate flood runoff and increase the downstream peak discharge. On the other hand, downstream riparians can benefit from upstream measures of flood prevention (e.g. flood polders) or the extensification of land uses (e.g. restoration of wet lands, natural retention areas) in the form of attenuated and delayed peak flows.
Addressing these interdependencies – commonly referred to as upstream-downstream relations – calls for regional approaches in flood risk management and coordination at a catchment or river basin scale, as mandated by the EU Floods Directive (2007/60/EC). This involves overcoming the "spatial misfit" between the bio-physical system (i.e. the catchment or river basin) and the administrative and judicial boundaries in flood risk management (Seher and Löschner, 2018).
Against this background the contribution explores two options for catchment-oriented flood risk management in Austria – (i) regulative planning instruments and (ii) upstream-downstream cooperation – and discusses the possibilities and limitations with regard to spatial planning.

REGULATORY INSTRUMENTS

On the basis of catchment-scale flood hazard and flood risk information regulatory spatial planning instruments (such as regional plans) may designate suitable areas to secure the necessary land resources for (i) flood retention and flood runoff and (ii) future flood control measures, such as flood polders or river corrections. Such top-down planning directives are legally-binding and generally entail zoning bans or zoning restrictions, which have to be implemented in local land use plans. They represent a highly effective instrument to secure large-scale areas and thus to mitigate both the increase in hazard potential (loss of flood retention space) and in damage potential (settlement growth in hazard areas). On the downside, such regulatory (spatial) planning instruments are usually not compatible with the need for flexibility emanating from changing flood risk, e.g. due to possible climate-induced changes in the flood hydrograph. Moreover, as the designated areas inhibit land development options, the regional plans often require a lengthy coordination process across policy sectors and, in particular, with affected land owners and municipal stakeholders (Seher and Löschner, forthcoming; Löschner et al., forthcoming).

UPSTREAM-DOWNSTREAM COOPERATION

Voluntary cooperation between river riparians represents another option to encourage catchment-oriented flood risk management. According to the Austrian Federal Water Act, water associations under public law (Wasserverbände) can be established between administrative bodies (i.e. municipalities) and those in charge of maintaining public traffic routes, such as the Austrian Railways. In addition, water cooperatives (Wassergenossenschaften) may be established among non-state actors, including private landowners, who have a stake in or are affected by flood protection measures. Such bottom-up cooperations between upstream

[1] UNIVERSITY OF NATURAL RESOURCES AND LIFE SCIENCES VIENNA, INSTITUTE OF SPATIAL PLANNING, ENVIRONMENTAL PLANNING AND LAND REARRANGEMENT, PETER-JORDAN-STRASSE 82, VIENNA/AUSTRIA (email: lukas.loeschner@boku.ac.at)

and downstream riparians are flexible in scope (their focus may range from the joint construction and maintenance of flood control measures to the coordination of emergency planning activities) and in scale (they may span administrative borders and be adjusted according to the functional ties in the given field of action). Moreover, compensation mechanisms to account for the respective benefits and adverse consequences associated with the different activities and risk reduction measures may be tailored according to the different interests and needs of the members of the cooperation. On the other hand, cooperations usually focus on issues related to water management whereas the consideration of formal land use planning in water associations is often inadequate (Nordbeck et al., 2018) Although they are entitled to exert influence on land use planning, the cooperative organizations are in a weak legal position when it comes to imposing sanctions for misconduct. Therefore, such governance arrangements should be complemented by formal approaches of land use planning (Thaler et al., 2017; Seher and Löschner, 2018).

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