River Basin Adaptation Conference

Book of Abstracts

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RBA Conference Themes

The River Basin Adaptation Conference aims to share experiences and identify best-practices on science-society interactions for river basin management and climate change adaptation. The conference addresses two related themes:

Theme 1 - Adaptation of river basin management to global change

Climate change and socio-economic developments are affecting the availability of and access to fresh water for drinking, agriculture, ecosystems and industrial activities. These changing conditions are posing challenges to policy and governance with regards to the optimisation of freshwater supply and demand and call for an urgent need to adapt current water management strategies. *This theme covers recent research and emerging practical experience on adapting water management in order to build resilience in the context of climate change.*

Theme 2 - Science and society interactions in water management

Water management is a cross-cutting issue, which relates to a myriad of stakeholders, interests and areas of expertise. Moreover, it becomes increasingly clear that the wider society, in river basins and beyond, demands to be not only informed, but also taken on board in the development of sustainable water management strategies. Hence, for adaptation strategies to be credible, informed and achievable, they need to be developed through active participation of a diversity of stakeholders, sectors and policy areas in the river basin. *This theme covers recent research and good practices on involving science & society in water management decision making.*

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Plenary Theme 1: Adaptation of river basin management to global change

Adaptation to Climate Change in Flood Risk Management in the Netherlands

Dr. Ad Jeuken**,** Deltares, Delft, the Netherlands

DMCSEE framework for integrated drought management: DriDanube project

Dr Andreja Sušnik, Slovenian Environmental Agency, Ljubljana, Slovenia

Adaptation policy challenges: moving from incremental to transformational adaptation

Dr Christos Zografos, John Hopkins University - Pompeu Fabra University Public Policy Centre, Barcelona, Spain

Institutionalizing adaptation for management of the Maipo River basin in Chile: Opportunities and impediments

Dr Sebastian Vicuña, Pontificia Universidad Catolica de Chile, Centro de Cambio Global, Santiago, Chile

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Adaptation to Climate Change in Flood Risk Management in the Netherlands

Ad Jeuken

Deltares, Delft, the Netherlands

The Netherlands is working on climate proofing water risk management under the national Delta Program. It has two main goals: keeping the Netherlands safe against floods; and guarantee fresh water supply also in dry periods. The Delta programme explicitly links CCA and DRR. For flood risk management the policy outcomes directly feed in to existing and renewed management practices. There are the continuous activities in disaster risk management (prevention and preparedness) and asset management (e.g. maintenance and replacement). The cyclic nature of these activities makes them ideally suited to gradually adapt to changing river flows and sea levels. On the other hand projected climate changes might also call for more structural or transformational changes. The Delta Programme has adopted an adaptive planning approach to support decision making under uncertainty with the aim of reducing the risk of overspending or underinvestment". The method promotes flexibility by facilitating possible shifts from one strategy to another. Short-term decisions must be logical in the long term by not obstructing long-term measures, or by keeping long-term options open. Objective based thresholds (at what level the system fails) guide the order and moment for new measures to be implemented. Strategies are envisioned as series of measures in pathways. In the presentations examples of applications of the methods developed will be shown and necessary conditions for implementation of adaptive strategies and transformational changes identified.

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DMCSEE framework for integrated drought management: DriDanube project

Andreja Sušnik

Slovenian Environment Agency - ARSO, Ljubljana, Slovenia

Water scarcity and droughts hit South-Eastern Europe region frequently and had large impacts on the economy and welfare of the people. Despite damages in last decades, drought is still not considered as an issue of high priority. To enable coordinated approach in drought management in 2006 Drought Management Center for SE Europe - DMCSEE was established. The mission of the DMCSEE is to coordinate and facilitate the development, assessment, and application of drought monitoring and management tools and policies in SEE Europe with the goal of improving drought preparedness and reducing drought impacts. DMCSEE acts as network center cooperating with wide range of experts and institutions within Europe and internationally through different projects. Recently, DriDanube project in the Danube Transnational Programme was launched. The aim is to improve capacity of the Danube region for drought emergency response and enhance preparedness for drought management by introducing recently developed monitoring and risk assessment tools. Cooperative and interactive Drought User Service will be developed in order to enable more accurate and efficient drought early warning. It will integrate all available data, including large volume of the most recent remote sensing products. DriDanube Strategy to improve drought emergency response will be the basis for more efficient drought management cycle in the region. DriDanube project aims to change mainly ad-hoc drought response to pro-active response based on risk management procedures. Cooperation among all relevant institutions will be strengthen leading to increase culture of preparedness throughout the Danube region.

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Adaptation policy challenges: moving from incremental to transformational adaptation

Christos Zografos

John Hopkins University - Pompeu Fabra University Public Policy Centre, Barcelona, Spain

A typical guidance for drafting climate change adaptation plans suggests characterising adaptation measures as soft, green, or grey ones. Nevertheless, there is a broader debate as regards the character of adaptation policies, specifically a debate as to whether they follow an incremental or a transformational logic. According to Kates (2012), transformational adaptation refers to actions adopted at a larger scale and which try to transform places and shift locations, whereas incremental adaptation envisions adaptation as a set of corrective actions that try to avoid disrupting socio-ecological systems. Arguably, transformational adaptation is a more sustainable response because it tries to challenge the underlying framework that generates vulnerability and in particular inequitable vulnerabilities to climate change (Ribot, 2011). This presentation will focus on the challenges faced when trying to pursue transformational adaptation. Using a case study of vulnerability and insecurity to climate change in the Ebro Delta in southern Catalonia, the presentation will focus on explaining how systemic elements and imperatives constrain adaptive capacities by favouring adaptation measures that intent to avoid the disruption of current socio-ecological systems and rejecting measures that could transform those systems in order to respond to climate change challenges. It will illustrate how adaptation measures can be green but incremental, thus failing to deal with some key driving forces and processes that create vulnerability. Finally, the presentation will reflect upon the contradictions and incompatibilities of incremental adaptations, and on the deeper challenges faced when pursuing transformational adaptation policies.

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Institutionalizing adaptation for management of the Maipo River basin in Chile: Opportunities and impediments

Sebastian Vicuña

Pontificia Universidad Catolica de Chile, *Centro de Cambio Global, Santiago, Chile*

Adaptation to global-change processes is conventionally centered on assessment of human and environmental drivers and vulnerabilities; interactive planning, implementation, and iterative evaluation of response measures and their outcomes; and enhancement of adaptive capacity. Applied in a range of river-basin contexts globally, adaptive management to water insecurity responds to hydroclimatic variability and uncertainty coupled with rapid growth in urban and agricultural water demands and often the deterioration or loss of ecosystem services. Practical experience has centered on knowledge co-production, demand management, flexible infrastructure operation, and the coordination of these and other adaptive actions. Less well understood are the challenges and opportunities for institutionalizing adaptation, which we assess here by a) characterizing adaptive capacity in relation to global-change drivers, b) identifying institutional thresholds in adaptation processes, and c) iteratively evaluating institutional learning over short- and medium-term adaptive cycles. While seeking to distill generic understanding, we consider the institutionalization of adaptation in the Maipo River Basin in Chile, where prolonged drought and human-induced water scarcity have been compounded by sectorally isolated response initiatives. Lessons of broader relevance include the pivotal role of science-policy co-production, the need for broad-based public support for adaptation, examination of synergies and disjunctures in public and private interests, and flexible yet continuing institutional learning.

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Plenary Theme 2: Science and society interactions in water management

Water Governance in cities: people, policies and places
Dr Oriana Romano, OECD, Paris, France

Citizen participation at work: Experiences from the BeWater project
Ms Anabel Sánchez, CREAF Research Centre, Barcelona, Spain

Participatory Action-research and the use of citizen science in promoting effective climate adaptations actions
Dr Filipe Alves, Climate Change Impacts, Adaptation and Modeling Group (CCIAM) / Centre for Ecology, Evolution & Environmental Changes (CE3C), University of Lisbon, Portugal

Citizen participation on adaptive river basin planning and management
Dr Marc Parés, Institute for Government and Public Policy (IGOP), Autonomous University of Barcelona (UAB), Spain

Youth River Parliaments – From sensitization to action
Mr Clément Magos, GoodPlanet, Brussels, Belgium

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Water Governance in cities: people, policies and places

Oriana Romano

OECD, Paris, France

Climate demographic and urban trends have an impact on water risks in cities and surrounding environments, now and in the future. Both infrastructure and solid institutional framework are needed to cope with too much, too little and too polluted water. OECD (2016) Water Governance in Cities shows that current levels of water security and service delivery should not be taken for granted in OECD countries. Water crises are often primarily governance crises in the sense that challenges go beyond issues on hydrology, financing and infrastructure. Institutions have an important role to play in raising awareness; triggering behavioural and policy change; and managing trade-offs across people, places and policies.

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Citizen participation at work: Experiences from the BeWater project

Anabel Sánchez

CREAF Research Centre, Barcelona, Spain

The BeWater project, supported by the European Commission's 7th Framework Programme, offered a unique opportunity to contribute to adaptation policy design and practices with experience-based knowledge. Four research institutes located in the cardinal points of the Mediterranean region, partnered with expert organisations and members of the local communities to elaborate local adaptive water management plans. Innovative approaches were developed within the project to facilitate a truly collaborative process to increase societal resilience to climate variability and change with the common aim of introducing adaptation principles into water management at the river basin scale. Adaptive management poses challenging questions that need to be tackled through methods and practices that have a solid theoretical framework but are still to be integrated into ordinary management procedures and policy design. Knowledge sharing and mutual learning between scientists, experts, decision-makers and local society have provided the needed basis for a truly participatory approach, offering a solid ground for capacity building, awareness raising and the development of concrete proposals. The process of co-production developed in four case studies, namely, case study river basins Pedieos (Cyprus), Vipava (Slovenia), Rmel (Tunisia) and Tordera (Catalonia, Spain), has proven to be able to deliver results with a high degree of social acceptance, political relevance and technical interest to tackle the uncertainties and complex nature of global change.

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Participatory Action-research and the use of citizen science in promoting effective climate adaptations actions

Filipe Alves

Climate Change Impacts, Adaptation and Modeling Group (CCIAM) / Centre for Ecology, Evolution & Environmental Changes (CE3C), University of Lisbon, Lisbon, Portugal

In this presentation, BASE deliverable 5.3 (Participation in climate change adaptation - http://base-adaptation.eu/publications) which focused on the use of participatory action-research methodologies in 22 European case studies, will be briefly presented with a focus on case studies relating to river basin climate adaptation. The Participatory Matrix developed during BASE will be presented as a tool for assessing and designing participatory approaches in complex socio-economic systems. Challenges, obstacles and opportunities for different types of stakeholder involvement and citizen engagement will be discussed aiming at a tree-choice model where both researchers and decision-makers could bring their own needs and desires in order to establish effective and efficient pathways for context-specific public participation in climate adaptation strategies and actions.

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Citizen participation on adaptive river basin planning and management

Marc Parés

Institute for Government and Public Policy (IGOP), Autonomous University of Barcelona (UAB), Barcelona, Spain

The EU Water Framework Directive (WFD) requires EU member states to produce and implement river basin management plans, which are to be designed and updated via participatory processes that inform, consult with, and actively involve all interested stakeholders. This paper draws on primary research and analysis of the WFD literature to compare implementation of the Directive in EU member states in the initial WFD planning phase (2000-2009). More specifically the paper focuses on the Catalan case, where the effects of a real deliberative process on river basin management planning are examined, identifying its strengths and weakness and unveiling those factors that explain the lights and the shadows of deliberation. What we learned from these experiences could be a significant insight for developing successful adaptation strategies against the impacts of climate change and other pressures. However, further evaluation is required and new solutions should be provided to cope with new trends, such as the increasing connectivity of citizens. Some of these new solutions could come from socially innovative initiatives, such as Citizen Observatories for Water Management. In this paper we argue that this kind of solutions are context-sensitive and require community resources to be successful. In this vein, building community capacities could be a key strategy to foster socially innovative or self-organized responses to cope with climate change effects. We conclude that participatory capacity building process should be developed at local scale to produce a really adaptive river basin planning and management.

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Youth River Parliaments – From sensitization to action

Clément Magos

GoodPlanet, Brussels, Belgium

Many youth participation organs exist in the field of water. Locally or at a higher level youngsters are mobilized to take a part in the management of water. Among all those experiences, three will be shortly described and a few conclusions and recommendations will be formulated. The word participation, has actually many different meanings. Between sensitization, consultation, collaboration, co-creation and youth initiative is a wide scope of different forms of youth participation. In the projects I'm about to describe, you'll find many of those types, sometimes mixed together. Scheldt Youth Parliament: 10 years of awareness raising Goals: common identity, basin development, link with institutions Youth Assembly of Sebou Bassin: Legitimacy through institutional existence Goals: Recognize youth as an actor, knowledge building, identity building Young Water solutions: youth organization action oriented Goals: Concrete projects, high level competence, community based Those experiences are linked by common process of installing youth as a stakeholder in the water management sector. After ten years of experience, our conclusions are triple: 1) Never get satisfied 2) Know the stakeholders 3) Collaborate to have a high level of competences.

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Interactive parallel sessions: RBA Conference Lightning Talks

Lightning Talks are a dynamic opportunity to deliver concise insights and purposeful perspectives on RBA Conference themes. Time is short and the stakes are high: the audience might not know the project being described so LightningTalkers have to work quickly to state the problem or challenge in relation to the conference themes, elaborate their approach and present their outcomes, while making sure they leave time for their best argument, star strategy or top tip.

5 minutes… 5 slides…

Can you meet the Lightning Talk challenge?

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Best practices for designing adaptive management strategies

Group A

Science and society cooperation for mountain terrace rehabilitation in Cyprus
Dr Christos Zoumides, Energy, Environment and Water Research Center (EEWRC), The Cyprus Institute, Nicosia, Cyprus

A research on the effects of tourism on freshwater resources of Mugla Province (Turkey)
Assoc. Prof. Dr. Nedim Özdemir, Department of Basis Sciences, Fishering Faculty Mugla Sıtkı Kocman University, Mugla, Turkey

Multicriteria analysis (MCA) for prioritizing River basin adaptation options: case study of Rmel, Tunisia
Prof. Hamed Daly-Hassen, INRAT, University of Carthage, Tunisia

More than twenty years connecting people with the river. The case of La Tordera River Basin (NE, Catalonia)
Dr Roser Maneja Zaragoza, ICTA-UAB, Barcelona, Spain

Effective National Wetlands Conservation Policy Awareness Communication Campaigns for Participatory River Basin Management in Uganda
Prof. Wilson Okaka, Kyambogo University, Uganda

Developing participatory adaptation plans for river basins – a handbook
Dr Ulf Stein, Ecologic Institute, Berlin, Germany

Group B

BeWater Project in the Tordera river basin: interpretation of results
Dr Annelies Broekman, CREAF, Barcelona, Spain

The assessment of sediment retention service in the Mediterranean Rmel river basin using InVEST SDR model
Ms Ines Saidi, INRGREF, Tunis, Tunisia

Climate change and water management - Breaking the vicious circle
Mr George Demetriou, Technical Manager of Water Board of Nicosia, Cyprus

Experiences of adaptation to global change in three river basins in Catalonia: the case of LIFE+ MEDACC project
Dr Eduard Pla, CREAF, Spain

Involving youth in water management in the context of global change - experiences from the Rmel river basin
Ms Doha Zamel, Young leader association/REC, Zaghouan, Tunisia

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Science and society cooperation for mountain terrace rehabilitation in Cyprus

Christos Zoumides, *Energy, Environment and Water Research Center (EEWRC), The Cyprus Institute, Nicosia, Cyprus*

Adriana Bruggeman**,** *EEWRC, The Cyprus Institute*

Elias Giannakis**,** *EEWRC, The Cyprus Institute*

Corrado Camera**,** *EEWRC, The Cyprus Institute*

Lack of rainfall and soil erosion are problems that many Mediterranean farmers face. These environmental stresses are becoming worse with climate change. Erosion can be a severe issue in farming, especially on steep mountain slopes. Dry-stone terracing is an intensive cultivation practice that has been implemented for centuries in the Mediterranean region. Besides food production, these man-made structures are particularly beneficial in terms of water retention and control of soil erosion in sloping hillsides, as well as being a biodiversity habitat. Despite their importance, terrace landscapes are gradually abandoned as a result of depopulation and marginalization of mountain regions. Consequently, many of the terraces are no longer cultivated and maintained, causing a domino effect of collapsing terraces.

Participatory methods and community-based approaches have an important role to play in combating land degradation. In the Troodos Mountains of Cyprus, a well-defined participatory framework was developed to identify key stakeholders and to select Sustainable Land Management approaches for reducing soil erosion and land degradation. Among the options suggested and evaluated by stakeholders, community-based terrace rehabilitation had the best overall performance. In the first two years of implementing the approach, three mountain communities co-organised hands-on terrace maintenance events, engaging more than 250 people in rehabilitation activities. The community-based approach has sparked the interest of people within and beyond the research site. This outcome indicates that social innovations can benefit from the integration of local and scientific knowledge.

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A research on the effects of tourism on freshwater resources of Mugla Province (Turkey)

Assoc. Prof. Dr Nedim Özdemir, Department of Basis Sciences, Fishering Faculty Mugla Sıtkı Kocman University, Mugla, Turkey

Assoc. Prof. Dr.Ahmet Demirak, Department of Chemistry, Faculty of Science Mugla Sıtkı Kocman University

With the favourable climate, natural beauties and especially 12 months tourism opportunity, Turkey became one of the most desirable touristic regions of the world, till 1970's. Because tourism ensures an important amount of income and provides foreign currency, it have been generally evaluated economically. However, the past, today and the future of the water resources (streams, river, lakes, thermal waterfall, underground waters) which is the most important natural resources presented to tourists, have almost never been questioned, until recently. The intense supply of the water resources to tourism is quite notable, especially on the summer seasons. Furthermore, climate increase related to global warming became markedly perceptible in the study field, like the other regions of the world. Whereas, the quality of the water resources is being deteriorated more and more while the natural water resources are limited and being intensely used. On the other hand, the dynamic character of tourism cannot be underestimated, during national and international economical problems that countries face. Therefore, a balanced and continiously reasonable usage of the water resources became necessary.

This study covers the effects of summer season tourism activities the freshwater resources in the Mugla Province.

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Multicriteria analysis (MCA) for prioritizing River basin adaptation options: case study of Rmel, Tunisia

Hamed Daly-Hassen, *INRAT - University of Carthage, Tunisia*

Sihem Jebari, *INRGREF - University of Carthage,*

Nicolas Robert*, European Forest Institute*

Developing an adaptation plan for a river basin using a participatory process can lead to the identification of numerous management options in a context of limited financial and water resources. Consequently, a tool is needed to compare the performance of the collected options and to help make a selection. This presentation aims to illustrate that multicriteria analysis (MCA) is a useful tool to prioritize management options.

Located in the region of Zaghouan, NW Tunisia, the Rmel river basin (87,000 ha) is mainly covered by forestland (30%) on mountains, and agricultural land (51%) largely affected by erosion, and a dam downstream with an initial capacity of 22 million m3. Climate change projections predict an increase of temperature by 1.1°C and a decrease of rainfall by 15% in 2050 following the climate scenario A2.

Stakeholders were invited to participate in a series of workshops to identify adaptation options and to select and weight evaluation criteria for the evaluation. The 19 identified options were assessed using a section of 15 criteria referring to both the design of the options (costs, efficiency, feasibility, acceptability, etc.) and their expected impacts on the river basin. Determined scores and weights of the criteria were combined with an impact analysis of each adaptation option to derive a ranking. For the Rmel river basin, the top five options were successively the use of water saving techniques, the protection against forest fires, the support of income generating activities, promoting investment, and development of new techniques of water and soil conservation.

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More than twenty years connecting people with the river. The case of La Tordera River Basin (NE, Catalonia)

Roser Maneja Zaragoza, *ICTA-UAB, Barcelona, Spain*

Antoni Mas Ponce**,** *ICTA-UAB*

Martí Boada Juncà**,** *ICTA-UAB*

The knowledge of the cultural and natural values associated with water resources leads the engagement of the society in participatory and decision-making processes, which are necessary to develop successful conservation and management proposals. Through the re-discover of socioecological heritage, society can be more involved in participatory actions. New perspectives on research in environmental and sustainability education become strategic and effective tools to aware citizens of taking seriously global change challenges.

Since 1996, L'Observatori de la Tordera Project carries out a long term monitoring of socio-ecological indicators in La Tordera River Basin in order to assess its environmental status, leading test pilot protocols and establishing new methodologies in collaboration with local and regional institutions. Referring to these indicators, ten research lines have been consolidated, being four of them included into the WFD (2000/60/EC).

In 2004, the Environmental Education and Communication Program (PROECA) has been created with the purpose to transfer the acquired knowledge from the scientific sphere to society. PROECA is considered as a pioneer program in the implementation of educational strategies at formal, non-formal and informal education. Students become researchers for one day being involved in scientific adapted methodologies used in Mediterranean river basins. Students interpret the environment through different bioindicators according to the level of education: elementary (riparian vegetation, chiropters and amphibians) and secondary (macroinvertebrates, birds, fishes, diatoms, macrophytes, hydrology and physic-chemical parameters).

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Effective National Wetlands Conservation Policy Awareness Communication Campaigns for Participatory River Basin Management in Uganda

Wilson Okaka, *Kyambogo University, Uganda*

Irene Judith Nagasha**,** *Kyambogo University*

This paper uses the findings of a study on the challenges of designing and delivering effective participatory communications campaigns for the national wetlands conservation and management policy in Uganda to discuss participatory river basin management in the country. present the lessons learned from the national beach managements programme; river – basin management national policy impacts, wetlands conservation management policy strategies; recommend best practice, effective policy strategies; discuss the prospects of replications to other countries, sub-regions, or regions; and state the social responsibility of the media advocacy communication in promoting gender equality, north-south partnerships, as well as policy research information dissemination for public participation in river basin management activities projects, programmes, or policies. The problem was based on the assumptions that the campaigns strategy for the national wetlands policy awareness in Uganda has been less successful because it did not focus on the audience participation and audience demographic factors. The multi-media strategy was employed in the national campaigns. Electronic media was the most accessible channels to the target audiences. There was no gender barrier to information uptake. Low income and education levels were barriers to access to wetlands information. Weak participation, popular media, and interpersonal communications. The socio-economic backgrounds of the audiences are vital for policies and laws, low or no audience participation. The stakeholders are: governments, researchers and research institutions, social networks, CSOs, communities, and north – south partnerships.

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Developing participatory adaptation plans for river basins – a handbook

Ulf Stein, *Ecologic Institute, Berlin, Germany*

The presentation is intended to provide information needed to guide a participatory development of a River Basin Adaptation Plan.

The central component of the presentation outlines the methodological steps followed in BeWater to create the river basin adaptation plans. This begins with the initial stakeholder dialogue and participation process, followed by the development and analysis of water management options, and ending with the implementation approaches that permit the creation of the river basin adaptation plans.

In order to understand how this process was experienced in practice within the BeWater project, relevant examples from the four case studies are outlined, including the challenges faced in each basin, the lessons learned and the steps forward for implementation of the plan.

Finally, some key findings and overarching lessons learned relating to river basin adaptation planning are included, presenting information gained from the project as a whole. Here, the critical differences and similarities observed between the four cases are highlighted to foster a successful future application of the methodology in other river basins.

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BeWater Project in the Tordera river basin: interpretation of results

Annelies Broekman, *CREAF, Spain*

Anabel Sánchez**,** *CREAF*

The Tordera river basin is a small watershed, rich in natural heritage and of great geostrategic importance for Catalan socioeconomic development. Impacts of global change may have a particular relevance in this territory, affecting the regional as well as the local population due to the crucial role of this basin in the connection between northern and southern Catalonia.

The BeWater Project promoted a participatory process for the co-creation of a specific river basin adaptation plan to tackle challenges in Tordera, engaging different local actors to identify, formulate and evaluate management options. The information obtained from stakeholders was taken up in the project in different ways, allowing structured integration of the contributions made by all the different perspectives within the methodological development stages of the river basin adaptation plan.

As a result, 33 water management options were designed, revealing the most urgent aspects Tordera society considers need to be implemented to reduce its vulnerability to the impacts of global change. An analysis is performed to interpret these, indicating aspects related to water and sectorial policy development context in Catalonia, as well as experiences and legacies related to previous participatory processes.

Results show the importance of establishing adequate environmental flow regimes in the basin, the creation of new deliberative spaces and the importance of adaptive forest management for maintaining the functionality of the local water cycle. The interpretation of these results contributed designing ways forward to improve current water management and deliver key policy messages to responsible parties.

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The assessment of sediment retention service in the Mediterranean Rmel river basin using InVEST SDR model

Sana Bouguerra**,** *National Agronomic Institute of Tunisia*

Sihem Jebari**,** *INRGREF, Tunis, Tunisia*

Ines Saidi, *INRGREF*

Ecosystems provide a variety of benefits to people. Regulating services are the benefits people obtain from the regulation of ecosystem processes. Sediment retention service is one of the regulating services. It helps decision makers in the planning of land use at the landscape level. We applied the InVEST (Integrated Valuation of Environmental Services and Tradeoffs) Sediment Delivery Ratio model in the Rmel river basin located in Tunisia. The aim of this study is to evaluate the impact of soil and water conservation techniques on the provision of sediment regulation service. The results reveal that sediment retention provided by the actual landscape is 50.34ton/ha/year. During the planning meeting of the BeWater Project, stakeholders of the river basin proposed a scenario of soil and water conservation techniques. The regulating service is expected to increase under this scenario, by 11.75%, which indicates a reduction of costs related to reservoir sedimentation.

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Climate change and water management - Breaking the vicious circle

George Demetriou, *Technical Manager of Water Board of Nicosia, Cyprus*

Water is a renewable but unfortunately a scarce resource. All countries, even those that until recently did not face water-related challenges, they now review their understanding on climate change and its effect on water availability and consequently to water resources.

Science and society can play a key role to climate change adaptation and contribute to mitigating its impacts. The consequences of climate change include global warming, decrease of rainfall and increase of extreme precipitation events. These impacts imply increased water demand for irrigation and domestic water supply, which increases the demand for energy for either providing the required quantities of water or assuring its quality. Consequently, this leads to the increase of emission of greenhouse gas that accelerates the climate change. Thus, water management is a critical factor in breaking this vicious circle.

Water losses in networks are the major issue a water utility is facing today, especially in dry climate areas with severe scarce water resources. Successful management of losses contributes in energy savings, reduced carbon volumes and reduced infrastructure and operational costs.

Rational management of water distribution networks can contribute to the mitigation of climate change impacts. Advanced technology in monitoring and control systems along with best practices have improved management and reduced losses thus protecting water resources quality and availability. Utilities, in cooperation with citizens have to be proactive and respond quickly to the requirements of a water distribution system in all operational phases (designing, constructing, maintaining and repairing).

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Experiences of adaptation to global change in three river basins in Catalonia: the case of LIFE+ MEDACC project

Eduard Pla, *CREAF, Barcelona, Spain*

Annelies Broekman**,** *CREAF*

Diana Pascual**,** *CREAF*

Gabriel Borràs**,** *OCCC, Barcelona, Spain*

Sergio Vicente-Serrano**,** *IPE-CSIC, Huesca, Spain*

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Inma Funes**,** *IRTA*

Carmen Biel**,** *IRTA*

Mediterranean river basins are highly sensitive to the effects of climate change, especially with regards to decreasing water availability. This communication shows a brief review of a process for applying adaptation strategies to address these impacts in the framework of the LIFE+ MEDACC project, started in 2013 in three watersheds in Catalonia. The analysis developed by the project to assess climate change vulnerabilities and design adaptive strategies has been divided in five main steps: 1) Historical analysis of climate, hydrological and land use data; 2) Compilation and assessing of existing adaptation measures; 3) Future impact modelling of climate change and land use change projections; 4) Design of new adaptation measures and 5) Testing of demonstrative pilot cases. The process has the support of a stakeholder committee that enriches the development of the project. Project outcomes show that streamflow have significantly decreased in the three river basins during the last five decades, together with an increment of minimum temperatures. In all the cases, this streamflow decrease caused by climatic changes is aggravated by concrete water management practices and land use changes. Indeed, the current status of all studied river basins cannot support natural and human water use requirements. New adaptation measures in the fields of agriculture, forest and water management are currently being designed and, in some cases, tested through pilot cases. First results show the importance of including a sound diagnosis in the basin's vulnerability assessment and management design needs to focus on new adaptation measures that may radically change current river basin dynamics.

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Involving youth in water management in the context of global change - experiences from the Rmel river basin

Doha Zamel, *Young leader association/REC, Zaghouan, Tunisia*

In order to strengthen youth involvement in the water and climate change agenda, the BeWater project has established a pilot initiative in Tunisia. This initiative aimed to help understanding the ongoing participatory process on water and to build up a youth profile to be actively involved as a key stakeholder among the regional representatives.

The initiative was coordinated by Global Water Partnership in synergy with the National Institute for Research in Rural Engineering, Water And Forestry, and supported by a number of local NGOs (Young leader association, WeLoveZaghouan, Commission environnement du district 414 –Llions Clubs), EFI and Deep Blue Consultants. This initiative was established after an agreed-upon action plan based on a national consultation, during which, the Young Leader Council Association (YLC) took part. Specific actions were eventually defined, including the elaboration of a “White book” to COP21.

In alignment with BeWater objectives, namely, promoting and fostering dialogue and collaboration between science and society, this initiative has paved the way to youth by actively involving local NGOs as the YLC in the project activities such as the water management-related topics and setting the Rmel River Basin Adaptation Plan. Moreover, the YLC in Zaghouan took part of several activities and workshops targeting youth NGOs members such as the awareness campaigns, the Open Day for large public and the launching of the BeWater Card Game.

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Policy considerations for participatory river basin management

Group A

Role of globalization in promoting sustainable development
Prof. Sihem Jebari, INRGREF, Tunis, Tunisia

Modelling coastal vulnerability
Dr Komali Kantamaneni, Southampton Solent University, UK

"They have kidnapped our river": lessons from dam removal conflicts and the role of ecosystem services in Catalonia
Mr Mattias Brummer, University of Bayreuth, Lebanon

Agri-environment measures for improved water resource management: evidence from Cyprus
Mr Epaminondas Giannouris, Managing Authority of Rural Development Program, Ministry of Agriculture, Rural Development and Environment, Nicosia, Cyprus

Interaction between forest and water, a case study on the Rižana watershed
Dr Simon Poljanšek, Slovenian Forestry Institute, Ljubljana, Slovenia

Group B

Climate change adaptation in the Pedieos River Basin, Cyprus: the importance of green areas around urban rivers
Dr Elias Gannakis, Energy, Environment and Water Research Center; The Cyprus Institute, Nicosia, Cyprus

Another train pulling into the station: adaptation to climate change. Shall we get on board?
Mr Gabriel Borràs Calvo, Catalan Office for Climate Change, Barcelona, Spain

Participatory Modelling for Water Resources Management
Mr Josep Osorio, Climate Service Center Germany (GERICS), Hamburg, Germany

Recent experiences in governance of transboundary mountain river basins for adaptation in the Italian Alps
Dr Luca Cetara, EURAC research - Italian Delegation to the Alpine Convention, Bolzano, Italy

Evolution of the watershed management approach and the intervention dynamics for better local governance of development
Mr Ben Haha Mohamed Naoufel, (Assistant Director of Planning, DGACTA) Ministry of Agriculture, Water Resources and Fisheries**,** Rmel River Basin Team, Tunisia

States' territorial sovereignty over Trans Boundary Water Resources in the context of Climate Change
Mr Joseph Longunza Malassi, University of Kwazulu Natal, Durban South Africa

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Role of globalization in promoting sustainable development

Sihem Jebari, *INRGREF, Tunis, Tunisia*

Ines Saidi**,** *INRGREF*

Hedia Ezzeddine*, INRGREF*

Globalization manages, among other things, the adaptation to climate change as an integrated strategy on the global scale. This seems to be a great opportunity for the vulnerable developing countries. This vulnerability is a kind of mixture between natural components and human actions. The adaptation strategies are fundamentally linked to development. This is being displayed within the current work on the Tunisian case study, by demonstrating how the lack of technology can be a potential to seriously impede a nation's ability to implement adaptation options by limiting the range of possible responses.

The level of research on adaptation to climate change has been relatively poor to date. However, specific methodologies for climate change analysis, risk assessment, and management scenario simulation are crucial to provide valuable information for planning and regulation. In fact, enhancing Adaptive Capacity of a system or a nation needs a very specific requirement. Among the first aspects that need to be considered is to raise the level of awareness of climate change impacts amongst all relevant stakeholder groups, insure the diagnosis of vulnerability and understand the political act in everyday life. The latter aspects will be illustrated based on Tunisian experiences. The outcome of this work shows the importance of building and enhancing adaptive capacity based on unified vision. This can be based on improved scientific understanding of the problems, and openness to face challenges in order to be able to develop solutions.

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Modelling coastal vulnerability

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Some coastal cities of England are significantly vulnerable to climate change induced hazards such as sea level rise, floods, coastal erosion and other associated factors. A considerable number of coastal segments which consists vast infrastructure were already damaged by unprecedented and frequent storm strikes and erosion, evident from 2013-2014 severe weather incidents. Therefore, there is real need to evaluate the coastal vulnerability of English cities at current scenarios, while very limited literature has been found on England's coastal vulnerability. Accordingly, a Physical Coastal Vulnerability Index (PCVI) was developed and then applied to the Southampton City (coast) which is one of the top port and trade cities in the United Kingdom (UK). PCVI was used to determine vulnerability and to assess microscale applicability and simplicity of use for an estuarine environment. Analysed PCVI scores were used to rank the coastal cells into four classes from extremely low to high based on the intensity of relative coastal vulnerability. Results highlighted that Southampton coastline is moderately vulnerable and however, the considerable percentage of is located in highly vulnerable coastal sections. Current work demonstrates that the methodological framework can be used as a coastal management planning tool and can be adapted for estuarine or coastal environments without any geographical remits based on the availability of suitable data.

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"They have kidnapped our river": lessons from dam removal conflicts and the role of ecosystem services in Catalonia

Mattias Brummer, *University of Bayreuth, Lebanon*

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In the light of climate change there is a need to restore the natural functioning of river ecosystems to guarantee access to ecosystem services (ES) provided by rivers. One mechanism to restore rivers is the decommissioning of small dams, but restoration can create opposition and even lead to conflicts, as anthropized landscapes form part of the environmental history and imaginary. To facilitate decision making, actors' perceptions on ES under different management scenarios should be taken into consideration to facilitate adaptation to climate change.

We evidence the role of perceptions on ES through two exploratory case studies analyzing conflicts over dam removal in the Ter river basin (Catalonia). These case studies highlight how combining participatory mapping and interviews can make contrasting values visible and contribute to conflict interpretation. Additionally, what emerged is on the one side, the dichotomy of perceptions between locals and outsiders, and on the other side, the relevance of cultural values, environmental aesthetics and history for actors positioning. We propose expanding participatory mapping and the use of interviews or workshops to the river basin level for the sake of conflict unravelment under climate change scenarios, as decision making will rarely be enforced without local support. This approach could easily be transferred to other regions and other cases involving river rehabilitation projects. In conclusion, to facilitate adaptation to climate change by implementing river restoration projects actors' perceptions and values can play an important role for decision making and should be analyzed carefully.

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Agri-environment measures for improved water resource management: evidence from Cyprus

Epaminondas Giannouris, *Managing Authority of Rural Development Program, Ministry of Agriculture, Rural Development and Environment, Nicosia, Cyprus*

Agri-environment measures are a key element for the integration of environmental concerns into the European Common Agricultural Policy and play a crucial role for meeting society's demand for environmental benefits provided by agriculture. These measures can be designed at the national, regional, or local level, and adapted to particular farming systems and specific environmental conditions, constituting a targeted tool for achieving environmental goals, including adaptation to climate change. The design of these management measures at the river basin level is a complex procedure for policy makers, as the concerns of social actors need to be met. The structural complexities, for instance, arise from the interactions between (a) abiotic–biotic parameters and (b) urban–natural environment.

In general, the effectiveness of the new agri-environment measures, which are theoretically acceptable by stakeholders, is practically determined by the productivity and the effort required to be applied on the field (expressed both in money and time). The engagement of stakeholders during the design and decision making process can positively contribute to the overlapping concerns and result in innovative approaches that are not easily identified at first sight. This study focuses on two different measures that are introduced for funding under Pillar II of the Cyprus RDP 2014-2020. Through these measures, farmers are subsidised to change their agricultural practises and contribute to an improved water quality and quantity status. The study also brings to the forefront the applicability and effectiveness of such policy measures in theory and practice.

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Interaction between forest and water, a case study on the Rižana watershed

Simon Poljanšek, *Slovenian Forestry Institute, Ljubljana, Slovenia*

Forests have numerous positive influences on water sources. By slowing down the speed of wind and water run-off, they reduce soil erosion which keeps water, originating from forested areas, at high quality levels. But protection takes its toll, as trees also use water. In combination with climate change, this already presents a problem in Rižana watershed, where river presents a main water source for Slovenian coastal area. River flow is, similar to some other Slovenian rivers, already in falling trend, also due to the insufficient precipitation. In combination with increased summer demand of households, industry and agriculture, water shortage events occur. With forecast of decreasing precipitation and increasing air temperature, such events will be more frequent, greater and longer lasting. How trees will react, is difficult to answer. They can increase water demand to fight water stress, remain in “status quo” or face possible die back, which would increase river flow, but endanger soil protection. Solution could be in a selection of tree species, still providing all the water functions of the forest, but with reduced water consumption/demand. First step is to investigate, if there is a difference in response of most common trees species from this area; oak species (namely Quercus petraea) and black pine (Pinus nigra) to climate factors. To quantify growth, trees were sampled using increment borer and tree-ring widths measured. In climate-tree ring analysis, correlation coefficient was calculated between climate data (precipitation and air temperature) and tree-ring widths. Preliminary results show, that climate influenced black pine growth more strongly than oaks’.

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Climate change adaptation in the Pedieos River Basin, Cyprus: the importance of green areas around urban rivers

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Climate change projections for the Mediterranean region indicate higher temperatures, less rain and more extreme precipitation events. Natural areas along urban rivers could contribute to climate change adaptation. The escalating pressures of urbanization and climate change and the increasing diversity of societal preferences create a variety of demands that urban green areas should meet. Micrometeorological measurements and a total of 305 questionnaire surveys were conducted in the Pedieos River linear park in Nicosia (Cyprus), to explore people's perceptions and satisfaction regarding the services of the park, assess thermal comfort and climate change awareness. People identified a range of services and benefits including enjoying nature (43%), engagement in physical activities (34%) and socializing and relaxing (22%). Although very few respondents (1%) identified cooling as an important benefit of urban parks, the majority of them (84%) were satisfied or very satisfied with the cooling effect of the Pedieos River Park. The differences between the park users' thermal comfort perceptions and the thermal comfort index values derived from the micrometeorological station observations revealed that people are strongly adapted to the hot local climatic conditions. The majority of the people (81%) were concerned about climate change. Their suggestions for adaptation actions included reducing energy and water use and environmental protection. However, there was no concern about urban flooding, during the hot summer months of the survey. A follow-up survey on water management options to reduce flooding indicated a preference for green and managerial options among park users.

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Another train pulling into the station: adaptation to climate change. Shall we get on board?

Gabriel Borràs Calvo, *Catalan Office for Climate Change, Barcelona, Spain*

Among the various types of intelligence, here we will be discussing emotional intelligence. According to the Wikipedia definition, emotional intelligence is the capability of individuals to recognise their own, and other people's emotions, to discriminate between different feelings and label them appropriately. People with emotional intelligence are therefore able to recognise, express, regulate, control and manage their own emotions and those of others to adapt to situations, achieve goals and objectives and feel good in themselves. We have deliberately highlighted in bold the term adapt. The definition of emotional intelligence inherently contains adaptation to changes. What a curious symbiosis!

The crisis of our evolution has consequences for the environment, the economy, society, and for demographics, security, food, water, geostrategic issues, energy, health and competitiveness, among other areas. So how can adaptation cushion the effect of these multiple consequences? By using emotional intelligence: we need to use adaptation as a crutch to help us live with the challenges we face, and to overcome them, if possible. A crutch? Yes, a tool providing support for us to do everything that we are certain that we have to do and that we have never done, or the things that even when we have done them, we have not done them with sufficient strength and conviction. And that is how adaptation can foster initiatives in the various sectoral policies which were either dormant, left in a drawer, or which require a boost in their implementation. Here we will talk about three examples which illustrate how adaptation can become a crutch.

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Participatory Modelling for Water Resources Management

Josep Osorio, *Climate Service Center Germany (GERICS), Hamburg, Germany*

Josep Osorio Piñero**,** *Department of Climate Impacts and Economics, Helmholtz Zentrum Geesthacht, GERICS*

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The provision and management of water resources is a complex issue, involving many actors at different levels. In order to ensure the representation of various interests in planning, stakeholder committees facilitate such integrative process, although stakeholders are often not trained to understand the complexity of a system inherent to social-hydrological issues. Planners and decision-makers generally use models to simulate the interaction effects of policies related to a plan, but most are difficult to use by stakeholders, who are thus forced to rely on simulations. Participatory modelling is a tool that allows the integration of stakeholders in the co-design and co-production of conceptual models to represent a system and its dynamics. With the aim of assessing the benefits of participatory modelling in water resources planning, we have conducted a comprehensive study in the context of hydrological extreme events, with special focus on droughts, in the Jucar River Basin, Spain. We have examined how collective perceptions of a common concern contribute to joint collaboration around participatory planning. The major benefit is that the developed model is more relevant to the real needs of stakeholders. In addition, the model integrates scientific and local knowledge, thus improving its quality and integrity. The assimilation by stakeholders increases, which generates more confidence, being therefore more willing to use it. This participatory process contributes to a better understanding of how decision-making on water resources in a context of hydrological extremes may be shaped according to a broad and integrative perspective of the water resources system dynamics.

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Recent experiences in governance of transboundary mountain river basins for adaptation in the Italian Alps

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Paolo Angelini**,** *Italian Ministry for the Environment Land and Sea - Italian Delegation to the Alpine Convention*

Andrea Bianchini**,** *EURAC research, Italian Delegation to the Alpine Convention*

The complexity of a river basin results out of a combination of physical, social and economic phenomena involving the basin territory and those stakeholders whose interests hold a local relevance. Research highlights how climate change impacts on those phenomena and stresses the need for integrated adaptation measures in mountain river basins. Experience with governance of national and transboundary river basins has shown the dramatic importance of managing interlinkages (impacts, trade-offs, benefits) as well as jointly identifying actions that can improve the coherence of policies, inter-sectoral coordination and dialogue (UNECE 2015). Evidence-based studies and adaptation planning experience identify methodologies and governance tools to be used to address specific challenges arising at the river basin level for adaptation purposes and manage complex inter-sectoral stakeholder governance. Starting from recent experience in the Alps and in Italy, the contribution combines, with specific reference to building resilience, evidence from UNECE Nexus methodology concerning linkages, benefits and trade-offs among sectors, their ranking and expected developments (2015), National Guidelines for River Contracts in Italy (2015) and Guidelines for local adaptation in the Alps concerning water management (2014). Evidence from UNECE Nexus Assessment in transboundary basins for Isonzo, case-studies collected under the National Board for River Contracts, and National and Regional Adaptation Plans in Italy (2016) will be used. Eventually some gaps to be filled in will be presented.

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Evolution of the watershed management approach and the intervention dynamics for better local governance of development

Ben Haha Mohamed Naoufel, *Assistant Director of Planning of DGACTA, Ministry of Agriculture, Water Resources and Fisheries***,** *Rmel River Basin Team, Tunisia*

Hassen Chourabi, *Director General of ACTA, Tunisia*

The Tunisian revolution has highlighted the need for greater participation of the population in the process of rural development and good governance of natural resources. The Tunisian rural world is marked by a fragility of its natural resources (water, soil, forests). Tunisian strategies and plans are now reaching their limits and are faced with the challenges of resource sustainability and efficient use.

The FCGBV (one of the watershed management programs) has initiated a sustainable management of natural resources through an integrated participatory development process at the scale of watersheds, which is considered to be sensitive to erosion, in order to allow sustained growth of production,in addition to improving the living conditions of the population, securing the country's water supply and protecting the socio-economic infrastructure. The program in its design was not able to solve the needs expressed by the various interest groups and the urgency of meeting them.

The evolution of the reflections on the approaches and methods initiated since 2012 gave back to the projectstheir dimension of support for the construction of a concerted approach between regional and local partners.

The current shift in administration from conservator to manager of natural resources with local leadership is a process that is just beginning

The process of consultation involving all the partners has led to innovations by setting up territorial consultation platforms for planning on "life territories " where natural resources take up an economic dimension in an area with a social homogeneity, as well as economic and environmental issues.

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States' territorial sovereignty over Trans Boundary Water Resources in the context of Climate Change

Joseph Longunza Malassi, *University of Kwazulu Natal, Durban, South Africa*

Africa is a water stressed continent with decreasing water resources and increasing water demand. This is due to various drivers. Such situation may lead the continent to recourse to important interbasin water transfers from excess watered regions into the stressed ones, in which case the Congo River Basin (CRB) may be solicited because of its abundant waters resources, as illustrates the standing call to save the Chad Lake. Covering 9 countries, and spanning over 3.7 million km2, with 30% of the surface fresh waters of Africa, the CRB can be seen as a water reservoir to the continent. Its usefulness however, is being hampered due to a poor governance of its Trans boundary waters resources (TBWR), given the significant political, legal and institutional challenges such as recurring armed conflicts, civil wars, and political instabilities that the basin's countries are facing since decades. Although technically feasible, any successful water transfer from the CRB may be impeded by that lack of adequate institutional and legal mechanisms, which may as well constitute fertile grounds which breeds germs of future conflicts. The big number of upstream smaller watercourses such as sources, streams that cross countries' borders to constitute downstream greater formations such as rivers and lakes within foreign states' territories are food for though. This study on states' territorial sovereignty over TBWR in a context of climate change is a critical thinking the TBWR legal and institutional framework at River Basin level, called to reflect an adaptation to a water stressed environment in which greater possibilities exist of lifesaving water transfers due to climate change.

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Interactive parallel session: Adapting to climate change in Slovenia (in Slovenian language)

Strategic framework climate change adaptation
Ms Barbara Simonič, Ministry for the Environment and Spatial Planning – Climate Change Section, Ljubljana, Slovenia

Integrating climate change in Vipava River Basin Adaptation Plan
Mr. Peter Suhadolnik, Institute for Water of the Republic of Slovenia, Ljubljana, Slovenia

The programme of measures for the sustainable use of surface waters in Slovenia
Dr. Nataša Smolar Žvanut, Slovenian Water Agency, Ljubljana, Slovenia

The LIFE Programme: good practice on River Basin Adaptation
Dr Mitja Kaligarič, Neemo – Timesis, Pisa, Italy

Adapting to the impacts of climate change in the Vipava Valley
Dr Matjaž Tratnik, Hidrotehnik d.d., Ljubljana, Slovenia

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Strategic framework climate change adaptation

Barbara Simonič, *Ministry for the Environment and Spatial Planning – Climate Change Section, Ljubljana, Slovenia*

Climate change is becoming more pronounced, and scientists estimate that, with the policies currently in force, we will almost certainly not be able to meet the goal of the Paris Agreement of limiting the global temperature rise to well below two degrees Celsius compared to pre-industrial levels by 2050. Considering the predictions regarding the scale of climate change impacts, Slovenia, with its diverse landscape and various climate types, faces ever greater uncertainty. The most striking aspect is the rise in air temperature, there are considerable changes in precipitation patterns, more extreme weather events are occurring.

That is why, the first national Strategic framework for climate change adaptation, adopted by the Government in December 2016, includes, first and foremost, guidelines on integrating adaptation to climate change into policies, measures and actions to a greater extent. Many sectors, operators and individuals have foreseen or are already implementing climate change adaptation activities. The Framework proposes in more detail individual horizontal activities that aim to contribute to better, sooner and more informed adaptation activities. It forsees among other steps and guidelines that will allow to continuously invest in the strengthening of knowledge and provision of better information on climate change impacts and adaptation methods in order for them to be integrated further, foster wider cooperation and integration, raise levels of education, competence and awareness. Successful adaptation to climate change impacts will also require more efforts to provide funding, and to exploit the synergies between individual policies and measures. The document presents the first step in the process of state coordinated process of climate change adaptation and is accompanied by four annexes, substantiated by years of research that aim to direct the coordinated efforts of the state towards making better informed decision in the future.

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Integrating climate change in Vipava River Basin Adaptation Plan

Peter Suhadolnik, *Institute for Water of the Republic of Slovenia, Ljubljana, Slovenia*

Vipava River Basin Adaptation Plan is one of four plans produced in BeWater project. Other plans are made for three other case studies included in BeWater project, namely Tordera (Spain), Rmel (Tunisia) and Pedieos (Cyprus). Common baseline of all four case studies is Mediterranean area and connected Mediterranean or sub-Mediterranean climate which is the case in Vipava RB.

The sub-Mediterranean climate in Vipava RB is moderated by occasional influxes of continental air masses from the north-east across the mountain barrier. Summers are hot and dry with occasional droughts, while winters tend to be mild and rainy with frequent bora winds. According to the analysis presented by dr. Kajfež-Bogataj in 2005, “in the period 1951-2000, the average annual air temperature increased by 1.1 °C, and during the last 30 years, warming exceeded the limit of 1.5 °C”. Climate change projections for Slovenia published by the Slovenian Environment Agency in 2008 suggest that the average annual temperature in the Vipava Valley could increase by around 1.3 °C by 2030. Based on this facts Fuzzy Cognitive Map was produced and Impact Assessment of water management options was made. According to the projections of climate change the factor of air temperature in growing season was increased on maximum (+1) and the factor of precipitation was reduced on minimum (-1). Main method for evaluating water management options was multi-criteria analysis based on criteria derived from the Fuzzy Cognitive Map and Impact Assessment.

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The programme of measures for the sustainable use of surface waters in Slovenia

Nataša Smolar Žvanut, *Slovenian Water Agency, Ljubljana, Slovenia*

In the process of preparation the River Basin Management Plan for the Danube Basin and the Adriatic Sea Basin 2016-2021 in Slovenia and for the Programme of Measures, the granted water rights have been analyzed. To meet the objectives of water management, the Programme of Measures regarding surface water exploitation was prepared. The primary objective is the sustainable use of water resources in line with the objectives of water protection and water engineering.

The basic Programme of Measures provides mechanisms for sustainable water use, water withdrawals control, monitoring related to water rights and decision-making process on water use. The supplementary Programme of Measures also includes activities to support decision-making on water exploitation, including the restrictions and upgrading different water-related databases along with their integration in a joint information system and measures addressed to the increasing awareness of water and proposals for reduced water use.

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The LIFE Programme: good practice on River Basin Adaptation

Mitja Kaligarič, *Neemo – Timesis, Italy; University of Maribor, Slovenia*

Panos Fetsis, *Neemo – LIFE Programme, Brussels, Belgium*

The LIFE Programme was established in 1992 and is the EU's funding instrument for the environment. The general objective of LIFE is to contribute to the implementation, updating and development of EU environmental and climate action policy and legislation by co-financing pilot or demonstration projects with added value.

Since its start, the LIFE Programme has co-funded nearly 150 projects focussing on climate change adaptation, mobilising some €307 million. Most importantly, LIFE has been most active in mainstreaming climate adaptation in many water policy areas, namely the Water Framework Directive, the Floods Directive and the Water Blueprint initiative, by demonstrating the implementation of adaptation measures that can reduce the severity of potential climate change impacts on water abundance and water quality.

LIFE projects have developed modelling tools, explored different managed aquifer recharge methods and determined variations in river flows. Other projects have addressed water quality and eutrophication issues, or have been at the forefront of promoting a water saving culture. Some projects have helped map flood risks, provided early flood warning systems and reduced the impact of inundations through river and wetland restoration. Another project cluster has demonstrated the practical value and cost effectiveness of natural water retention measures.

Some best LIFE practices dealing with river catchments or aquifers will be presented during the River Basin Adaptation Conference, offering possibilities for replication and transferability, as well as encouraging water management specialists and climate change experts in Slovenia to submit project proposals within the LIFE Climate Action sub-programme.

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Adapting to the impacts of climate change in the Vipava Valley

Matjaž Tratnik, *Hidrotehnik d.d., Ljubljana, Slovenia*

The increased frequency of extreme weather phenomena, such as droughts, floods and strong winds might significantly limit agricultural production of Vipava Valley in the future. With the contribution of the LIFE financial instrument of the European Union, the project LIFE15 CCA/SI/000070, the LIFE ViVaCCAdapt aims producing a climate change adaptation strategy for the period 2018-2021. We first assessed the three key climate change vulnerability components: (a) exposure (we prepared the climate change projections for climate variables temperature, precipitation and potential evapotranspiration and assessed their influence on agriculture), (b) sensitivity (we analysed the local agricultural practices related to combating droughts, floods and strong winds), and (c) adaptive capacity (we assessed the implementation level of the existing climate change adaptation policies). Confronting the components we assessed that the agriculture at the area faces a high degree of climate change vulnerability. It is highly exposed and sensitive, and has a low adaptive capacity as numerous policy measures for adapting to climate change are not being implemented. Next, an operative irrigation decision support system will be developed and tested involving 35 local farms. The tool will provide farmers the recommended irrigation requirements with the aim of reducing irrigation water consumption at the area. To prevent further soil loss caused by strong winds and to provide better conditions for crop production we will analyse wind conditions, use computer modelling to optimise the green windbreak design, and establish and evaluate new green windbreaks on a 1000 m^2 demonstration plot.

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