EUROPEAN COMMISSION
DIRECTORATE - GENERAL
ENVIRONMENT
Directorate D
Unit D1

Office International de l'Eau

ACTeon environment research & consultancy

Service contract n°ENV.D.1/SER/2013/0010

# Pilot Project - Atmospheric Precipitation - Protection and efficient use of Fresh Water: Integration of Natural Water Retention Measures in River basin management

# **Synthesis** of the Mediterranean Regional Workshop on NWRM

Turin, Italy. September 11th-12th, 2014


Contact persons:

Ing. B. Fribourg-Blanc
T +33 (0) 5 55 11 47 97
F +33 (0) 5 55 11 47 48
e-mail b.fribourg-blanc@oieau.fr

Phd Natacha Amorsi
T +33 (0) 5 55 11 47 97
F +33 (0) 5 55 11 47 48
e-mail n.amorsi@oieau.fr


amec

BEF LATVIA

SLU

institute IMDEA water

REKK

enveco Environmental Economics Consultancy

I.A.CO Ltd Environmental & Water Consultants

SRUC

REGIONAL ENVIRONMENTAL CENTER

# I. Note to the reader

This note was prepared by Gonzalo Delacámara and Estefanía Ibáñez (IMDEA), with contributions from facilitators from the breakout working group sessions: Elia Desmot (OIEAU), Dennis Collentine (SLU), Nick Jarritt (AMEC), and Gloria de Paoli (ACTEON), and also from speakers and other workshop participants.

For any comment or clarification please contact:

Gonzalo Delacámara, mediterranean@nwrm.eu

## CONTENTS

I. NOTE TO THE READER

II. THE CONTEXT 1
II.1. THE CONCEPT 1
II.2. THE PROJECT 2
II.3. OBJECTIVES OF THE WORKSHOP 4
II.4. WORKSHOP PARTICIPANTS 5

III. KEY MESSAGES AND LESSONS LEARNT FROM WORKSHOP PRESENTATIONS & DISCUSSIONS FROM THE PLENARY SESSIONS AND BREAKOUT GROUPS 6
III.1. WHY NATURAL WATER RETENTION MEASURES? 6
III.2. THE MULTIPLE BENEFITS OF NWRM – WATER RETENTION: A MEANS TO DIFFERENT ENDS 8
III.2.1 BIOPHYSICAL IMPACTS 8
III.2.2 ECONOMIC BENEFITS 10
III.2.3 GENERAL DISCUSSION 12
III.3. NWRM AS PART OF ECOSYSTEM-BASED MANAGEMENT APPROACHES 13
III.3.1 NWRM: AN ECOSYSTEM APPROACH 13
III.3.2 DISCUSSION 14
III.3.3 ECOSYSTEM-BASED ADAPTATION APPROACHES 15
III.4. ROLE PLAY – CATCHMENT PLANNING FOR NWRMS 18
III.5. SUPPORTING NWRM DESIGN AND IMPLEMENTATION - THE KNOWLEDGE BASE & THE PRACTICAL GUIDANCE 21
III.5.1 DISCUSSION 25
III.6. NWRM WITHIN THE CONTEXT OF CLIMATE CHANGE ADAPTATION (CCA) 26
III.7. NWRM WITHIN THE CONTEXT OF DISASTER RISK REDUCTION (DRR) 28
III.8. NWRM AS A CATALYST FOR POLICY COORDINATION 30
III.8.1 DISCUSSION 33
III.9. INPUTS FOR THE WFD CIS PROCESS – PANEL OF POLICY MAKERS AND PRACTITIONERS 34

IV. WORKSHOP AGENDA 36

V. LIST OF PARTICIPANTS 39

# II. THE CONTEXT

## II.1. THE CONCEPT

NWRM may be good on their own (if appraised individually, which does not make much sense) because they help restore the environment and ecosystem functions and services. Yet, self-evidence of advantages tends to ignore the existence of alternatives that may serve the same purpose and to overlook the opportunity cost of resources. Therefore, besides their rationality for nature restoration, NWRM need to be judged against their potential contribution to other policy objectives (WFD, FD, EU 2020 Biodiversity Strategy, CCA strategy, CAP reform, Habitats Directive, Birds Directive, etc.). At the end of the day, NWRM advantages are better captured within integrated programmes of measures, such as those that are designed and implemented as part of the planning cycles of the WFD and the FD.

As part of 'successful stories', sometimes purely financial reasons would suffice. NWRM might be cost-effective alternatives to attain particular objectives (improving the status of water bodies, mitigating flood risks, etc.). Yet, costs other than purely financial ones may be more relevant in most cases (notably in upstream-downstream relationships). Thus, as important as putting the right incentive in place is also to avoid prevailing ones (and environmentally harmful subsidies).

In addition, trade-offs should not be neglected. Changing land-use practices entails opportunity costs. Not only benefits are characteristic of NWRM; specific costs could also be relevant. What should then be financed and what not? Who should pay? The assessment of trade offs allows to identify who wins and who loses and to figure out the required incentives to make NWRM acceptable and implementable.

And what is most important: if in addition to water management NWRM serve many other purposes (i.e. their multi-benefit dimension), how should then these measures be financed?

## II.2. THE PROJECT[1]

Within the context of the EU Green Infrastructure Policy[2], an increasing policy interest has emerged as to the so-called Natural Water Retention Measures (NWRM). NWRMs have been brought to the water policy arena because of their potential contribution for water management[3], among other important contributions to attain environmental policy objectives[4].

To respond to this interest, the EC DG ENV launched a dedicated study entitled **Pilot Project - Atmospheric Precipitation - Protection and efficient use of Fresh Water: Integration of Natural Water Retention Measures in River basin management**. This study aims at:

- Developing a sound and comprehensive European (web-based) knowledge on NWRM. The knowledge base will structure available information on technical, environmental, socio-economic, governance and implementation aspects of NWRM, mobilizing existing practical experiences, studies and stakeholders' knowledge.
- Promoting knowledge and best practice exchange: contributing to the development of a European NWRM "community of practice" by bringing together all parties interested in the design and implementation of NWRM in the context of the planning process of the WFD or the Floods Directive, the development of a climate change adaptation strategy or the establishment of sustainable urban plans. This is achieved by the development of four informal regional networks: the Danube, the Mediterranean, the Baltic, and Western networks.
- Further developing and maintaining a catalogue of measures, case studies and associated database with geographical references
- Contributing to WFD CIS and to identify / create operational tools that can be used at national, river basin, and/or local level to facilitate inclusion of NWRM in the RBMPs and FRMPs.

---

[1] Written taking into account presentations from Ms Edvokia Achilleos (EC DG Env, Project Officer) and Benoît Fribourg-Blanc (OIEau, NWRM Project Coordination).

[2] http://ec.europa.eu/environment/nature/ecosystems/

[3] Other mentions to NWRMs in the Blueprint to Safeguard Europe's Water Resources (COM (2012) 673), its Impact Assessment (SWD (2012) 382) or the Stella Report (Stella Consulting, 2012) develop a particular aspect: NWRMs are a type of Green Infrastructure; NWRMs are one amongst other kinds of measures to enhance resource efficiency; etc.

[4] More specifically, "among the measures that can greatly contribute to limiting the negative effects of floods and droughts, it is green infrastructure, particularly natural water retention measures. These include restoring and maintaining floodplains and wetlands, which can hold water in periods of abundant — or excessive — precipitation for use in periods of scarcity. Green infrastructure can help ensure the provision of ecosystem services in line with the EU Biodiversity Strategy. Reducing soil sealing is another measure that can diminish flood risks. These measures should be included in both RBMPs and [Flood Risk Management Plans] (FRMPs) and… should become a priority for financing under the [Common Agricultural Policy] (CAP), Cohesion and Structural Funds" (COM (2012) 673).

Natural Water Retention Measures are described as “multi-functional measures that aim to protect water resources and address water-related challenges by restoring or maintaining ecosystems as well as natural features and characteristics of water bodies using natural means and processes. The main focus of applying NWRM is to enhance the retention capacity of aquifers, soil, and aquatic and water dependent ecosystems with a view to improve their status. Appropriate application of NWRM supports green infrastructure, improves the quantitative status of water bodies as such, and reduces the vulnerability to floods and droughts. It positively affects the chemical and ecological status of water bodies by restoring natural functioning of ecosystems and the services they provide. The restored ecosystems contribute both to climate change adaptation and mitigation.”

The main outputs of the project are:

- A catalogue of measures with 53 measures clustered in 4 groups, under adjustment and review of experts
- Workshops have represented a key opportunity to address NWRM challenges, to get feedback, and to pool expertise and inputs from water stakeholders. The first round of Regional Workshops (held in January 2014) was very effective in providing a shared overview of NWRM definition, main features, main water management issues to be addressed and implementation challenges and experiences in the four regions. The second round of Regional Workshops started in June 2014 with the Baltic Workshop (Gimo, Sweden), followed by the Danube (Bucharest, Romania) and the Western (Strasbourg, France) workshops. The Mediterranean Workshop (Turin, Italy), was the last workshop of this second round and the last workshop of this pilot project, which has proved to be an opportunity of moving one step forward and gaining a deeper insight on core water management issues and related NWRM applications in the four regions.
- Case Studies collection: 40 in-depth case studies, plus 44 actual light case studies
- NWRM individual factsheets: 53 factsheets (1 per measure) with cluster functions and 53 knowledge based templates. Additionally this includes a literature review and a knowledge base for gathering quantitative and qualitative data
- Policy Questions: based on a literature review and structured as 12 synthesis documents (grouped under 3 disciplines: Biophysical and technical aspects, Socio-economic dimensions, and Governance, implementation, and financing)
- Platform for end-users: targeting practitioners, managers, policy-makers and providing a user-friendly interface, linked to the database.

## II.3. OBJECTIVES OF THE WORKSHOP

The present workshop was the second and last one (within the scope of this project) to be held in the context of the Mediterranean Network. It was designed both to link NWRM to different policy challenges (including those framed by the Water Framework Directive and the Floods Directive) and also to emphasise on the multi-benefits of these measures, as linked to different policy aims (natural flood management, drought risk mitigation, biodiversity conservation, climate change adaptation, etc.). To achieve this, the workshop was also highly interactive, and structured around the following activities:

- Presentations followed by actively facilitated discussions;
- Breakout group sessions to work on a real-life case study: participants were asked to find solutions for specific issues encountered in the planning and implementation phases, using a case study as working example. Building on case study knowledge, the groups went through the key steps of design and implementation of NWRMs (steps proposed in the Practical Guidance). Discussions served to single out key implementation issues and possible solutions/ steps to boost NWRM effectiveness in delivering multiple objectives;
- Thematic groups sessions with focused presentations, followed by facilitated discussions. Three groups learnt and discussed about key themes linked to NWRM, and namely: (i) NWRM within the context of climate change adaptation (CCA); (ii) NWRM within the context of disaster risk reduction (DRR); and (iii) NWRM as a catalyst for policy co-ordination;
- Policy panel: a round-table discussion led by policy makers dealing with the implementation of NWRM-related directives and strategies at the EU and MS level, focusing on inputs for the WFD CIS process.

A second objective was to receive participants' feedback on the practical guidance, which is being drafted within the NWRM initiative. An insight on the logical steps for designing and implementing NWRMs proposed in the guidance was provided; participants discussed how the key messages emerging from the workshop fed into the practical guidance, building on activities and experiences shared during the workshop.

To ensure coherence among workshops held in the four regions, the workshop agenda was developed according to common building blocks, although providing additional leeway for regional specificities.

The present document provides a synthesis of the main elements and lessons learnt which emerged during the second Mediterranean Workshop.

## II.4.WORKSHOP PARTICIPANTS

The Second Mediterranean Workshop engaged participants from all countries of its community of practice: Portugal (despite being an Atlantic country), Spain, Italy, Malta, Cyprus, and Croatia (which is also part of the Danube regional network). Besides, there were participants from Turkey, and members of the consortium from France and Greece.

Participants were invited according to the main topics to be discussed during the workshop, their expertise on NWRM, and their involvement in the NWRM initiative. In particular, participants to the workshop were:

- River basin district managers (from water planning units), directly working on the WFD implementation.
- Practitioners dealing with NWRM implementation on the field;
- Researchers and academics working on NWRM issues;
- Environmental protection organizations.

The Regione Piemonte (the Regional Government of Piedmont) kindly hosted the workshop. Piedmont Region plays a remarkable role leading Italian Regional Governments in environmental issues. Paolo Mancin, responsible for water management issues in the DG Environment of the Regional Government, represented the Piedmont Region and acted as host of the event.

# III. KEY MESSAGES AND LESSONS LEARNT FROM WORKSHOP PRESENTATIONS & DISCUSSIONS FROM THE PLENARY SESSIONS AND BREAKOUT GROUPS

## III.1.WHY NATURAL WATER RETENTION MEASURES?

**Edvokia Achilleos (DG ENV, EC)**, project officer of the NWRM initiative, presented the EU policy context for this project.

Beyond the 'Blueprint to safeguard Europe's water resources' (2012), the policy background for NWRM as a complement of conventional measures includes the White Paper on Adaptation to Climate Change (2009), the Green Infrastructure Communication (2013), the Climate Change Adaptation Strategy (2013) and an information package delivered to the EU MS Water Directors (Towards better environmental options in flood risk management).

Given the emphasis on the relevance of green infrastructures to reduce the impacts of floods, droughts, and land-use related pressures, the Blueprint proposed Member States (MS) these infrastructures in their RBMPs as part of an integrated approach to manage water resources across policy areas and sectors.

NWRM are to be supported in at least three different ways: the EC to develop CIS tools (mostly within WG PoM, but also in other CIS WGs) to favour the uptake of these measures in the RBMPs and FRMPs, through prioritising funding of natural infrastructures and ecosystem-based adaptation for the water sector in the ESIF (EU Structural and Investment Funds), and via conditionalities such as greening of the CAP.

There are several benefits that justify the implementation of NWRM such as their potential to reduce the impact of diffuse pollution, to regulate the flow regime using natural means and to reduce climate change vulnerability, to restore deteriorated morphological elements of the riparian area and the floodplain, to improve water status, and to be a better environmental option for flood risk management supporting Natural Flood Risk Management.

The project has links with other EU policies, such as environmental policy (Nature 2000, Habitats Directive, LIFE+, Soil Strategy, Biodiversity Strategy); climate change adaptation (CCA Strategy); green infrastructure policy (Communication on GI); forestry (new Forestry Strategy); Regional Policy (Cohesion Funds, ERDF); agricultural policy (CAP, EAFRD); and research and innovation funds (notably Horizon 2020, but also other initiatives).

Within the context of the new CIS work programme, the WG PoM had several meetings in which a high-level policy paper was proposed (Sept 2013), and a drafting team was furthered to define the scope and contents of a policy document (Nov 2013). DG ENV, DE, FR, IT, NL, UK, EEB, WWF, WI,

NWRM PP and WFD CIS support consultants (including Pierre Strosser, from the project consortium), compose the drafting team. Discussions on different issues related to NWRM took place (March 2014) to provide inputs to the drafting team and a final scope was agreed for a 'Policy Document'. The document aims at explaining the policy relevance of NWRM, and to stimulate their uptake as effective means for achieving water and other environmental policy objectives. It is meant to be used as a tool by Water Directors, to persuade other policy makers for joint action, and decision-makers at the National Competent Authorities for WF/FD and local and regional catchment-scale decision-makers. The NWRM project will be providing the knowledge base, experiences, technical background and practical guidance tools to complement this document. Further discussions of the WG PoM (Oct 13th-14th, 2014) will focus on the final version of the 'Policy Document' to be approved by SCG & Water Directors in Nov-Dec 2014.

> Financing opportunities:

The European Structural and Investment Funds (ESIF, 2014-2020) comprise the following EU funding mechanisms: i) European Regional Development Fund (ERDF); ii) European Social Fund (ESF); iii) Cohesion Fund (CF); iv) European Maritime and Fisheries Fund (EMFF); v) European Agricultural Fund for Rural Development (EAFRD).

ESIF thematic objectives are linked to multifunctional measures. Among the 11 thematic objectives, three are on sustainable growth:

- TO-2 (supporting the shift towards a low-carbon economy in all sectors),
- TO-5 (promoting climate change adaptation, risk prevention and management). Priorities within this objective involve supporting dedicated investment for adaptation to climate change, including ecosystem based approaches, and promoting investment to address specific risks, ensuring disaster resilience and developing disaster management systems.
- TO-6 (protecting the environment and promoting resource efficiency). Priorities within this objective are related to investments in water sector to meet the EU environmental acquis, conserving, protecting, promoting, and developing natural heritage, protecting biodiversity, soil protection and promoting ecosystem services including NATURA 2000 and green infrastructures, and improving urban environment including regeneration of brownfield sites and reduction of air pollution.

  NWRM could support the implementation of RBMPs / FRMPs which include investment in green infrastructures (preservation of ecosystem services, i.e. floodplains, wetlands, etc.) and take advantage of synergies with other environmental objectives

In addition, Ms Achilleos presented opportunities within the CAP (including 2 out of 6 relevant rural development priorities and links with Pillar I and II); LIFE+ initiative; and other financial instruments (i.e. Integrated projects (IPs)) that can be perceived as good occasions.

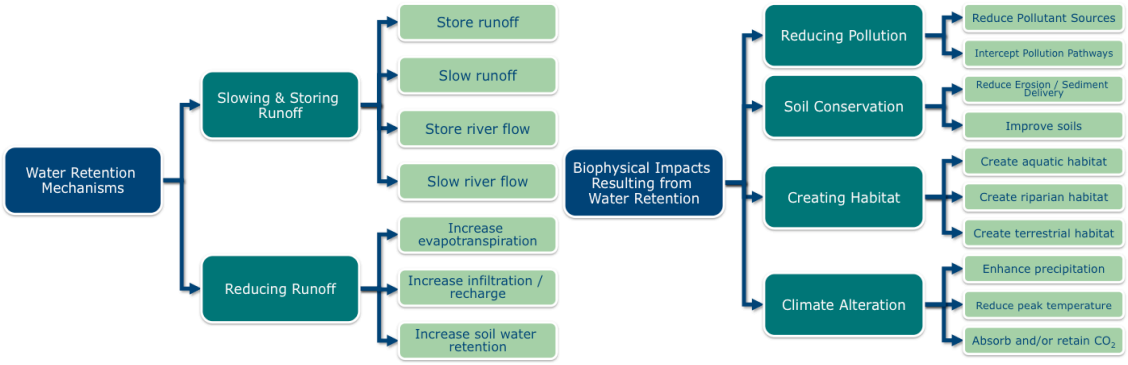
## III.2.THE MULTIPLE BENEFITS OF NWRM – WATER RETENTION: A MEANS TO DIFFERENT ENDS

### *III.2.1 Biophysical impacts*[5]

Natural Water Retention Measures enhance hydrological system function using, mimicking, and/or promoting natural processes to retain water in the landscape. A key part of this project is to build an evidence base for NWRM: what are they? How do they work? What benefits do they provide? How do they contribute to EC Policy objectives?

Understanding how NWRM work is central to building the evidence base. One should therefore think about biophysical impacts in a structured manner:

- The mechanisms by which measures retain water
- The biophysical impacts that result from water retention




Separate considerations of the outcomes of these impacts are: i) delivering ecosystem services benefits, ii) contributing to meeting policy objectives.

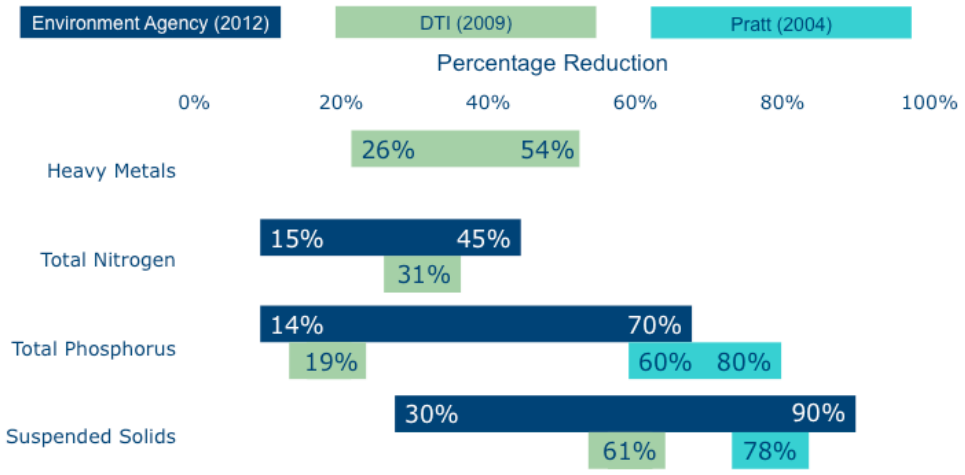

Biophysical impacts are the central evidence component; mechanisms to show how benefits and policy objectives are realized should thus be better understood. Without the biophysical benefits the link between the measures implemented and the contribution to policy objectives cannot be made. If

[5] Nick Jarritt, AMEC

there is no measurement of those benefits it is almost a leap of faith to believe that they actually have positive benefits.

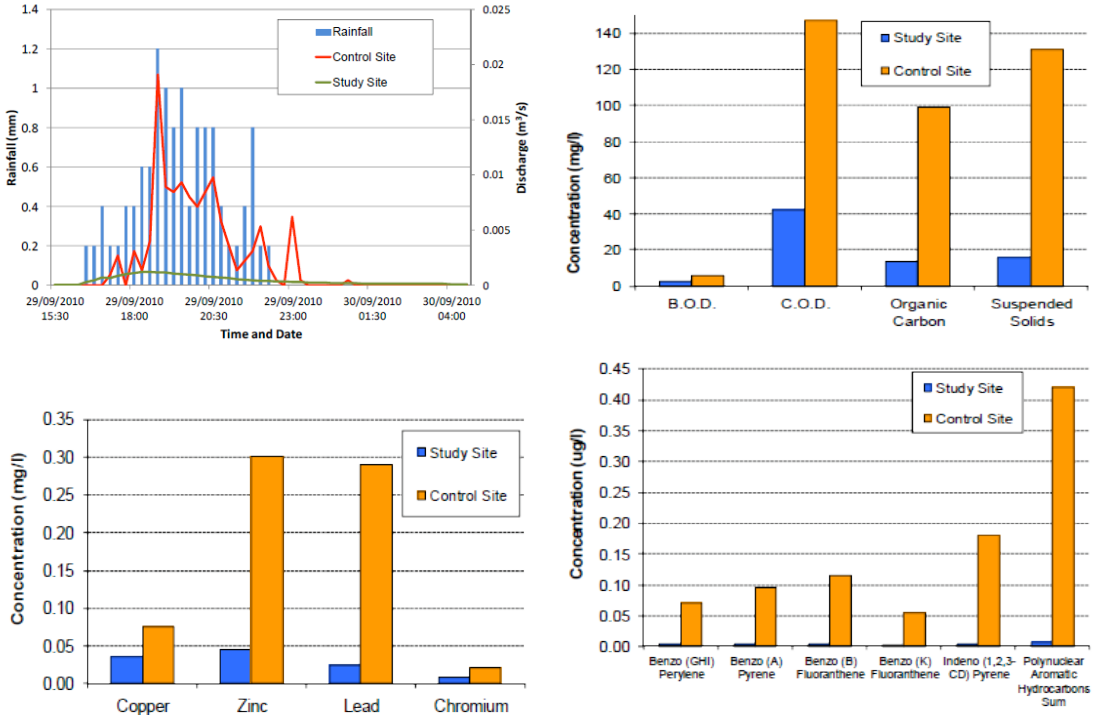
> Urban Natural Water Retention Measures: The NWRM project has identified 13 types of "urban" NWRM. They are effectively Sustainable (urban) Drainage Systems, although they can be applied outside of urban areas.

SuDS can be considered in terms of its mechanism (storage, infiltration, conveyance) or scale (source control, increasing treatment area/drainage catchment). For example, 'detention basins' primary purpose is to store and slow runoff, but they also deliver improved water quality (heavy metals, nitrogen, phosphorous). The use of sand/gravel substrate to filter outflow can significantly reduce sediment delivery during storm events.




> Showcase project to demonstrate effectiveness of Sustainable Drainage Systems in residential developments – Lamb Drove, UK

It is a long-term study completed in 2006 aiming at investigating how SuDS perform; it has had on-going monitoring process from 2006-2011. Cambridgeshire County Council, a forward-thinking authority keen to promote use of SuDS, promoted it. The showcased project applied a range of SuDS techniques (rainwater harvesting, permeable paving, green roofs, swales, filter strips, detention basins, retention ponds), which were compared against a control site on same estate with no SuDS implemented. Comparison of water quality parameters summarised across multiple storm events show a significant impact of SuDS measures to filter pollutants from urban runoff, which was also significantly reduce.




From these results it can be concluded that evidence of biophysical impacts of SuDS shows that they are effective in delivering runoff control that they are designed to provide, and also effective at intercepting and filtering urban diffuse pollution. Understanding and demonstrating biophysical impacts allows us to understand the benefits of NWRM, and to link impacts to ecosystems services benefits & policy objectives.

### *III.2.2 Economic benefits*[6]

On the other hand, to measure economic benefits, it is critical to recognize that NWRM are multipurpose. The central question is how these measure have to be assessed and against what they should be assessed. We need to be able to produce an assessment that takes into account all the multiple benefits of any measure in order to prove its effectiveness:

- Catchment scale is of paramount importance, individual measures may have little effect; it is rather the cumulative effect of (a set of) measures that is relevant when factoring in economic benefits.
- Challenges: when it comes to assess not only the performance and effectiveness of NWRM but also their contribution to welfare, benefits are often widespread – quite often interventions in one place (i.e. upstream) may generate benefits elsewhere (i.e. downstream). Cost-

[6] Gonzalo Delacámara, IMDEA, Mediterranean Network Coordinator

effectiveness is a matter of choosing the right system boundaries rather than merely a monetary question.

- This also has implications in terms of relevant (direct and indirect) benefits: NWRM provide multiple benefits way beyond water retention. Water retention indeed is an ancillary benefit of measures (also) serving other purposes. If some benefits were overlooked, NWRM would not seem cost-effective (i.e. lack of incentives for engagement).
- Valuing benefits is a challenging issue – currently evidence on effectiveness mostly refers to design conditions, not actual performance (this is a main drawback for economic valuation).

There is a need to go beyond (financial) project appraisal

- Avoiding self-indulgence – NWRMs are good in themselves because they serve to restore aquatic ecosystems and thus the biophysical flows of ecosystems services they deliver.

But

- Self-evidence of advantages tends to ignore the opportunity cost of the resources implied and the existence of alternatives that may serve the same purpose.
- Besides its rationale for restoration (and emulation of natural functions) NWRM need to be judged against its potential contribution to other objectives as stated in the WFD, FD, EU 2020 Biodiversity Strategy, Climate Change Adaptation Strategy, CAP reform…).
- Properly designed and implemented NWRM represent opportunities that need to be adapted for the purposes of water management.

If we end up thinking of economics we need to think on incentives able to modify behaviour.

- Prevailing incentives favour the maintenance of the status quo (in semi-arid water scarce areas in the Mediterranean, incentives to retain water are weaker than in relatively water abundant areas).
- A NWRM might be rational from an overall cost-benefit perspective but still non-appealing for those in charge of implementing it. Voluntary acceptance, in forestry and agriculture, requires properly designed economic incentives [The CAP reform (CAP pillar 1: greening but also RDP) can be one example (more: ESIF // partnership agreements; CCA & DRR; R&TD and innovation funds; LIFE; EIB)].
- If NWRM's benefits are not public goods (non-rival and non-excludable) how could beneficiaries pay for them?
- The cost-recovery issue: if in addition to water management, NWRM serve many other purposes how should these measures be financed?
- Can payment for environmental services be based upon public information and ex-post evaluation?

### *III.2.3 General discussion*

> Risk and uncertainty management related to the implementation of NWRM, imply that policy and decision makers have to move away from their comfort zone. Is there any data available regarding the rate of failures comparing these measures to grey infrastructure? Is risk management associated more to economic benefits or to biophysical impacts? Can they actually be de-linked?

> Although perception of policy makers is that these might be very expensive, almost any of these measures are less costly than any flawed or bad decision. Risk management is key to both dimensions of the analysis (economic and biophysical), and to undertake any action. NWRM in decision making is mainly a choice between taking the risk of spending some money in measures that may get some benefits but may not have as many benefits as expected or not spending that money at all and have the certainty that any benefit would be achieved. This is a challenge that this project is facing regarding evidence.

> NWRM can also be used to reduce the extension of other needed measures that have to be implemented.

> In the Mediterranean there are significant storms events – do NWRM have the capacity to deal with such events? The design is key to attenuate whatever events you want to; however, if you design a measure to cope with more intense events trade-offs change, i.e. land taken or set aside to implement a pond will affect the general development of the area.

> When implementing SuDs, pollutants are significantly removed from runoff but is there a risk of accumulation of these pollutants in the soil/substrate and of infiltration to groundwater? For urban systems maintenance is key. Long-term monitoring has proven that performance decays in terms of reducing pollution concentration in runoff and that it will eventually become a pollution source, thus, effective maintenance is of paramount importance.

> When implementing some NWRM, new habitats are created for species (i.e. mosquitoes) that might have an effect on public health. This is actually an important fact as there is not answer yet, although there are some natural ways of controlling mosquito's population.

> There is a significant disparity in the evidence on measure performance, is there enough information on why this occurs and the reasons behind them? Literature reviews offer wide ranges but they do not provide in-depth information on those ranges. That is why in this project, evidence from case studies and other applications if key as it provides that kind of in-detail information (specific outcomes under site-specific conditions)

> The information provided so far is very useful but it does not cover all the criteria actually needed. It might be useful to add issues that should be taken into account in real decision making processes such as long and short term effects, or conflicts between the risk control approach and the protection approach. Also, the effects and performance of measures variability is huge, and that variability is also depending on monitoring is done.

> There is also a third pillar in this project about how to make things happen, thus institutional variables have also been taken into account in the project, i.e. social acceptability, institutional set up, assumption costs, sequencing of water reforms, etc.

## III.3.NWRM AS PART OF ECOSYSTEM-BASED MANAGEMENT APPROACHES

### *III.3.1 NWRM: an ecosystem approach*[7]

NWRM must be based on a eco-systemic perspective. There are some reasons that justify this statement. Only ecosystem-based measures will sustainably fulfil the expected goals in the medium and long term. Besides, the complexity of river systems make artificial measures prone to failure, and non-working measures can be an obstacle for future planning and management. Also, inefficient measures can promote (social, economic and environmental) unexpected inconveniences. Further, uncertainties and knowledge gaps in river functioning recommend a precautionary approach, as close as possible to the natural river dynamics.

There are potential approaches of restoration initiatives to promote NWRM, however each one of them may pose some disadvantages.

- Historical range of variability: when taking into account the evolution of a specific site or location, i.e. a river reach of a watershed, evidence shows that we may face static vs. dynamic processes.
- Reference image. A pre-disturbance status is chosen as a reference point (or target status) for restoration.
- Maximization of biodiversity. In some restorations projects one of the main targets is enhancing biodiversity.
- Recovery of valued species. If the focus is placed on specific species of flora or fauna, we might not be promoting the ecological viability or connection among different water bodies.
- Recovery of lost ecosystem processes. The alternative to the above one is focusing on ecosystem processes, i.e. reconnection of meanders, or reconnection of surface and groundwater bodies.
- Ecosystem services framework. Lately this approach is pointed out as the most effective, especially in urban areas.

Some examples on restorations experiences were presented. The example in the Arga-Aragón River showed that floods were not mitigated by channelizing the river each year (and spending 6-5 million euros/year in grey infrastructure). Protection from T100 floods across the river floodplain through a Life+ project in the 'Mink Territory' and others, that enables to implement some measures targeting the recovery of the ecosystem functions entails:

[7] Fernando Magdaleno Mas, CEDEX, Spain

- Construction of wetlands for habitat of endangered species and improvement of water cycles (retention, infiltration, etc.)
- Reintroduction/maintenance of LWD for habitat, water and sediment trap, improved trophic connections, etc.
- Connectivity improvement for habitat, flood amelioration, better W/D ratio, infiltration, reduction of erosion and encroachment
- Diversity, low density and opportunity of plantations: role of vegetation in water retention and habitat dynamics
- Standing dead trees for habitat, improved hydromorphology, refuge, etc.
- Biological removal of stumps to avoid loss of quality of riparian soils (and infiltration), enhance trophic network and also social interest.

Ecosystemic approach can be applied from very different perspectives, but should always be inherent to NWRMs. Not only NWRMs but also ESS, LSS, EOs-WFD/FRD/BHD can be intermingled and optimized through ecosystem-based procedures.

Design of measures must target long-lasting solutions for multi-pressured and changing systems, and it is key to discuss the outcomes of alternatives and finding one different solution for each site and condition. Monitoring and learning from results if necessary to any further implementation of these measures.

### *III.3.2 Discussion*

> Can be conflict between the different approaches? Are there potential conflicts between restoring hydro-morphology and biodiversity, for example? There are actually conflicts between the process approach and biodiversity. We might need to give more importance to processes; however, the key question is how to define 'processes'. According to the specific moment when you look at a river, condition would be specific of that moment, and there is a big variability. Describing all possible alternatives is key, and then define which one is better contributing to the total benefit. Multipurpose solutions to satisfy all stakeholders.

> There is a need to act on alien species to get them out of the sites to be restored. However, some species are always going to remain.

### *III.3.3 Ecosystem-based adaptation approaches*[8]

Adopting an ecosystem-based approach to WRM provides a framework for mobilisation based on the principle that in broad terms, systems to be managed are complex, unpredictable, and characterised by unexpected responses to different interventions. Any approach that aims to maintain and rehabilitate natural regulatory functions of ecosystems within an entire catchment could be considered an ecosystem approach to IWRM.

Application of an ecosystem approach to WRM has been tested in river basins in different regions and climatic settings around the world. Results have demonstrated the benefits for reducing climate vulnerabilities and strengthening resilience in river basins globally[9]. As a result, the ecosystem approach has emerged as a promising step-wise process to deal with integration and sustainability of water management. These steps can be related to real-life water management issues using the following 7 questions to help frame responses: What is the water-related problem and what ecosystem services are needed to solve it? What actions are needed? What governance, and what agreements are needed to enable action? What knowledge is needed? What incentives and financing are needed? Who needs to be empowered to act? What capacities are needed?

Ecosystem-based adaptation approach (EbA) can be applied at multiple scales, including at the river basin level. Being part of a comprehensive adaptation strategy, EbA allows for a coordinated approach to adaptation at the basin level. It promotes ownership of adaptation strategies, particularly for rural and local communities highly dependent on natural resources, and where environmental pressures are high. This is because activities and measures may require modification of livelihoods, for example, by changing land use for conservation.

Practical adaptation strategies associated with IWRM or IRBM are intended to overcome a lack of coordination and disjointed planning among sectors that can otherwise easily result in unnecessary expenditure, and large infrastructure that fails to provide expected results at the expense of natural ecosystems. IWRM is also designed to replace fragmented management of water and encourage sustainable use, including dealing with water-energy-food nexus issues. One such strategy is to work on revitalising flowing water in rivers.

> Ecosystem and droughts:

Changes in land use (e.g. deforestation) can have devastating effects on ecosystems but are not considered in characterisations. The characteristics of the land surface (e.g. soil moisture, snow-cover,

8 Stefano Barchiesi, IUCN, Global Water Programme.

9 Overview of the Water And Nature Initiative (WANI) portfolio of projects and history (2001-2008). WANI has produced a series of toolkits to support learning on how to mainstream an ecosystems approach in water resource management.

forest cover, land use) have a considerable influence on the system's reactions to weather and climate.

Indicators (e.g. preventive, operative, management/organisational) are not sufficiently developed to address different conditions across Europe (hydroclimatic, catchment structure and ecosystem services, management) and different drought phases (pre, during and post). Single indicators are usually not combined, made commensurable and do not deal with non-stationality and the time dimension of droughts. Using different types of indicators requires improved integration tools, which should also explicitly address drought conditions, incl. distinct indicators for water scarcity.

> Ecosystem governance and resilience

Established approaches to climate change adaptation are highly “impact specific”, and are designed to lower vulnerability to specific projected impacts of climate change across sectors. Such approaches are based on assessment of vulnerabilities, and subsequent action to address those that are highest priority. Building resilience is complementary to this impact-specific adaptation planning. Climate resilient communities and nations need to take both impact-specific action for adaptation and improve institutional functions in response. As both expected and unexpected impacts of climate change unfold, in locations where resilience is enhanced, development trajectories and poverty reduction will more likely be able to continue progressing. This will be due to higher capacities to cope with shocks and, when necessary, to readjust and rebuild according to new realities through, for example, making effective use of better climate information in adaptation strategies as they become available.

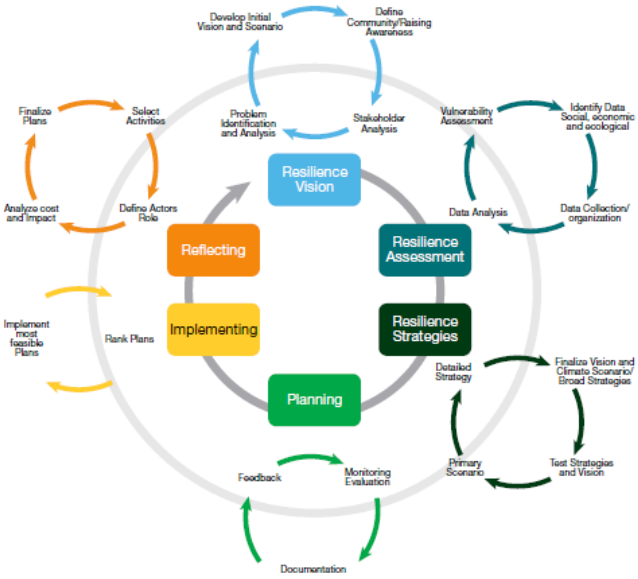
For adaptation that works with uncertainty, we need resilience. Ecosystems and EbA alone will not deliver this alone… but ecosystem services and natural infrastructure are part a framework that for building climate resilience in practice

In this context, there is a mutual and reinforcing link between EbA measures as a strategy to build resilience. This link is best captured through a resilience framework, which integrates four different key areas:

- Diversity of livelihoods, economy, and nature;
- Infrastructure and management;
- Self-organisation in ways that empower people to make needed decisions – with appropriate roles for different stakeholders and institutions; and
- Learning and adaptation.

A review of some projects and publications was included in this presentation:

> SEARCH project: The idea of groundwater artificial recharge has been studied and discussed further with stakeholders through the SEARCH project (2011-2014) that was carried out in Marj Sanour area. The project developed a resilience framework for adaptation to climate change that includes among other measures the implementation of artificial recharge interventions using wells. The aim of these wells is to recover the severely declined water level of the shallower Eocene aquifer in the watershed and the surrounding areas, and to minimize the submerged agricultural area. Technical specifications were important to meet the aim of the project and ensure that the aquifer is enhanced while its water quality does not deteriorate.




> Green Infrastructure Guide for Water Management: this guide addresses one of the main barriers to widespread adoption of GI solutions: a general lack of awareness of the solutions and associated cost-benefits.

> WISE-UP to climate: This project aims to show the application of optimal portfolios of both water infrastructure (e.g. dams, levees, irrigation channels) and 'natural infrastructure' (e.g. wetlands, floodplains, watersheds). It will create dialogue with decision-makers to identify and agree trade-offs. 'WISE-UP to climate' will seek to link ecosystem services more directly into water infrastructure development in the Volta basin (Ghana principally, but also Burkina Faso) as well as the Tana basin in Kenya.

Conclusions:

- Make ecosystems part of the solution
- Foster participation in decision-making
- Connect multiple scales through dialogue
- Promote learning for up-scaling

## III.4.ROLE PLAY – CATCHMENT PLANNING FOR NWRMs

Interactive working groups were organized during the first day to work on a real case study were the application of NWRM was key to recover the Quaggy River (SE England). The main objective of the role-play was the development of a management plan that would give space to NWRM to address the different challenges and regulations by providing multiple benefits. Participants that were asked to play the role of river basin managers were responsible of developing the plan. The rest of participants assumed the role of sports officials (who manages and develops sport facilities in parks), government services (the state institution defining the legal framework, responsible for financing and source of information), municipal councillor (responsible for flood protection and urban development), and journalist (critically comments on the game and mirrors the public opinion).

**Case study background**

The Quaggy is an urban river in Greater London. It has a total length of 17 km passing the southeastern boroughs Bromley, Greenwich and Lewisham. Via the River Ravensbourne it is a tributary to the Thames. Due to the strong urbanization of London making it a megalopolis the Quaggy lost its natural flood plain. In the 20th century the river was channelized into long, straight culverts in order to facilitate flooding. These channels partly run even underground. The river is closed-off by tall hedges and fences. Thus in some areas residents only know there is a river at all, when it floods their gardens. Due to the channelization flood events happen regularly (once every five years) affecting 600 homes only in Lewisham. That's why the government services suggest a further development of the river and new flood protection measures. The authority wants to stay with the classical approach of channelization, protection walls and concrete retention basins. The numerous parks giving distinction to the townscape of London will play a key role during the game. The Quaggy passes the parks Hawkwood, the Chinbrook Meadows, Sutcliffe Park and Manor Park. However these parks consist only of big lawn areas with sport fields and are little used by the citizens. This is where new measures are installed whatever they are classical grey or near-natural solutions.

**Suggested NWRM to be implemented**:

- Green roofs and permeable pavements to reduce the runoff volume outside the green areas
- Retention ponds and wetlands, to enhance water storage at flooding events in the parks next to the river.
- Re-meanders, bringing the river back to the surface, and floodplain restoration to recover the area to the neighbour and to enhance river functionality

**What was actually done at the Quaggy**. The project comprised 3 components, each being implemented by a separate contract: Sutcliffe Park Flood Storage Area, Weigall Road Flood Storage Area, and Downstream channel improvement works.

Sutcliffe Park was the largest component of the project, converting a level grassed open space into a wetland flood storage area storing 85,000$m^3$. Integral to this scheme were a range of amenity and environmental features, recognising the need to improve the value of the park as well has providing

flood protection. The completion of the project resulted in an increase of the number of visitors by 73% and the length of visitor time increasing, dispelling the myth of the incompatibility between flooding and open space, if well designed.

Weigall Road Flood Storage Area undertook the construction of a second flood storage area to provide 65,000$m^3$ of storage, while the downstream works were set back defences, and in-channel habitat improvement including the creation of instream habitat features and bird and invertebrate boxes installed within the wall.

**Issues raised in from the general discussion**:

> Information for modelling in the urban context was way more important to engage people and neighbours into the project. It was a real challenge to convince people into doing changes in their own land yards. In this case it was also important to make the river visible again, so that citizens could understand where the floods were coming from.

> The catchment approach was pointed out as important to understand the dynamics, i.e., of the runoff. Flood prevention would not come only form the specific areas pointed out in the case study but also from upstream were the runoff is generated, and where some other measures (i.e green roofs or permeable pavements) could be implemented. However in the real case, the Quaggy was a river solution, where only the green areas next to the river were the ones that could actually influence the state of the river. There were high constraints and this was the proposed solution

> More than the specific technical difficulties, or the hydrological information available, what was actually critical was the political and the government willingness to implement a different plan; it was a political challenge.

> Financial incentives to foster NWRM implementation at individual level (i.e. fiscal incentives for green roofs)

> Where there is environmental degradation, usually it follows a social degradation of the affected site too. In that sense, when an improvement on the environmental conditions is carried out, the associated welfare also increases (improved amenities). The economic analysis should be able to capture this.

> Usually, and specifically in the Quaggy river, only when the project was completed and monitoring of outcomes began, it was possible to quantify the related benefits

> The Environmental Agency was in charged of mobilizing the knowledge gained with this experience in case it is replicated elsewhere.

> There was a big concern on how these new measures would be paid. Maintenance costs were singled out as important as the initial investment to implement the measures. The total cost was 1.1

million pound, plus 3.8 million pound; a total of 5 million pounds. Every group was concern on the citizens; most of the discussion was out of the NWRM itself but on the planning process.

> Other lessons learnt:

- Participation of relevant stakeholders in the process was key for the acceptance of the final plan
- Trade-off should be taken into account when planning
- The negotiation phase should be long enough to allow stakeholders to accept the proposed measures. It should address all practical concerns and major worries, and has to take into account the local context.
- Communication on benefits of the implemented measures was important to engage citizens
- It was important to bring technical expertise to the planning process
- In the urban context, design had to move from water management to actual spatial planning
- Long-term effectiveness is also a major concern

## III.5.SUPPORTING NWRM DESIGN AND IMPLEMENTATION - The Knowledge base & the practical guidance[10]

This session was indented to review the work progress on the project-based tools that create the knowledge base of the project. The objectives of these tools are to develop a shared online knowledge base to allow common understanding and aggregation of knowledge on NWRM at EU level; to contribute to develop the sharing of good practices in designing, selecting and monitoring of NWRM; to establish a practical guide to allow the platform user to identify relevant information to implement NWRM.

> Principles

The challenge when developing the knowledge base was grouping and the “parameterisation” into a database structure. As above, NWRM are multi-purpose measures, targeting multiple policy objectives. Also, a wide range of applications impacts and benefits was raised (most often, context specific). And finally, multiple sources and information flow paths that were not harmonised had to be included.

A knowledge base in this sense is defined as a wider system capable of grouping and conveying information in an organised manner and targeting multiple end-users’ needs. It should have the capacity to access information on different levels (synthetic, analytical, queries, etc.) in a seamless and transparent way.

> End-users

1. Design Practitioner (DP). They need a ‘Set of Principles’ that will allow them to correctly identify options and design what qualifies under NWRM. Evidence base of the available options (i.e. detailed for each measure) is needed, and it has to be more technical than the ones intended for the policy audience:

- Application/function
- Intended primary and secondary purposes of each NWRM
- Operational risks
- Design considerations
- Adaptability
- Maintenance requirements
- Impact to public perception, etc.

[10] Maggie Kossida, IACO, Greece

Clear references to existing guidelines and engineering standards are also very useful to be included in these Factsheets. Besides, links to incentives (direct and indirect subsidies) are also very useful to design practitioners.

However, to guide their selection among the options, the case studies (which give the specificities and feedback of actual applications) are the real supporting knowledge.

The case studies can provide the practitioners feedback on a range of potential impacts (biophysical) across a variety of conditions and under different context, information on the design implications, real costs, social acceptability, enabling factors, constraints and preconditions. A case study (application) database relevant to design practitioners should contain:

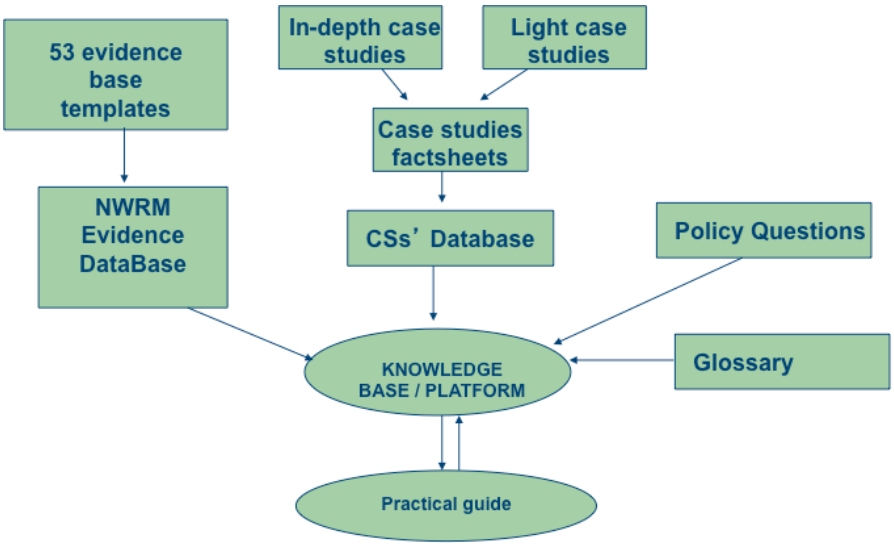
- Descriptive information
- Technical information on the main design parameters and monitoring requirements (to allow the practitioner identify similarities and/or discrepancies as compared to his candidate site/environment)
- Quantifiable indicators (especially with regards to the biophysical impacts and economic information, along with possible performance metrics) to help them grasp the range of costs and benefits and the overall performance/effectiveness
- Lessons-learned to highlight the main risks, implications, enabling factors and preconditions.

2. Policy community. There are designed policy questions that target this the policy community:

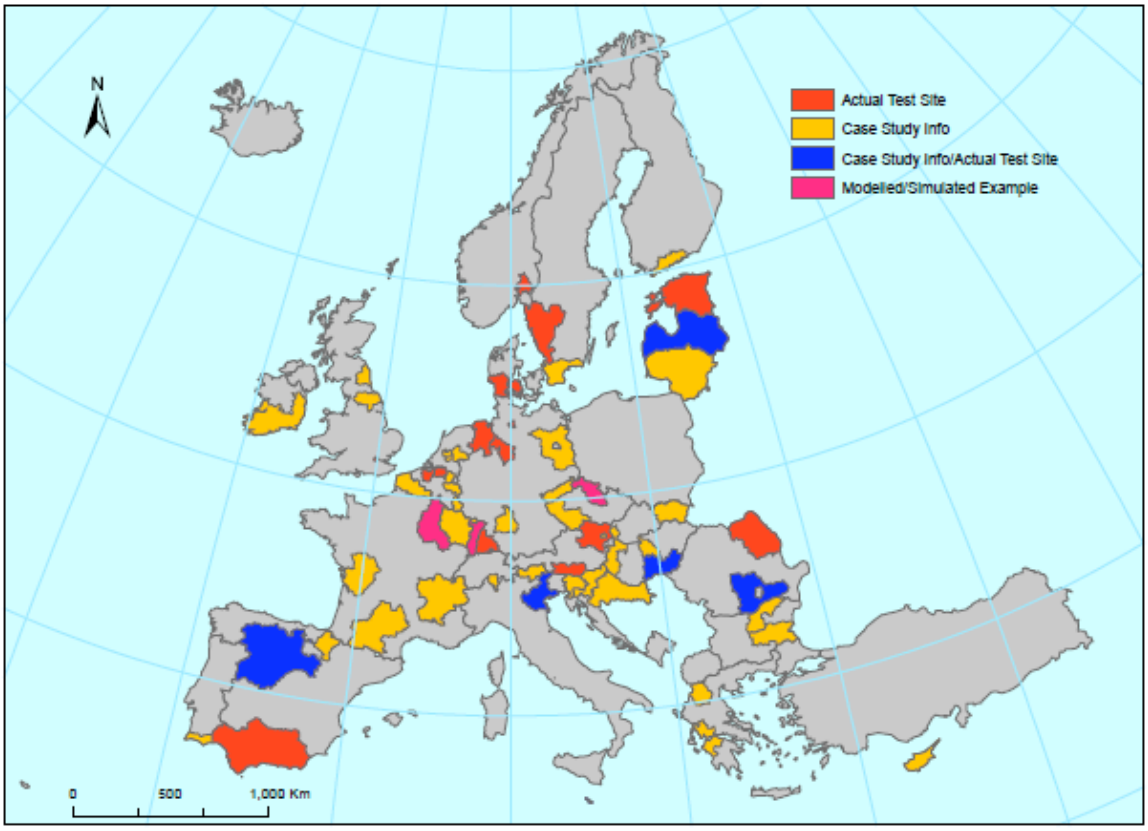
- What are the most effective NWRM's (or combinations of NWRM's) - and for which (biophysical) circumstances? What evidence exists on NWRM effectiveness?
- Which assessment methods and practices are used for NWRM's?
- What is the contribution of NWRMs to reaching EU Directives' objectives?
- What are the benefits and co-benefits of NWRMs?
- "Better" option than the "traditional" measures?
- What are the main barriers and success factors for implementing NWRMs? (Public awareness, perception, public investment, etc.)

3. Research community: input to modelling, simulations, comparative studies, quantified parameters mainly on biophysical impacts and costs.

> Structure of an Integrated Knowledge Base




> The Case Studies' Database: a selection of 80 applications (actual test sites, case studies, modelled/simulated example) was included in the database[11].




[11] There is more than one case study per coloured area

The case studies database contain the following main entries: NWRM applications of any kind e.g. test site, a case study or even modelled results documented in research studies, etc.; NWRM types grouped in more general categories, NWRM sectors, e.g. forest measures, urban measures, agricultural measures; Sources (references) that have been used to document NWRM applications or NWRM types; Parameters divided in categories (design, biophysical impacts, socio-economic, governance, policy, etc.). It is a normalized database that ensures referential integrity. It is based on an Object-Relational Database Management System (PostgreSQL)

The NWRMs' Evidence Base gathers information on the natural water retention measure (description), on the geographic applicability (land use, region) and the scale of the application, on the biophysical impacts (slowing & storing runoff, reducing pollution, soil conservation, creating habitat, climate alteration) and the ecosystem services benefits (provisioning, regulatory & maintenance, cultural, abiotic), on the policy objective to which it is related (WFD, FD, Habitats, 2020 Biodiversity Strategy), on the design parameters, costs and incentives of the application, and on governance and implementation issues.

> Lessons learned:

- Very diverse cases/applications, often using a bundle of NWRM: thus, 1-1 allocation of impacts
- Benefits is not always feasible
- EU-level info on NWRM CSs is piecemeal, often lacking quantified data. There is more focus on some NWRM applications than others
- Harmonisation of information is difficult (different objectives, context, etc.). Not all parameters are applicable for all NWRMs.
- A database is not for the sole purpose of having a collection of information, but it should be functional from a users' perspective
- Evidence is key
- Mix of "DB products" and tailored outputs (preformatted) to accommodate needs and facilitate access to info.
- Expandable and adoptable to new knowledge and evidence

> A Practical Guidance: what for?

- To support the design and the implementation of NWRM at the catchment scale in Europe and contribute to the achievement of EU (water) policy objectives
- A guidance targeting practitioners, water managers, urban/land/sector planners
- A guidance developed in both paper and web-based format, interacting with the NWRM knowledge base

### *III.5.1 Discussion*

> It is key to have in mind target end-users when designing the knowledge base

> Regarding financial issues, the application of NWRM among Member States may differ significantly. However when designing the knowledge base multiple levels have been taken into account. Within the policy questions information on financing at the EU level is available. However, there is also information on how the specific case study was financed, i.e., applied local instruments

> For in-detail information, it is necessary to go to the evidence base and check the specific criteria. NWRM will not perform the same in different Member States, thus criteria for policy makers has to be available so they can take decisions based on their own specific conditions.

> In the database identification of parameters has been done, but as a percentage of runoff attenuation or pollution reduction. These parameters are types of indicators, however neither thresholds have been defined nor the related effect of what would happen if values were over or below those thresholds.

> The map in which applications have been represented does not necessarily reflect the situation in Europe. The project was interested in applications with a coherent storyline, and thus was difficult to find as many as desirable. It might happen that one Member State has more applications because the information there was better.

> Sometimes the knowledge on the measures is not so well established. There is a need to be cautious when stating that a measure can be implemented in a specific place, as in most of the times the particularities of the site and the lack of information on the measure may end up in a failure application. The challenge for the project has been that measures across the whole database cover a wide range of impacts, areas, etc. It tries to balance the useful aspect of helping practitioners and policy makers find a way into this process, towards the right kind of measure without putting to much weight on it, and not become evidence in itself. In this project what has been done is to set a clear difference between how you take evidence form the literature, how you present that, how you bring it all together, and being sure that it does not become evidence itself. We are using the knowledge base to help people to go through this process but not to assert what impacts and benefits measures will have under any conditions.

> These measures should be assessed against actual policy measures.

## III.6.NWRM WITHIN THE CONTEXT OF CLIMATE CHANGE ADAPTATION (CCA)[12]

Climate Change is driving most of the measures being applied. During this session 3 presentations were delivered; all of them had partial success stories, which in many cases raised the issue of land property and ownership, as a need to establish cooperation with stakeholders and other people involve.

The first presentation was based on the relevance of bio-engineering and riparian afforestation within the context of water scarcity[13], This presentation highlights, on a river system scale, the need of NWRM studies to integrate a trans-disciplinary combined approach to restore the system function. Many complex interrelated processes occur and they need to be considered and quantified. Riparian zones are extremely productive systems, which also have buffering function and provide or contribute to the provision of fundamental ecosystems services, as in the case of groundwater recharge and water quality. Riparian canopies intercept rainfall, reducing direct runoff and slowing down the river. Root growth and decomposition in soil reduce the overland flow (mulch), increasing the riparian soil moisture and the infiltration capacity. River bank water storage capacity reduces flood intensity and sustains stream flow. The slope, rugosity, complexity and state of the riverbank are important factors in water storage capacity and retention.

In Mediterranean countries, climate change effects are affecting water availability, increasing droughts and the manifestation of extreme events, generating severe biodiversity losses, increasing forest fires, reducing sustainable cropping areas, increasing summer energy demand and reducing hydropower. In Portugal, massive changes in land use have occurred, mostly caused by climate change as the main driving force.

Natural engineering and riparian afforestation measures at local spatial scale are seen as means to restore facets of the river functions In the Iberian Peninsula. They are implemented to promote or preserve biodiversity, and not directly aimed at NWRM *per se.* NWRM are an indirect consequence of these actions but they have not been quantified; this emphasises the need to include quantifiable NWRM in programmes.

In the case of River Odelouca, in Algarve Portugal, bioengineering measures were carried out, seeking to increase habitat heterogeneity and quality. Firstly bank stabilization measures where done, followed by channels interventions.

[12] Session facilitated by Dennis Collentine, SLU, Sweden

[13] Samantha J. Hughes, CITAB-UTAD, Portugal

NWRM cross cut different spatial scales: from bioengineering at local scale to land use and processes at catchment scale. There is a need to prioritize river reaches for NWRM restoration measures within a whole river network (i.e. catchment) for greater environmental return. Moreover, there is a need to understand how riparian conservation status or integrity affects other processes within the river network. Finally for the application of multiple criteria morphological dynamics, should play a major role in such studies, to underpin most physical and biological processes and fundamentally for building multi-scale resilience into NWRM.

The second presentation was on water banking through Managed Aquifer Recharge (MAR)[14], in Italy. The project was located near the city of Vicenza, being the upstream area the water recharge zone while the lower part is dominated by public wells. It is a dynamic area, with two groundwater bodies interconnected. Lately, the general trend of the water table level has been decreasing. Mainly because the main source of the aquifer recharge comes from the Alpine rivers, and those rivers were channelized. The seeming solutions could be pumping the water from one place to put it where it is needed, however this is a controversial solution since it demands pipes plus fight against population perception. Moreover, the effect of climate change also acts as lowering of the water level.

The general objective of the project was based on developing an adaptive strategy to the climate changes for the sustainable governance of the upper Vicenza's plain groundwater resources, in order to achieve the WFD-RBMP (2010) environmental objectives for to 2015 and 2020.

Recharge solutions were implemented in different spots; infiltration wells, infiltration trench, forested infiltration area, infiltration brook (basin) and (sub) infiltration field. Also floods were used as inputs since they are the main drivers of natural aquifer recharge. The success of the project demonstrates that MAR through artificial solutions is possible and needed in a short time and that they should be included in the whole long-time picture.

A governance tool towards a groundwater contract was presented and defined as a "voluntary agreement amongst public and private subjects variously involved and/or committed into local water body issues, aimed at the ecological restoration and socioeconomic regeneration of watersheds through a participative process"

Finally a review of different demonstrative MAR measures, in different Italian municipalities, was presented, including inflation trench, infiltration wells, infiltration brook (basin), forested infiltration area and sub infiltration field. The monitoring measures and the reached outcomes, where mentioned.

The last presentation of this session on riparian buffers to mitigate runoff effects and the role of riparian vegetation[15] introduced the MIRIAM project. It aimed at mitigating the risk of surface water

[14] Giancarlo Gusmaroli, Life+ AQUOR Project, Italy

[15] Vincenzo Pellegrino (Regione Piemonte) & Andrea Ebone (IPLA - Istituto per le Piante da Legno e l'Ambiente), Italy

contamination due to pesticide and nutrient runoff. The surface and sub-surface runoff conveys pesticides and nutrients to the water bodies, affecting the whole catchment. The project comprised four phases:

- Contamination risk diagnosis at catchment basin level; characterisation of the basin by means of maps (slope, soil texture, etc.)
- Contamination risk diagnosis at the field level; crops, agronomical practices, shortcuts, ditches, etc.
- Determination of the contamination risk degree by means of decision support systems
- Determination of the Best management practices (BMP's) and a combination of mitigation measures.

Regarding the last point, the idea was not to present a limiting list of tools, but BMP's to induce a change in population behaviour. The mitigation measures involved a combination of measures as soil management (e.g. lower tillage intensity, rough seed bed), cropping practices (e.g. crop rotation, cover crops), vegetative buffer strips (e.g. riparian, in-field buffers), retention structures (e.g. vegetation ditches, ponds), correct use of fertilisers and pesticides (e.g. doses, timings) and optimised irrigation (e.g. drip/sprinkler vs. surface irrigation, water volumes).

The expected results of MIRIAM project are the integration of several Directives as the nitrate directive, WFD and Pesticide directive, the dissemination of BMPs and guidelines for the agriculture sector operators and a set of guidelines for the preparation of Rural Development Program notices and tenders (integrate environmental policies with economic planning based on EAFRD and CAP).

During this presentation another project was presented: Eau Concert Project, which aims at preserving and improving the quality of the river ecosystems in the cross-border area of the Regione Piemonte and Rhône-Alpes strengthening the management tools and participatory processes introduced by the European WFD.

### III.7.NWRM WITHIN THE CONTEXT OF DISASTER RISK REDUCTION (DRR)[16]

During this session 3 presentations were delivered. The first one of them was on Key issues to be addressed for the implementation of NWRM to tackle flood risk in Italy[17], where it was interesting to see the challenge of uncertainty that high energy rivers pose. In these systems the ability to take no regret measures is much more limited; measures that are not as effective as expected have huge impacts. Key NWRMs for flood risk mitigation (hydromorphological River Restoration measures) aim at slowing down flow peaks and restoring the connection with and flood retention capacity of floodplains.

[16] Session facilitated by Nick Jarritt, AMEC, UK

[17] Andrea Goltara, CIRF, Italy

Key issues to be tackled:

- Scale: measures are still conceived to act at a too local scale (in space but also time) in order to properly compare "traditional" vs. "working with nature" alternatives.
- Emergency vs. planning: In practice in Italy the large majority of interventions related to flood risk management are funded and implemented under Emergency (post-disaster) conditions, often bypassing planning
- Overlaps of plans and authorities
- Cultural shift is needed: NWRM concepts are to a very limited extent integrated in the know-how of DOs in public authorities. Most Italian RBMPs neglect hydromorphological restoration and the same is happening with Flood Risk MPs
- Insufficient legislative support
- Lack on Funding
- Insufficient policy support
- Insufficient public participation: Measures such as NWRMs for flood risk mitigation, to be developed and with effects at catchment/basin scale, entailing change of use of large portions of land and often conflicts between areas / stakeholder, etc., particularly need to be developed and supported through a participatory approach
- Technical issues

The second presentation on Local water harvesting[18,] explored the wisdom and sustainability of the Maltese traditional and legal requirement for each building to have its own rainwater storage. It also aimed at demonstrating the flood impact of the neglect of the compliance with this rule in recent times. A description of the retrofit of a 60 million euro underground flood water drainage system being introduced with EU funds was made, and the issue of the consequences of bad planning, weak compliance and disjointed water management were raised.

Last presentation was on Forest NWR and climate change adaptation in the Mediterranean[19]. It introduced how forests comprise a significant influence on hydrology mostly in a beneficiary way. Forests, due to the their higher infiltration rates and soil water consumption, produce lower levels of storm flow and greater soil stability than any other vegetation type, forest soils also provide purification of water. Global warming and reliant processes on the environment and society put more pressure on better utilization of the natural water retention of forests. The mitigate potential of forests should be developed and either aimed at reducing runoff formation or mitigating adverse impacts of running waters. To mitigate the effect of drought in the future, forest management has to examine various adaptive strategies aimed at increasing resilience of forests and also to consider landscape measures aimed at drought impact management. However, adaptive potential of the NWR of the Mediterranean

18 Philip Grech, Grech & Associates, Malta

19 Ivan Pilaš, Croatian Forest Research Institute, Croatia

forests and scrublands should be evaluated through multiple functions and services that they provide such as biodiversity conservation, erosion control, and carbon sequestration, timber production together with societal and recreational function.

## III.8.NWRM AS A CATALYST FOR POLICY COORDINATION[20]

During this session 3 presentations were delivered to highlight the importance of coordination between policies due to the multi-benefits that NWRM can provide. Policy coordination is not a choice but a need when talking about NWRM. It was present in all presentations.

The first presentation, named '**When soil conservation meets water retention**'[21], analysed the hydrological impact of green cover crops in olive orchards to jointly enhance soil conservation and water retention. In Andalusia (Southern Spain), where olive trees cover 70% of cropland, one third of the crops are on slopes, causing severe erosion problems, due to the crop structure that leave the soil unprotected to degradation. Benefits from cover crops have to do with erosion control (cover crops give mechanical protection of the soil), increase of infiltration and nutrient content, occasionally pasture, improved water quality, biodiversity, etc. However, even when you use a cover crop, you are still having a significant runoff amount in wintertime. So cover crops may not be a solution by itself.

Trade-offs need to be taken into account and thus the balance between infiltration and evapotranspiration. The differences between the Mediterranean and other European countries are not that much in rainfall but in evapotranspiration. Competition for water with the tree sometimes imply a reduction in yield; if cover crops are to be implemented, yield cannot be affected. Unlike other NWRM, there is widespread empirical evidence of the use of cover crops on runoff, soil properties, and soil-water balance. There are major effect in soil conservation, a significant reduce in runoff and improvements of the top soil centimetres, which leads to an improved resilience to other impacts and a greater biological activity.

Cover crops are a key element in achieving sustainable tree production in the Mediterranean. They have a relevant role as NWRM (if properly implemented) and contribute to mitigate problems associated to large runoff events: flood damages, offsite contamination. However, its effective adoption is proving to be challenging; ground cover to place cover crops is often poor and uneven, farmers are likely to be reluctant to its implementation and there is a limited offer of seeds and machinery available. On the other hand additional risk rise, such as the cost, the potential risk for yield and the technical complexity to harvest, control and seed the land.

[20] Session facilitated by Gloria de Paoli, Acteon, France

[21] José A. Gómez, IAS-CSIC, Spain

The second presentation was an overview of **NWRM in Cyprus: past – present – future**[22]. Traditionally NWRM implemented in Cyprus were widespread terracing in mountainous areas that nowadays are abandoned (NWRM: A10), retention reservoirs on temporary rivers for artificial-managed aquifer recharge (NWRM: N1, N13), as well as wetland and lake restoration (NWRM: N2, N12), detention trenches in alluvial riverbeds for artificial-managed aquifer recharge (NWRM: N13), SuDS (mainly in Limassol urban area), afforestation in artificial terraces in headwaters areas (NWRM: F2), continuous cover forest (NWRM: F6), and ditch blocking and small check dams as support to reforestation efforts (NWRM: F9, F13). Most of these measures were responses to the dry climate and water scarcity of Cyprus, which usually did not aim at restoring or maintaining aquatic ecosystems.

Today, RBMP review the measures included in the PoM, and identify those measures that may have a water retention component. Further analysis of the identified NWRM is carried out to single out the water retention component, to describe recognized benefits but also those that have been missed, and to coordinate involved bodies. As a result a better insight in NWRM and its gaps is reached and the identification of priority areas for future action is possible.

However, during the process it was highlighted that NWRM awareness and knowledge exists only in relation to (urban) stormwater management, that the multiple benefits of measures for riparian zones were not recognized, that measures for WFD and FD did not recognise each others benefits, and that identified gaps in stakeholders participation were limited. This might be because management of riparian zones and aquatic ecosystems are new challenges in Cyprus (since the WFD), thus there is a lack of experience. Besides, real problems with urban flooding forced authorities to engage with the problem gaining experiences, which are already available.

From the first river basin management plan (RBMP #1) assessment in the light of NWRMs one might state that self-evidence of advantages of measures blurs the general view when assessing their benefits and their trade-offs (especially in fields with lack of experience). However, the evaluation of WFD measures from a NWRM perspective improves the identification of (hidden) multiple benefits, and a detailed inspection of the working mechanisms of measures improves the identification of affected policy objectives. Also, comprehension of the interrelations between working mechanisms of measures, policy objectives and benefits/trade-offs is crucial for the assessment of measures

The evaluation of proposed measures in the WFD-PoM from an NWRM point-of-view fosters a spherical, integrated approach and facilitates the identification of policy objectives, additional benefits, and stakeholders otherwise missed.

Constraints stem from the still sometimes unclear definition of NWRM, which poses difficulties when determining if a measure qualifies as NWRM. Also, NWRMs' retention effects are hard to quantify,

[22] Gerald Dörflinger, Water Development department of Cyprus, Cyprus

making it harder to convince decision makers. Other limitations encountered are related with the lack of awareness for NWRM and that the group of potential promoters on the national level is very small.

To finish with his presentation, Gerald Dörflinger added some comments and suggestions to the NWRM consortium:

- The definition of NWRMs would benefit from further explanation and clarification, e.g.:
- Provide guidance and methods to quantify the retention effect of different NWRMs
- Categorize NWRMs according to applicability in different European regions, i.e., clearly highlight NWRMs regional applicability. This could be a system of "degree of applicability" per region (e.g. +, ++, +++)
- Review the NWRMs' description and adjust them for regions of applicability where possible. For example, some forestry NWRMs referenced to peatland & boreal forests are applicable in Mediterranean forests (water retention and erosion protection for e.g. afforestation)
- Do releases of environmental flow qualify as NWRM?
- Why buffer strips may not work in Mediterranean?

The last presentation of this session was on **sediment management programmes and river contracts**, instruments for river and basin restoration[23]. Sediment Management Programs are planning tools at river basin scale that have the same purposes as the plan for the hydrology (PAI), and deals with a single river (sub) basin. Their main objectives are: environmental protection, environmental quality, and environmental improvement.

Studies at river basin scale are necessary to recreate and preserve the dynamic equilibrium of the river. These studies are based on the geomorphology (sediment sources, morphological evolution, works, historical events, etc.), hydraulics (hydrology, water discharge in different return periods, flood plains, etc.), and ecology (landscape analysis, water quality and quantity, fauna and flora, environmental quality index, etc.).

There are different options that can be implemented. First, it can be decided to implement no intervention, however, if the decision is to implement one it can be sediment removal, morphological restoration, protection works, management of woodland belt, etc.

River and lake contracts in the Piedmont region come from the obligation to achieve environmental objectives. In the beginning there was a fragmentation of responsibilities and it was difficult to reconcile different interests. Planning at regional scale requires applications at the local level. These contracts integrate various decision-making levels, but each subject operates within its limits. It allows a streamline procedure. The aim of river contracts is to achieve environmental quality objectives through public and private participation instead of through the adoption of centralized measures.

[23] Paolo Mancin, Regione Piemonte, Italy

River and lake contracts meant to be a local instrument for regional planning implementation, taking into account participation, as in art. 14 of the WFD. They also serve as platforms for dialogue for everything related to water (although not only water issues are treated), and to adopt sustainable development policies.

### *III.8.1 Discussion*

> There was a sediment model. For sediment abstraction in rivers, after the sediment programmes, the department the gives authorisation is completed to see if the action to be implemented is foreseen in the contract of the basin; now only environmental metrics are considered, i.e. period that the works are in progress.

> Were sediments introduced in the river? There are rivers that need refilling of sediments, but always based in specific conditions.

> In cover crops, are the species based on the seeds banks, or are introduced? Have you considered introducing other species that could benefit insects, bees, etc.? Most species are grass; in other cases they are mixes of cover crops, 12-20 several species, which provide same protection and hydrological benefits plus more diversity. Also, homogeneous cover crops from natural species are used, with seeds that come from pasturelands. Local species are better adapted to local conditions.

> Does no tillage relate to the use of natural species? No, no tillage is referred to bare soils. If you don't tillage and then let the plant grow it is a different thing, named natural cover crop, for example. However, due to the traditional management over the years with herbicides there is no seed bank.

> Could the microbial community of the soil be beneficial? With time it might become more productive, as they might provide additional nutrients. Soils might be much more resilient but the main limitation of south European crops is water thus not big changes in yield might be notice.

## III.9.INPUTS FOR THE WFD CIS PROCESS – PANEL OF POLICY MAKERS AND PRACTITIONERS

*Panellists: Evdokia Achilleos (EC DGENV, Water Unit, project officer); Andrea Goltara (CIRF); Giorgio Pineschi (Ministry of the Environment, Italy), Gerald Dörflinger (Water Development Department of Cyprus), Jaime L. Fraile (Segura River Basin, Planning Office, Spain).*

- This project has been successful in bringing together a community of practice to share knowledge and expertise on NWRM, and also in having people from different practice levels and different providing feedback and input to the project product. We had many good suggestions that have been forwarded to the working groups as well.
- In terms of water policy development and implementation, in the CIS for the WFD we are paying attention to NWRM, making an especial effort in communication and promoting their uptake in the planning cycles. It is discussed not only in the WG PoM, but also in the WG Floods. It is important also as we want these measures to be a common element between river basin plans and flood risk management plans. Actions are currently under development to coordinate both of them.
- Beyond what is being done in relation to water policy implementation there are activities in other related environmental policies such as the Biodiversity Strategy, or Green infrastructure Policy.
- The EC has promoted activities on streamlining water marine, nature, biodiversity and legislation in practice. There are documents and guidance on how to deal with potential conflicts between the WFD and natural or habitat conservation. The idea is to see how to coordinate the documents of the WFD with other policies. In December there will be a workshop addressing these issues. NWRM is a good example of how you can implement something that will benefit different policy objectives.
- This new label (NWRM) might be useful but it needs to be integrated in different policies. There is need to be careful when promoting measures that might be conflicting among each other.
- It has to be clear what we mean by natural. For example, two different options for storage of waters in droughts: restore connection with the aquifer and SuDs. However one may contribute to the improvement of the ecological status and the other one not.
- It is important to highlight policy to avoid conflicts between the different planning options. When spending part of the available funding in one measure, we need to be sure that other measure with opposite effects is not being funded (avoiding contradictions in funding). Energy policy incentive may conflict with other policies, for example.

- Hydromorphology needs to be more important in the definition of status of the Directive.
- In southern Mediterranean basins risk management is not only about drought but also about intense flood events. When these events occur, usually packs of new investments are made available to implement measures. The problem with NWRM in some planning units of river basins is that people in charge of the decision-making are much more into grey infrastructure (intense bias through grey infrastructure). Sometimes is difficult to embrace new measures to tackle drought and flood risks. It is much more about where to put the available funding than seeking for additional funding.
- Also, in regions like southern Spain, where there is an intense use of water, there is a belief that all retained water will not be available for other productive uses such as agriculture, which is also a setback for NWRM implementation.
- There are problems for selling the NWRM is the mentality of users and older technicians in charge of the actual management of the river basin.
- They need this kind of initiatives in order to help them to persuade the managing directors of the benefits of NWRM.

# IV. WORKSHOP AGENDA

Final version _ September 8th, 2014

Day 1

★ REGISTRATION AND LIGHT LUNCH (12.30 – 13.30)

· **Opening session (13.30 – 14.10)**

- 13.30 - 13.40 *Welcome* – Salvatore de Giorgio (Regione Piemonte, Regional Environment Director) [IT]
- 13.40 - 14.00 *Introduction to the project (I)* – Evdokia Achilleos (EC DGENV, Water Unit, project officer) [CY]
- 14.00 – 14.10 *Introduction to the project (II)* – Benoît Fribourg-Blanc (OIEau, on behalf of NWRM Project Co-ordination) [ES]
- Facilitation and Introduction to the workshop – Gonzalo Delacámara (IMDEA, NWRM Mediterranean Co-ordinator) [ES]

· **Session 1· The multiple benefits of NWRM – Water retention: a means to different ends (14.10 – 15.10)**

- 14.10 - 14.30 Nick Jarritt (AMEC) [UK]. *Biophysical impacts: evidence from Sustainable urban Drainage Systems (SuDS)*.
- 14.30 - 14.50 Gonzalo Delacámara (IMDEA) [ES]. *Economic evidence of benefits of NWRM*.
- 14.50 - 15.10 Facilitated discussion / all participants – Ayis Iacovides (IACO) [CY]

· **Session 2 · NWRM as part of ecosystem-based management approaches (15.10 – 16.10)**

- 15.10 - 15.30 Fernando Magdaleno (CEDEX) [ES] *NWRM: an ecosystemic approach*
- 15.30 - 15.50 Stefano Barchiesi (IUCN, Global Water Programme) [IT] *Ecosystem-based adaptation approaches – lessons from the EU SEARCH project*
- 15.50 - 16.10 Facilitated discussion / all participants – Maggie Kossida (SEVEN-Engineering Consultants) [EL]

★ COFFEE BREAK (16.10 – 16.30)

· **Session 3 · Facilitated role playing in break-out groups (16.30 – 18.40)**

- Led by Pierre Strosser, ACTeon [FR]
- Facilitated by: Pierre Strosser, Gloria de Paoli, Sabine Tutte (ACTeon); Nick Jarritt (AMEC); Gonzalo Delacámara, Estefanía Ibáñez (IMDEA);

★ CONFERENCE DINNER (Aperitif @ La Revoltosa, Piazza Emanuele Filiberto 4, followed by dinner @ Osteria La Gricia, Piazza Emanuele Filiberto 6).

Day 2

· **Opening Session & wrap-up session from the role playing (9.00 – 10.00)**

- 9.00 - 9.05 *Synthesis of Day 1 & Introduction to Day 2* – Gonzalo Delacámara (IMDEA, NWRM Mediterranean Co-ordinator) [ES]
- 9.05 – 10.00 *Wrap-up session (General discussion from the role playing)* – Pierre Strosser, ACTeon [FR]

**· Session 4 · Supporting NWRM design and implementation (10.00 – 10.40)**

- Maggie Kossida (SEVEN-Engineering Consultants) [EL]. *The knowledge base*
- Pierre Strosser (ACTeon) [FR]. *The practical guidance*

★ COFFEE BREAK (10.40 – 11.00)

· **Session 5 · Parallel sessions // Breakout groups (11.00 – 12.30)**

Breakout group 1: NWRM within the context of climate change adaptation (CCA)

- 11.00 - 11.20 Samantha J. Hughes (CITAB-UTAD) [PT]. *The relevance of bioengineering and riparian afforestation within a context of water scarcity and drought risk*.
- 11.20 - 11.40 Giancarlo Gusmaroli (Life+ AQUOR project) [IT]. *Water banking through Managed Aquifer Recharge (MAR)*.
- 11.40 - 12.00 Vincenzo Pellegrino (Regione Piemonte) & Andrea Ebone (IPLA - Istituto per le Piante da Legno e l'Ambiente) [IT]. *Riparian buffers to mitigate runoff effects and the role of riparian vegetation*
- 12.00 - 12.30 Facilitated discussion / all participants – Dennis Collentine (SLU) [SE]

Breakout group 2: NWRM within the context of disaster risk reduction (DRR)

- 11.00 - 11.20 Andrea Goltara (CIRF) [IT]. *Key issues to be addressed for the implementation of NWRM to tackle flood risk in Italy*
- 11.20 - 11.40 Philip Grech (Grech & Associates) [MT]. *Local water harvesting – the Maltese experience*.
- 11.40 - 12.00 Ivan Pilaš (Croatian Forest Research Institute) [HR]. *Forest NWR and climate change adaptation in the Mediterranean.*
- 12.00 - 12.30 Facilitated discussion / all participants – Nick Jarritt (AMEC) [UK]

Breakout group 3: NWRM as a catalyst for policy co-ordination (spatial development, agricultural policy, urban development, water policy, land use policy, conservation policy)

- 11.00 - 11.20 José A. Gómez (IAS-CSIC) [ES]. *When soil conservation meets water retention*.
- 11.20 - 11.40 Gerald Dörflinger (Water Development Department of Cyprus) [CY]. *Practical and policy issues on current and future implementation of NWRM* (TBC)
- 11.40 - 12.00 Paolo Mancin, Regione Piemonte / Piedmont Region. *Sediment management programmes and river contracts: two instruments at a catchment scale for river and basin restoration* [IT].
- 12.00 - 12.30 Facilitated discussion / all participants – Gloria de Paoli (ACTeon) [FR]

· **Wrap up session – general discussion from the parallel sessions (12.30 – 13.00)**

· **Session 8 · Inputs for the WFD CIS process (art. 5 discussions, incentives – linked to funding issues, local trade-offs) – Panel of policy makers and practitioners. (13.00 – 13.40)**

- Panellists: Evdokia Achilleos (EC DGENV, Water Unit, project officer); Andrea Goltara (CIRF); Giorgio Pineschi (Ministry of the Environment, Italy), Gerald Dörflinger (Water Development Department of Cyprus) [*TBC*], Jaime L. Fraile (Segura River Basin, Planning Office, Spain) [*TBC*]
- Facilitated discussion / all participants – Gonzalo Delacámara (IMDEA)

· **Synthesis of the workshop – lessons learnt (13.40 – 14.00)**

★ LUNCH & INFORMAL DEBRIEFING (14.00 – 15.00)

# V. List of participants

| Family name | Name | Country | Organisation | Email address |
|---|---|---|---|---|
| Achilleos | Evdokia | EC | European Commission | Evdokia.ACHILLEOS@ec.europa.eu |
| Barchiesi | Stefano | IUCN | IUCN | Stefano.BARCHIESI@iucn.org |
| Boyacioglu | Hayal | Turkey | Ege University | |
| Boyacioglu | Hulya | Turkey | Dokuz Eylul University, Department of Environmental Engineering | hulya.boyacioglu@deu.edu.tr |
| Campanini | Mila | Italy | Regione Lombardia | mila_campanini@regione.lombardia.it |
| Ebone | Andrea | Italy | IPLA | ebone@ipla.org |
| Fraile | Jaime | Spain | Water Planning Office / Segura RBA | jaime.fraile@chsegura.es |
| Gómez Calero | José Alfonso | Spain | Instituto de Agricultura Sostenible de Córdoba, CSIC (IAS-CSIC) | joseagomez@ias.csic.es |
| Gusmaroli | Giancarlo | Italy | Eco Ingegno | g.gusmaroli@ecoingegno.it |
| Dörflinger | Gerald | Cyprus | Water Development Department of Cyprus | gdorflinger@wdd.moa.gov.cy |
| Grech | Philip | Malta | Malta Water Association | pbgrech@gmail.com |
| Hughes | Samantha J. | Portugal | Departamento de Ciências Florestais e Arq. Paisagista, UTAD | shughes@utad.pt |
| Lillebø | Ana Isabel | Portugal | CESAM/Universidade Aveiro (Centro de Estudos do Ambiente e do Mar) | lillebo@ua.pt |
| Magdaleno Mas | Fernando | Spain | CEDEX (CETA: Centro de Estudios de Técnicas Aplicadas) | Fernando.Magdaleno@cedex.es |
| Mancin | Paolo | Italy | Regione Piemonte | paolo.mancin@regione.piemonte.it |
| Mattalia | Walter | Italy | Regione Piemonte | walter.mattalia@regione.piemonte.it |
| Pereira | Ruth | Portugal | Faculdade de Ciências da Universidade do Porto (FCUP) | ruth.pereira@fc.up.pt |

| | | | | |
|---|---|---|---|---|
| Pilas | Ivan | Croatia | Division of Ecology, Croatian Forest Research Insitute | ivanp@sumins.hr |
| Pineschi | Giorgio | Italy | Ministry of the Environment | pineschi.giorgio@minambiente.it |
| Rossetto | Rudy | Italy | Scuola Superiore S. Anna | r.rossetto@sssup.it |
| Silvestro | Chiara | Italy | Regione Piemonte | chiara.silvestro@regione.piemonte.it |
| Taguas | Encarnacion | Spain | University of Córdoba | ir2tarue@uco.es, evtaguas@uco.es |
| Urgnani | Cinzia | Italy | Regione Lombardia | Cinzia_Urgnani@regione.lombardia.it |
| Collentine | Dennis | Sweden | SLU | Dennis.Collentine@slu.se |
| Delacámara | Gonzalo | Spain | IMDEA | gonzalo.delacamara@imdea.org |
| De Paoli | Gloria | Italy | ACTEon | g.depaoli@acteon-environment.eu |
| Desmot | Elia | France | OIEAU | e.desmot@oieau.fr |
| Fribourg-Blanc | Benoît | France | OIEAU | b.fribourg-blanc@oieau.fr |
| Goltara | Andrea | Italy | Centro Italiano per la Riqualificazione Fluviale (CIRF) | a.goltara@cirf.org |
| Ibáñez | Estefanía | Spain | IMDEA | estefania.ibanez@imdea.org |
| Iacovides | Ayis | Cyprus | IACO | a.iacovides@iaco.com.cy |
| Jarritt | Nick | UK | AMEC | nick.jarritt@amec.com |
| Kossida | Maggie | Greece | IACO | m.kossida@gmail.com |
| Strosser | Pierre | France | ACTEon | p.strosser@acteon-environment.eu |
| Tutte | Sabine | France | ACTEon | sabine.tutte@posteo.de |