# NOVIWAM

Novel Integrated Water Management Systems

Southern European Regions

# JOINT ACTION PLAN

*Executive Summary*

SEVENTH FRAMEWORK PROGRAMME

NOVIWAM
Southern European Regions | Novel Integrated Water Management Systems

# JOINT ACTION PLAN
## *Executive Summary*

Project acronym: *NOVIWAM*
Project full title: *Novel Integrated Water Management Systems for Southern European Regions*
Project no.: *245460*
Project co-funded by the European Commission within the Regions of Knowledge theme of the Capacities programme of FP7
Project duration: February 2010 – January 2013

Diazoma River, Paphos Forest, Cyprus (A. Kontou)

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# NOVIWAM IN BRIEF

Vjosa River, Albania (F. Sinojmeri)

## 1 THE NOVIWAM PARTNERSHIP

The NOVIWAM project brings together five European research-driven clusters experienced in a wide range of aspects of water management, which include representatives from the "triple helix" (administration, academy and industry). Clusters represent five regions from Southern Europe: Cyprus, Albania, Poitou-Charentes (France), Andalusia (Spain) and the Northern Hydrographical Region of Portugal..

The structure of NOVIWAM is flexible enough to adapt the focus of its work in connection with the analyses developed by the consortium, which creates the best working conditions to develop new projects and improve practices on watershed management. The consortium partners have different specialties and institutional scope allowing an effective response to the needs identified within each region.

## 2 THE NOVIWAM PROJECT - KEY OBJECTIVES

To facilitate COOPERATION BETWEEN THE TRIPLE HELIX COMPONENTS (authorities, business, research) of each regional cluster.

To become a wide international RESEARCH-DRIVEN NETWORK of clusters focused on water.

To develop a RESEARCH AGENDA proposing solutions to the needs identified in the participating regions. Out of this research agenda, 5 priority actions will be clearly defined and promoted by project partners.

## 3 IDENTIFYING THE CORE ISSUES - SWOT ANALYSIS

A characterisation of the participating regions was conducted through stakeholder consultation and the project partner's research, concluding in a SWOT (Strength, Weaknesses, Opportunities and Threats) analysis. The SWOT analysis provided a close look on the situation of the integrated water resource management systems and the involved stakeholders, specifically in terms of the environmental and socio-economic context, governance and management issues, and the current scientific and technological situation and trends.

The conclusions extracted from the SWOT analysis served as drafting basis for the development of the NOVIWAM Joint Action Plan (JAP), which includes a series of actions to be undertaken and promoted jointly by the participants aimed at addressing the issues identified in the SWOT, using the internal strengths and external opportunities to correct the detected weaknesses and be ready to face potential threats.

## 4 A NEED FOR ACTION - JOINT ACTION PLAN

The SWOT and consultations revealed an absence of formal channels for the exchange of know-how, expertise and relevant data between researchers, public administration and the private sector, which prevents IWRM research projects to take duly into account relevant stakeholders' priorities and needs.

Water management governance also appeared in all participating region as one of the major weaknesses, mainly due to the relative novelty of the integrated water management legislation and associated administrative institutions.

Many similar needs emerged during the work and consultations around the SWOT analysis, ensuring that the research agenda embedded in the Joint Action Plan addressed real challenges in the water sector. Two short reports provided guidance on financing and implementation for research projects and actions that could emerge out of the JAP.

## 5 STEPS TOWARDS THE IMPLEMENTATION OF THE JOINT ACTION PLAN

A series of measures are introduced by NOVIWAM partnership to ensure a high impact for its activities and its proposed actions within and beyond the initial framework of the project.

# 0. GETTING STARTED

Tzielefos Bridge, Diarizos river, Pafos forest, Cyprus (A. Kontou)

Increasing efforts are being made to understand the consequences of environmental changes for society, particularly in the field of water resource management (García-Ruiz et al., 2011). Changes in water resources are particularly relevant in areas where water availability is a limiting factor for economic development.

The Water Framework Directive (WFD) (Directive 2000/60/EC), introduced key elements intending to shift the European Union water governance towards the application of Integrated Water Resources Management (IWRM) principles. The Global Water Partnership defined IWRM as the process of coordinating conservation, management and development of water, land and related resources across sectors, in order to maximize the economic and social benefits derived from water resources in an equitable manner while preserving and, where necessary, restoring freshwater ecosystems.

IWRM must therefore be faced from a multisectorial point of view, involving scientific research, technological development and innovation, social and economic aspects and administrative proceedings.

The NOVIWAM Project (Novel Integrated Water Management Systems for Southern Europe), funded by the EU 7th Framework Programme (FP7) under the Regions of Knowledge Initiative, was born to promote multilevel and interregional co-operation in the different sectors bound to the improvement and innovation on water management with particular focus on tools and methods.

*"The NOVIWAM project synthesizes different perspectives from the public, private and academic spheres"*

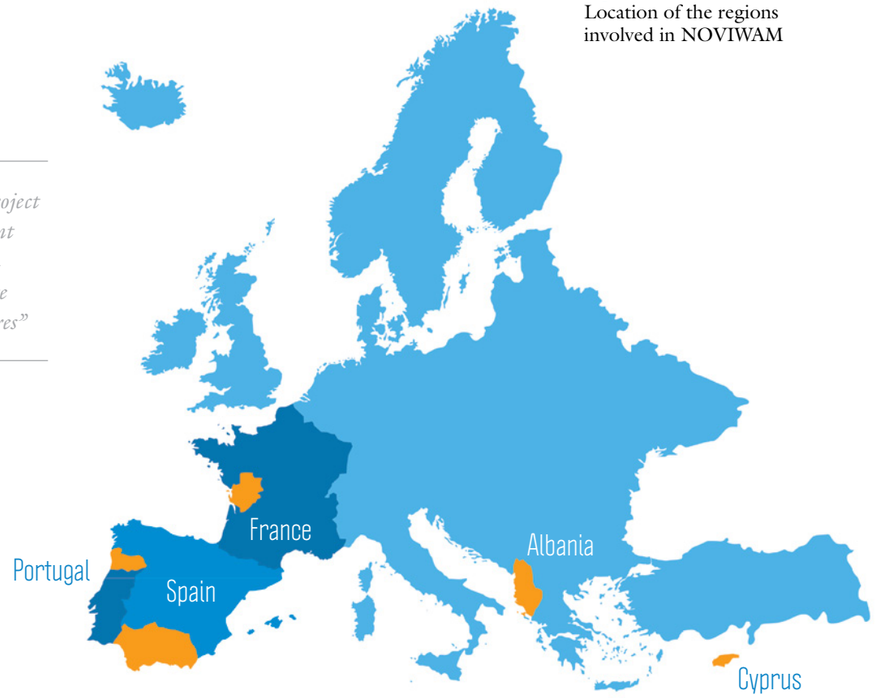



Figure 1
Location of the regions involved in NOVIWAM



# 1. NOVIWAM PARTNERSHIP

Valdevaqueros Sand Dune and the Strait of Gilbraltar, Cádiz, Spain (C. López)

The NOVIWAM partnership consists of 19 partners whose profiles and expertise comprehends an array of approaches towards research, innovation, policy and management in the water sector. To increase competitiveness they are grouped in five research-driven clusters from the following regions: Northern Hydrographical Region (Portugal), Andalusia (Spain), Poitou-Charentes (France), Albania and Cyprus (Figure 1).

This project adopts the Triple Helix model, i.e. Administration, Research centers and Business (Figure 2). The Triple Helix model is increasingly relevant as a conceptual framework for regional development mainly due to its capacity to describe a spiral model of innovation that captures multiple reciprocal relationships among these three institutional spheres (Etzkowitz & Leydersdorff, 1997)

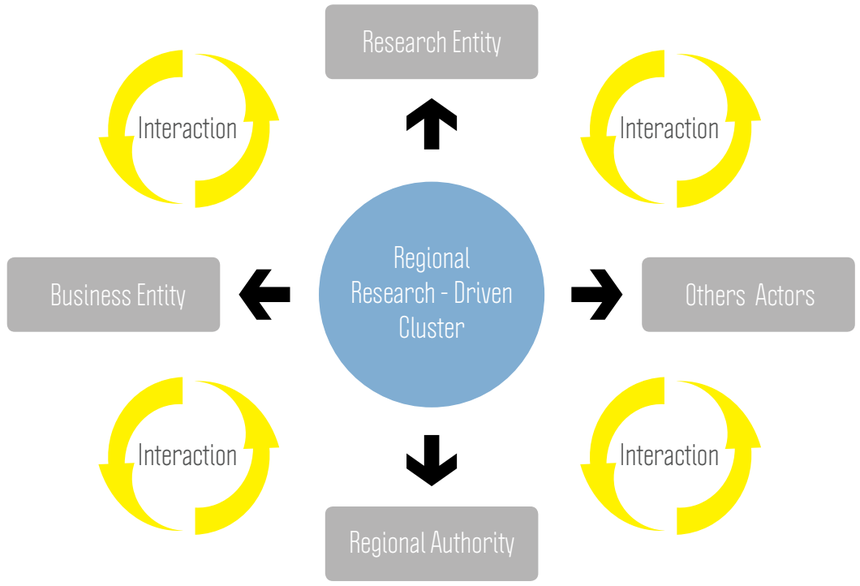



Figure 2
The triple helix model

# 2. THE NOVIWAM PROJECT: 5 REGIONS AND A COMMON CHALLENGE

Tarifa and the Strait of Gibraltar, Cádiz, Spain (M. Dunas)

To fulfill the WFD obligations and considering the complexity of water bodies control in an undefined future scenario, there is an increase demand of the use of IWRM strategies and methods.

The NOVIWAM project tackles these challenges by synthesizing the different perspectives of the public, private and academic spheres, introducing them into the promotion of multilevel and interregional co-operation in the field of Integrated River Basin Management.

## 2.1. KEY PROJECT OBJECTIVES

- To tackle IWRM challenges by multilevel co-operation between the triple helix components (authorities, business and research entities) from all sectors related to water in each of the participant clusters.
- To establish an international network of research-driven clusters to strengthen synergies between regional, national and EU initiatives contributing to the challenges in water issues that are common to Southern European regions and beyond. The priority focus of this type of collaboration is to work on NOVIWAM research agenda as well as to establish long-lasting links between clusters throughout the regions by sharing experience, know-how and technologies.
- To increase capabilities to face common water management challenges and to generate a critical mass that allows them to acquire and develop international visibility.
- To foster a dialogue and reflection process between the participating clusters in order to define a research agenda embedded within a Joint Action Plan (JAP) at European level to drive economic development through research and technological development activities in the water sector.

## 2.2. MEANS TO ACHIEVE THESE OBJECTIVES

An elaborated methodology was devised to facilitate the successful elaboration and implementation of the JAP, the main output and actual core of the NOVIWAM project. The following overview of the different phases and activities around the NOVIWAM JAP, with more detail on the JAP elaboration, is also presented in Figure 3.

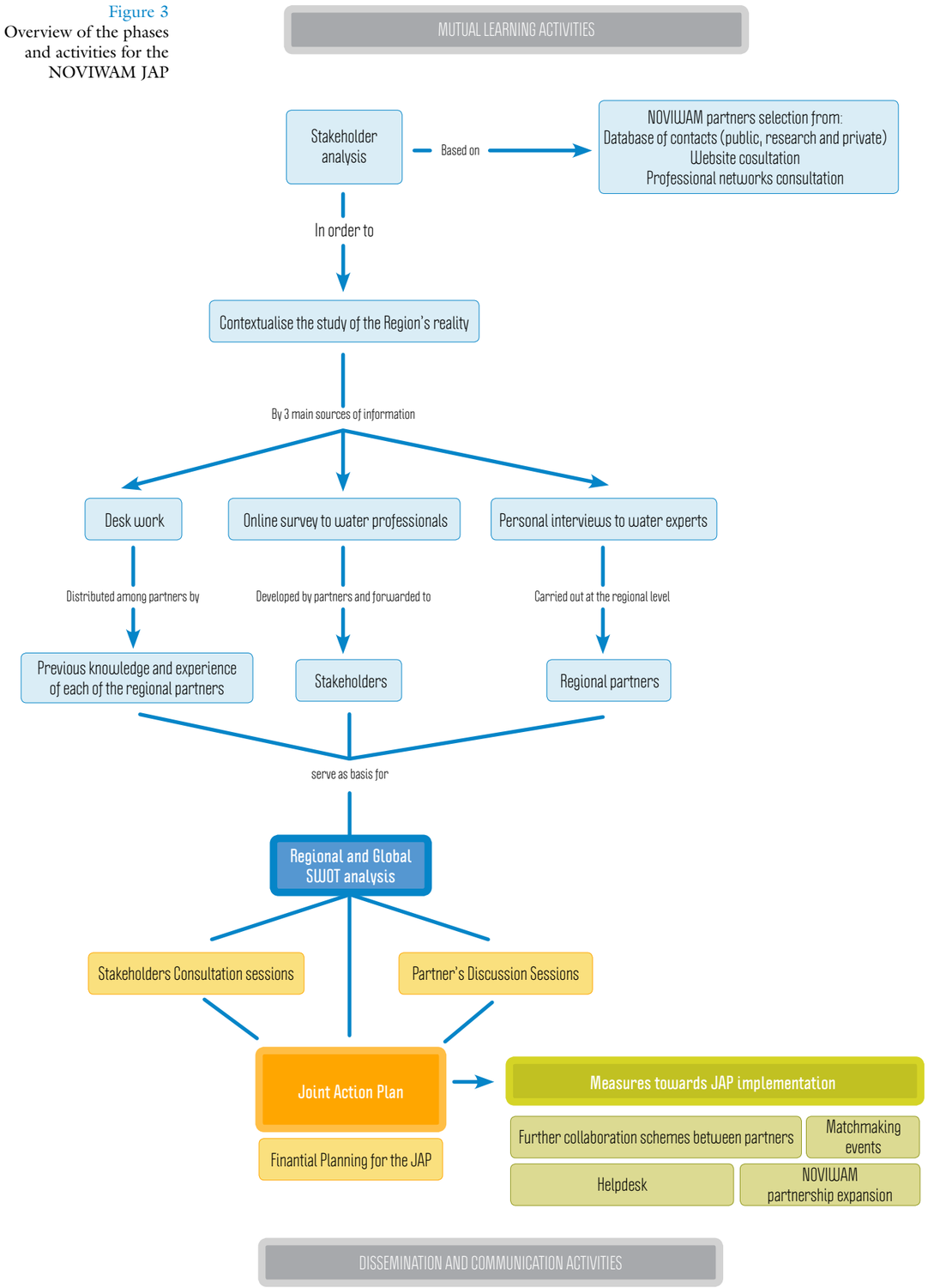
- An intensive characterisation work of the NOVIWAM regions conducted jointly by project partners, through desk work and stakeholder consultations through an online survey and personal interviews. The SWOT analysis tool was used for the identification of region´s Strengths, Weaknesses, Opportunities and Threats.
- The definition of the JAP based on the results of the SWOT analysis. The activities included in the JAP aimed at solving the weaknesses and mitigating the threats detected in the SWOT by exploiting the partners' strengths and existing beneficial factors.
- Establishment of a program for implementation of the JAP, including measures that will facilitate its execution:
  - Improving the capacities of the actors currently involved trough ongoing training activities such as staff exchanges among partners, thematic workshops, feasibility studies, etc.
  - Gaining support of the relevant authorities and decision makers.
  - Exploitation of the joint research capacities and exploration on collaboration possibilities in future transnational co-operation projects serving to the implementation of the JAP.
  - Enlarging the NOVIWAM community by involving further organizations and regions in the activities of the JAP.
  - Disseminating the results of the work at regional and international scale.

### A MUTUAL LEARNING PROCESS

By learning from the experiences of other regions and pooling the related know-how and technology, the partners will increase their capacity to solve in the most eco-efficient and sustainable manner the compelling water management problems currently faced and strengthen their preparedness against existing potential risks.

Bornos Reservoir, Cádiz, Spain (Visiones del Agua)

Figure 3
Overview of the phases and activities for the NOVIWAM JAP






# 3. IDENTIFYING THE CORE ISSUES – SWOT ANALYSIS

Douro River, Miranda do Douro, Portugal (ARH Norte)

The SWOT Analysis was based on information gathered in the characterisation activities in which the consortium produced reports covering a broad range of aspects of IWRM in the participating regions.

The characterisation activities included desk work as well as the points of view of more than 800 stakeholders from all participating regions that answered interviews or an online survey with different thematic questionnaires. The results of the characterization were included in a series of thematic reports.

*"Characterisation of the participating regions using inputs from more than 800 stakeholders, through online questionnaires and personal interviews"*

A comprehensive identification of relevant regional stakeholders from varied profiles (authorities, consultants, catchment managers, researchers or other groups of interest) was essential as a starting point of the work, in order to contextualize the subsequent work of characterisation of the regions and their research agendas. Then, a detailed stakeholder analysis was performed at the regional scale, in order to map out and characterise the most relevant actors involved in catchment management.

**THEMES INCLUDED IN THE CHARACTERISATION OF EACH REGION**

- Socio-political framework
- Legal and administrative framework
- Challenges and key issues for WFD
- River Basin Management RTD
- Decision Support Systems users needs and developers capabilities

Carrión de los Céspedes Experimental Plant, Sevilla, Spain (~Alcaer)

A significant part of the information incorporated in the mentioned reports was collected through online questionnaires. The organizations identified out of the stakeholder analysis were invited to participate in the online survey with questionnaires relevant to their different profiles. The stakeholders targeted by the survey had varied profiles and expertise: authorities, catchment managers, consultants, researchers, education staff or other group of interests that either work on water policy and management or catchment management RTD, or develop and implement technologies and tools. The information obtained in the surveys was complemented interviewing a number of selected experts on the different relevant themes identified by the consortium.

*"The conclusions extracted from the SWOT analysis and consultations workshops served for the NOVIWAM Joint Action Plan (JAP)"*

The reports were based on a detailed investigation work carried out by the partners based on their knowledge and expertise in the field and an extensive review of the existing literature complemented with the feedback provided by the contacted stakeholders.

The characterisation work resulted in a detailed mapping of the regional clusters current situation that allowed the consortium to carry out a SWOT analysis (for each of the regions and on a global scale), where impediments and factors of success of the activities of the clusters as well as their regional research systems, policies and institutional systems were studied.

### SOME QUESTIONS RAISED IN THE STAKEHOLDER ANALYSIS

- Who are potential beneficiaries?
- Who might be (adversely) affected?
- Who has existing rights?
- Who is responsible for intended plans?
- Who has money, skills or key information?



The SWOT analysis portrayed in the table above summarise the conclusions for all the regional SWOTs and gives a glimpse of the narrative of the mentioned characterisation. Accordingly, the latter and the former account for the situation of integrated water resource management systems and the involved stakeholders, specifically in terms of the environmental and socio-economic context, governance and management issues, and the current situation and trends of related science and technologies.

The desirable objective would be for each regional cluster to be able to maintain the strengths and to reinforce the weaknesses as internal factors upon which the cluster can influence. On the other hand, the opportunities and threats are external factors upon which the regional clusters cannot directly influence, but to which they can try to adapt themselves.

The conclusions extracted from the SWOT analysis served as guidelines for the drafting of the NOVIWAM JAP, which addresses the issues identified in the SWOT and includes a series of actions to be undertaken and promoted jointly by the participants.

### EXTERNAL EVALUATION

A board of six external experts (representatives from the triple helix) assessed all the outputs derived from the SWOT analysis. This enriching practice was reproduced later on subsequent phases of the project.

Waste Water Treatment Plant in Winter, Korça, Albania (Water supply and sewerage utility of Korça)

# GLOBAL NOVIWAM SWOT ANALYSIS

## STRENGTHS (S)

**S.1.** Increasing use of technological tools to assist decision making processes in catchment management (GIS, Hydrological models) in all the regions

**S.2.** Researchers experienced in the integration of the social and cultural dimensions of water

**S.3.** Increased proximity between the water authorities and the water users (public participation mechanisms, responsibility and communication between different stakeholders, etc.)

**S.4.** The implementation of a new institutional framework for the IWRM is common to the Portuguese and Cypriot reality

**S.5.** Tendency in all NOVIWAM involved regions to the organization of management of water resources at a basin level.

**S.6.** Remarkable investment during last years in terms of sanitation, urban wastewater and water supply in some of the NOVIWAM regions

**S.7.** Efforts made on the improvement of agricultural irrigation practices and infrastructures in all regions

## WEAKNESSES (W)

**W.1.** Overall for the five regions, lack of data availability, data dispersion, data incompatibilities, and difficulties to access to data, both quantity and quality data for surface and groundwater

**W.2.** Lack of DSS software to introduce economic tools in water management in all NOVIWAM region

**W.3.** Deficiencies in the technical competences of the staff in the catchment management authorities and lack of knowledge of the potential benefits of modeling tools in IWRM.

**W.4.** No formal channels for the participation of researchers on the decision making process regarding water management

**W.5.** Small experience in the use and development of DSS technological software in Cyprus and Albania (although is increasing in both countries).

**W.6.** In general all the clusters emphasize a shortage of technical and scientific means, both of human resources and equipment on the water management responsible entities.

**W.7.** Low data exchange potential between the different authorities involved in monitoring and water data collection generally in all regional clusters

**W.8.** The relative novelty of the integrated water management legislation and administrative organization means that their functioning is not yet at an optimal level in any region

**W.9.** In general for all five regions, delay in the accomplishment of some of the WFD 2015 environmental objectives

**W.10** Complexity of the network of legal competency, leading to a dilution of responsibilities in most of the regions

**W.11.** Generally, lack of resources to adequately control the compliance of water laws and prosecute infringements

## OPPORTUNITIES (O)

**O.1.** Development and implementation of an Information and Decision Support System by the management authority with a modular and evolutionary nature, structured to be improved according to the management needs in Northern Hydrographical Region and Andalusia.

**O.2.** Demand for convenient water pricing tools mainly in Poitou-Charentes and Andalusia

**O.3.** Data processing through DSS can help to visualize in all regions the economic and social value of environmental services

**O.4.** Knowledge and technology transference between all the partners can help exploiting existing synergies

**O.5.** Dense research institutes (on technical, DSS, economic problems) among partners from all the five regions, with the capacity to conceive and help to implement efficient solutions to crucial problems

**O.6.** Awareness of water management institutions of the importance of RTD cooperation in all regions

**O.7.** Reinforcement of partnerships between all regional water authorities and specialized entities to support the data production and treatment and the development of new tools, mechanisms and technological solutions

**O.8.** Creation of mechanisms specifically to promote public participation, responsibility and communication between different stakeholders in the five regions

**O.9.** The strategic importance of issues related to Integrated Water Resource Management, and the implementation of the WFD make national and EU investments related to research and innovation relatively safe in all regions.

**O.10.** The NOVIWAM concept seems suitable to adapt to new territories and regions (e.g. other Mediterranean countries and/or other regions in participating countries)

## THREATS (T)

**T.1.** Generally for all the regions, mechanisms for public participation do not achieve consensus between different stakeholders

**T.2.** Concepts such as environmental flows, or periods of scarcity, which are critical for the management of surface water resources in the Mediterranean climate regions (Albania, Cyprus and Andalusia) within the project are not priorities in the WFD, which focuses more on water quality.

**T.3.** In general, toughening of the opposition between 'economics' and the 'environment'.

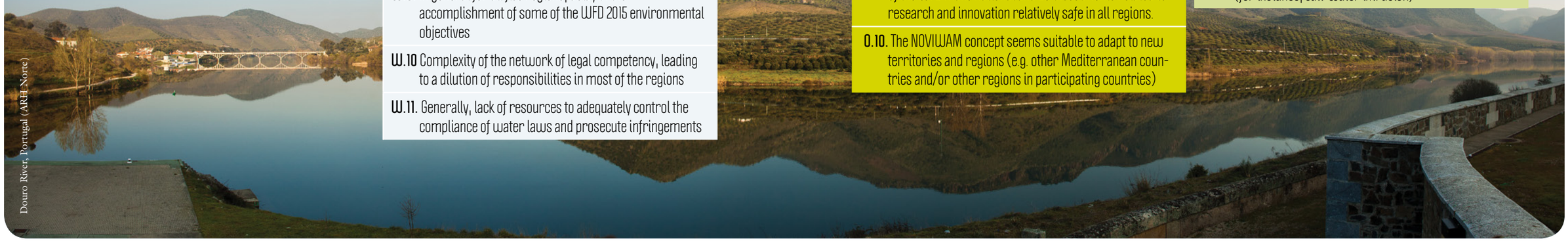
**T.4.** The present economic and financial situation limits the funds available for research or public investments.

**T.5.** Climate change increases in the frequency and severity of extreme events (droughts and floods), exacerbation of water scarcity impacts, degradation of water quality, and increase in sea levels.

**T.6.** Difficulty to solve common issues in water and agro-forestry planning (e.g. over pumping, diffuse pollution, efficiency issues related to water allocation and pricing, etc)

**T.7.** The level of social awareness about the importance of the environmental aspects of water planning is still low. This influences the political process and the decisions of managing and planning authorities.

**T.8.** Socio-economic and demographic pressures, lead to the overexploitation and degradation of water resources (for instance, salt-water intrusion)



Douro River, Portugal (ARH Norte)

# 4. A NEED FOR ACTION – JOINT ACTION PLAN

Pinail Nature Reserve, Poitou-Charentes, France (Tourism Office of Vouneuil sur Vienne)

The NOVIWAM consortium aims at making the JAP a reference in RTD and innovation activities in the water sector. To achieve this, the consortium has established a series of objectives in response to the necessities detected in the SWOT and proposes a series of actions to achieve these objectives, mainly RTD and innovation activities.

The objectives have been put forward both by the consortium members and by the inputs obtained from other stakeholders in a series of consultations and brainstorming workshops held by the consortium. With this consultation process the consortium aimed at ensuring that the activities contained in the JAP were of general interest as well as to enlarge the potential pool of future participants in the development of the JAP.

JAP consultation session in Braga, Portugal, June 2011

As a result of this process, the consortium established 11 objectives, with 23 working themes, under which to group the proposed actions (39 actions) and created associated working teams to foster the undertaking of these actions and the inclusion of other relevant stakeholders in their execution. The table below shows an overview of the objectives and themes included in the JAP, together with its correlation to the necessities detected in the SWOT. A description of 5 specific JAP actions can be found at the end of this section and further detail on other proposed actions can be found in the JAP annex.

The JAP also addressed two horizontal objectives, namely Bridging Links Among the Triple Helix Actors and Improvement of Governance and Stakeholder Capabilities, by preparing guidelines not only to ensure that the research and development activities conducted actually take into account the real needs of stakeholders and that results are transferable, but also to help in the management and implementation of actions similar to those in the JAP.



## NOVIWAM JAP OBJECTIVES AND THEMES

| WORK GROUP | Objectives | Themes | Correlation with SWOT |
|---|---|---|---|
| A | Management of groundwater bodies | Vulnerability assessment, nitrates contamination, emergent pollutants, etc. | (W) - Lack of data availability, data dispersion, data incompatibilities, and difficulties to access to data, both quantity and quality data for surface and groundwater<br>(T) - Difficulty to solve common issues in water and agro-forestry planning |
| | Management of coastal and transitional water bodies | Overexploitation of coastal aquifers and saline water intrusion, turbidity problems in estuaries, intensification of coastal erosion, etc. | (S) - Increasing use of technological tools to assist decision making processes in catchment management<br>(W) - Generally, lack of resources to adequately control the compliance of water laws and prosecute infringements<br>(O) - Constructive use of the regional authorities and universities expertise on soil salinity issues related to treated effluent application<br>(T) - Climate change increases in the frequency and severity of extreme events (droughts and floods), exacerbation of water scarcity impacts, degradation of water quality, and increase in sea levels. |
| | Management of interior surface water bodies | Evaluating the influence of human activities on water bodies, tools/ methods for assessing the physico-chemical impact on the ecological status of water bodies, etc. | (S) - Increasing use of technological tools to assist decision making processes in catchment management<br>(W) - The monitoring network does not cover the whole of the region. Quality control stations are not available in all water bodies.<br>(O) - Reinforcement of partnerships between all regional water authorities and specialized entities to support the data production, treatment and the development of new tools, mechanisms and technological solutions<br>(T) - Difficulty to solve common issues in water and agro-forestry planning |
| B | Assessment and monitoring of water bodies status | Evaluating the influence of human activities on water bodies, tools/ methods for assessing the physico-chemical impact on the ecological status of water bodies, etc. | (S) - Increased proximity between the water authorities and the water users<br>(W) - The monitoring network does not cover the whole region. -Quality control stations are not available in all water bodies.<br>(W) - In general for all five regions, delay in the accomplishment of some of the WFD 2015 environmental objectives<br>(W) - Generally, lack of resources to adequately control the compliance of water laws and prosecute infringements<br>(O) - Reinforcement of partnerships between all regional water authorities and specialized entities |
| | Optimisation of IWRM infrastructures | Assessment of the state of the losses in infrastructures for irrigation, losses in water distribution network, etc. | (S) - Increasing use of technological tools to assist decision making processes in catchment management<br>(W) - Lack of DSS software to introduce economic tools for in water management in all NOVIWAM region<br>(O) - Reinforcement of partnerships between regional water authority and specialized entities.<br>(T) - The level of social awareness about the importance of the environmental aspects of water planning is still low. This influences the political process and the decisions of managing and planning authorities. |

S: Strength W: Weakness O: Opportunity T: Threat

| WORK GROUP | Objectives | Themes | Correlation with SWOT |
|---|---|---|---|
| C | Water social and economic value | Social and economic impacts from the water pricing policy, water services cost recovery, water footprint of processes and incorporation in pricing, etc. | (S) - Adaptability of the behavior of some stakeholders (e.g. farmers)<br>(W) - Lack of DSS software to introduce economic tools for in water management in all NOVIWAM region<br>(W) - Non-optimal allocation of water use, No efficient economic tools for water management<br>(O) - Culture of "water is a public asset/wealth"<br>(T) - Financial constraints |
| | Alternative sources of water | Desalination, agricultural reuse of wastewater, sustainable management of rain water, etc. | (S) - Remarkable financing effort done during last years in terms of sanitation, urban wastewater and supply services treatment in some of the NOVIWAM regions<br>(W) - Insufficiency of quality monitoring<br>(O) - Wastewater reuse and wastewater treatment |
| | Integration of New Technologies | Remote sensing, GIS, technologies of nano/ultrafiltration membranes with renewable energy, etc | (S) - Increased development of research lines and teams on the fields of computerized tools, analytical modeling, developments of GIS and applications, mathematical simulation models.<br>(S) - Use of technological tools to assist decision making processes in catchment management (GIS, Hydrological models).<br>(W) - Low data exchange potential between the different authorities involved in monitoring and water data collection generally in all regional clusters<br>(O) - Production of new data regarding the ecological monitoring and the adequability of the monitoring networks. |
| D | Management of extreme event risk scenarios | Initiatives for avoiding urban growth in flood risk areas, sustainable urban drainage, alert systems, flood and drought risk management systems, etc. | (S) - Increasing use of technological tools to assist decision making processes in catchment management (GIS, Hydrological models) in all the regions.<br>(W) - Lack of DSS software to introduce economic tools for in water management in all NOVIWAM region<br>(O) - Experience in the development and design watershed physically model specifically developed to respond to the characteristics of Mediterranean watersheds.<br>(T) - Climate changes increases in the frequency and severity of extreme events (drought and floods), exacerbation of water scarcity impacts, degradation of water quality, and increase in sea levels |

To develop these objectives, themes and related actions five working groups were put together:

- Work Group A (composed of 9 partners). Actions proposed under this work group vary from vulnerability assessment, to studies on nitrates contamination, emergent pollutants, overexploitation of coastal aquifers and saline water intrusion, turbidity problems in estuaries, to management of eutrophication, river ecosystem management, monitoring and assessment of soil loss in hill slopes.

- Work Group B (composed of 11 partners). The collaborative ideas proposed by these partners are in line with evaluating the influence of human activities on water bodies, tools/methods for assessing the physicochemical impact on the ecological status of water bodies, assessment of the state of the losses in infrastructures for irrigation, losses in water distribution network, etc.

- Work Group C (composed of 13 partners). The ideas presented by this working group refer to water social and economic value (water services cost recovery, irrigation water pricing, water footprint, etc.) alternative sources of water (desalination, agricultural reuse of wastewater, etc) and integration of new technologies such as remote sensing, GIS and technologies of nano/ultrafiltration membranes with renewable energy.



- Work Group D (composed of 9 partners). The collaborative ideas under this work group include initiatives for avoiding urban growth in flood risk areas, sustainable urban drainage, alert systems, flood and drought risk management systems, etc.

- Work Group E (composed of 8 partners). A central aim of the NOVIWAM project is ensuring that the research and innovation activities carried out in the field answer real necessities of the relevant management authorities and other end users. It allows making sure that they are capacitated to uptake the results of these activities and their benefits are properly transferred to society. For this, the JAP includes a series of practices designed to ensure this within the scope of the two already mentioned horizontal objectives that try to standardize these practices in RTD and innovation activities in the field.

JAP Seminar in Poitiers, France, June 2011

A selection of 5 priority research actions under different themes of the JAP was done considering the interest that the authorities participating in NOVIWAM expressed in their results. NOVIWAM partners will commit to the development of those actions as detailed project proposals and seek possibilities of implementation. This approach towards the implementation of the JAP not only ensures the take up of its results, but also facilitates the visualization of a roadmap towards the adoption of the JAP ideas. Concept notes, including contact details for each of the 5 research actions are listed in the following pages:

*"A selection of 5 priority JAP research actions ensure the commitment of NOVIWAM partners to develop those actions as projects and seek possibilities of implementation"*

### FINANCIAL PLANIFICATION OF THE JAP

The consortium has also prepared a first guidance report of the financial itineraries to execute the initiatives included in the JAP. We check existent and upcoming RTD, innovation, environmental and ICT programmes at EU, national and regional level in which the relevance of the proposed actions to the existing programmes and mechanisms has been demonstrated.

# JAP ACTION

## INTEGRAL SYSTEM FOR THE DIAGNOSIS AND LOSSES OF WATER DISTRIBUTION NETWORKS BASED ON GIS OPEN SYSTEMS

### FRAMEWORK

- **JAP Objective.** Optimization of IWRM infrastructures
- **JAP Theme:** Losses in water distribution network (determination of acceptable losses)
- **Correlation with SWOT:** S.1, W.2, O.7, T.7

### DESCRIPTION OF THE ACTION

The objective of this JAP action is the investigation of new models, techniques and tools in the prediction of Water Consumption Models in urban cores in order to obtain an effective Management of an Integral System for the Diagnosis and Losses of Water Distribution Networks.

A Geographic Information System (GIS), based on Open Software, will be developed and will allow capturing, structure and integrating the information associated to network diagnosis and systematic leakage control, making them accessible to potential users, regardless of their location.

The whole network is usually too big to be managed, so that it is necessary to divide the network on what is called district meter areas (DMA). A network diagnosis and systematic leakage control will be implemented in order to get the optimization of network efficiency.

### EXPECTED OUTPUT

To obtain a **GIS tool** in Open Software that allows the operation of the supplying network:

- to maintain updated the geographic information of the network
- to define and to modify sector limits
- to locate the demand of each sector
- to have the information of volume and pressure
- to model the supplying network hydraulically
- to control the efficiency of the network (losses)

### RELEVANCE TO DECISION MAKERS

The main concerns of decision makers in charge of the networks operation are the water losses, which are estimated to reach an average range of 40 – 60 % in the regions participating in NOVIWAM. The main constraint for decision-making is clearly the difficulty on leakages identification.

Water losses have great impacts due to expensive water treatment in regions with water shortage. Therefore a system to identify any water losses or other relevant problems of the regional water distribution network would help to establish losses reduction objectives, as well as to define best practices in the Urban Water Cycle.

### DURATION

48 months

### BUDGET ESTIMATION

3 000 000 EUR

### CONTACT

**Agua y Estructuras SA (Ayesa) (Coordinator)**

**Contact Persons:**
Mariam Martin: mmartin@ayesa.es / Jesús Palazón: jpalazon@ayesa.es

Water distribution pipes, OIEAU National Training Centre, Limoges, France (M. Urena)

# JAP ACTION

## DEVELOPMENT OF MODEL PREDICTING RESPONSES IN URBAN AREAS, DUE TO HEAVY RAINFALL EVENTS

### FRAMEWORK

- **JAP Objective.** Management of extreme event scenarios
- **JAP Theme:** Sustainable urban drainage systems to help control floods and improve groundwater recharge and pollution reduction.
- **Correlation with SWOT:** W.1, W.5, S.1

### DESCRIPTION OF THE ACTION

Heavy rainfall events and more specific floods are disastrous occurrences that have historically caused economical and environmental negative impacts on local communities. In order to avoid these adverse results, research should focus on developing predicting tools. A flood map, flood warning system and a model predicting responses in urban areas due to floods are an essential part of a disaster management plan.

Development of an interactive map of hot spots based on the morphological properties of the area: slope, substrate infiltration capacity, percentage of covered areas (paved), watershed network, flood plain and presence or not of drainage network.

Based on the map results, action management measures can be suggested.

This project addresses:

- The facilitation of the implementation procedures as stated in the European Floods Directive

- Cope mechanisms in cases of sudden heavy rainfall events (which are expected to increase in number in view of the climate change)

- Evaluation of the financial, social and environmental impacts of the responses of urban areas due to heavy rainfall events.

### EXPECTED OUTPUT

- An **overall management scheme** including a model predicting responses in urban areas due to heavy rainfall events based on different scenarios.
- Development of an **online interactive map** (free public access) with the ability to elaborate the model parameters (e.g. mm of rainfall)
- Propose **prevention and mitigation mechanisms**: (i) reshaping of the criteria for the establishment of town planning zones; (ii) Obligatory application of sustainable urban drainage (SUD) systems per district; (iii) Establishment of a public warning alert system.
- **Feasibility study** on the use of sustainable urban drainage systems for the reduction of flood events.

### RELEVANCE TO DECISION MAKERS

The problem of heavy rainfall events in Mediterranean regions is more severe in urban areas because generally there are no separate networks for rain and wastewaters, nor any other infrastructure like storm tanks or infiltration areas. Therefore in the events of heavy rainfall, urban areas face a number of problems, such as collapse of sewage infrastructures and flooding, creating significant impacts on the locals' daily life.

Decision makers need to address this problem at the regional level, so to be able to offer to affected municipalities a tool that will allow them to take into account these frequent events in urban planning and help them to implement cost-effective prevention measures. This requires an efficient coordination between administrations at local and regional level, in order to avoid that each local administration develops its own model.

Therefore, an interactive map and a model predicting responses of rainfall events in urban areas would provide to local authorities a tool for decision making promoting sustainable development in the urban environment and preventing flooding which affect an important number of urban areas in the regions within NOVIWAM and other European regions.

### DURATION

36 months

### BUDGET ESTIMATION

500 000 EUR

### CONTACT

**SBLA and CUT (Joint Coordinators)**

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Erosion in Velipoja Beach, North of Albania (F. Sinojmeri)

# JAP ACTION

## DEVELOPMENT OF TECHNOLOGIES FOR IN-SITU ECOLOGICAL STATUS ASSESSMENT THROUGH AVAILABLE PHYSICOCHEMICAL DATA

### FRAMEWORK

- **JAP Objective.** Assessment and monitoring of water bodies' status.
- **JAP Theme:** Tools/ Methods for assessing the physicochemical impact on the ecological status of waterways, in the WFD sense.
- **Correlation with SWOT:** S.1, W.1, W.11, O.4, O.7

### DESCRIPTION OF THE ACTION

The ecological status assessment is one of the new and more challenging issues regarding the WFD implementation, not only due to its new conceptual approach, but mainly due to the need of methods and tools that allows the understanding of its correlation with other parameters that characterize an ecosystem. In addition to the conceptual challenges, there are limitations in the current ecological data collecting and processing procedures, that usually requires relevant resources (time and money) for counting species' individuals and communities. This highlights the importance of developing tools that allows the ecological data monitoring with automated or semi-automated methods and assess the impact of the physicochemical analytical parameters (more easy to measure) disturbance in the ecological status.

The first action will be focused on exploring the physicochemical modeling in the specific biotic and abiotic Mediterranean context and foresee the inference of the biological communities expression, namely the ones related with primary productivity. The seasonality expression and anthropogenic pollutant inputs are to be accounted for in this tool development.

Specifically, and given the importance of the biological communities liable for the above stated primary productivity in the establishment of the ecological status of different water bodies (according to the WFD classification schema), this tool outputs should permit the establishment of the water bodies ecological status specifically for the phytoplanktonic classification elements by its correlation analysis with physicochemical parameters.

In this context, there are some non-customized and non-calibrated solutions intended for the prediction of the ecological status assessment in future physicochemical scenarios (in the context of the River Basin Management Plans), but these experiences might be gathered under the JAP implementation towards the development and calibration of a customized tool to be designed under the multidisciplinary know-how from the NOVIWAM partnership. This action will allow a tool development research that will build the forecasting capacity of future ecological status regarding to the phytoplankton classification elements for water bodies under the WFD scope, and will be addressed to the modeling of the following environmental elements:

- Hydrological parameter assessment;
- Physicochemical parameter assessment;
- Phytoplanktonic communities' parameter assessment.

Alongside, the development of tools that allow the ecological data monitoring with automated methods (that necessarily requires technological development like sensors or similar data collection instruments) should constitute a second action that allow, for the first time, the integration of the remaining parameters to assess the status of a water body in the sense of the WFD (both ecological and physicochemical) in truly holistic monitoring networks, that can be essential for cost-effective information and decision support systems, comprising:

- data collection;
- data transmission according to defined communication protocols;
- data processing and validation;
- data visualization and publication, in real time (or, at least, in a short time).

### EXPECTED OUTPUT

Development of a **software modeling platform** able to comprise the specific nature of Heavily Modified Water Bodies (HMWB) Lakes in the Mediterranean context, mainly concerning real-time phytoplanktonic parameter assessment (including its integration with data collection systems), their correlation with physicochemical data and thus establishing the corresponding ecological status, under the WFD scope.

The scope of the tool can be progressively enlarged to other types of water bodies in the scope of the WFD (rivers, transitional and costal waters).

### RELEVANCE TO DECISION MAKERS

The update and representativeness of the monitoring data available has been an effective problem regarding the water bodies' ecological status assessment for some of the Regional Authorities with competencies in the development of River Basin Management Plans (RBMP) in the regions participating in NOVIWAM.

Ideally, this action should be articulated with the action referred in the JAP as *Development of Computerized Tools for Dynamic Water Status Classification Within a Permanent Monitoring Network* that would optimize the assessment of water bodies status as determined by the WFD.

### DURATION

26 months

### BUDGET ESTIMATION

800 000 EUR

### CONTACT

**Simbiente. (Coordinator)**

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# JAP ACTION

## ASSESSMENT AND REMEDIATION FOR EMERGING PRODUCTS

### FRAMEWORK

- **JAP Objective.** Management of groundwater and surface bodies.
- **JAP Theme:** Emergent pollutants.
- **Correlation with SWOT:** W.1, T.6

### DESCRIPTION OF THE ACTION

The detection of emerging contaminants such as antibiotics and pesticides in the environment can be highly challenging as they typically occur in the environment at very low levels (Kostopoulou and Nikolaou, 2008). Additionally, for many of them, reference standards, which are needed to validate the analytical methods, are not available. Among the analytical methods to quantify the emerging contaminants in the aquatic environment biological techniques (immunoassays) are the most sensitives; however they are limited by the availability of the specific antisera and subject to cross-reactivity (de Alda and Barceló, 2001). Other two methods which are commonly used for quantification of compound of interest after extraction are gas chromatography (GC), and liquid chromatography (LC) coupled to mass spectrometry (MS) or tandem mass spectrometry (MS/MS) (de Alda and Barceló, 2001). Overall, analysis is also very time consuming and costly and requires access to highly sophisticated equipment. The analysis of many manmade nanomaterials in environmental samples is further complicated since waters and soils already contain numerous natural nanoparticles. Hence, there is an urgent demand for an in situ sensor capable of detecting emerging contaminants.

This project idea aims to develop an action plan in order to tackle the problem of contamination with emerging pollutants in water bodies by selecting representative pollutants of each group (e.g. tetracycline and methyl parathion). The action plan will be developed following a multitask approach organized in sequentially and logical steps:

- **Analytical methods development/optimisation**
  - Development of a novel nanoparticle (NP)-based environmental sensor for in situ detection tetracycline and methyl parathion. The plan's approach is as follows: (1) fabrication, and the study of the nanoparticle (NP)-based environmental sensor; (2) optimization of the proposed sensing device and a prototype of this device will be produced in real water and wastewater changing conditions.
  - The quantification of tetracycline and methyl parathion will also be based on the extraction of the sample by either liquid/liquid separation or solid phase microextraction (SPME) followed by the analysis of gas chromatography (GC), and liquid chromatography (LC) coupled to mass spectrometry (MS) or tandem mass spectrometry (MS/MS).

- **Environmental technologies**
  - A biofilter will be developed using the adsorbent capacity of M. oleifera seeds to remove tetracycline from water. Tetracycline analysis will be performed before and after treatment of wastewater with M. oleifera extract using HPLC-MS and HPLC-MS/MS.
  - Optimization of the electrochemical oxidation method to degrade tetracycline and methyl parathion. It will be explored the possibility of electrochemical oxidation of emerging contaminants using different electrodes. The plan's approach is as follows (1) evaluate the effect of selected emerging contaminants concentration in the electrochemical oxidation rates; (2) assess the effect of matrix electrode composition on the emerging contaminants degradation; (3) compare the effect of current density on the oxidation/reduction of the emerging contaminants; (4) investigate the consequence of electrode fouling on the reaction rate; (5) obtain an estimation on the cost of energy consumption with the treatment of emerging contaminants using electro-oxidation with each different electrode.
  - Development of upgraded bioprocesses in order to cope with tetracycline and methyl parathion. It will be studied the treatment of the selected emerging contaminants in a simulated and controlled wastewater using aerobic and aerobic sequencing batch reactors. This approach will comprehend the real and common conditions of wastewater treatment plants effluents. The determinations of the selected compounds will be made in the soluble and solid (particulate) phases.
  - Development of a life cycle approach for the environmental technologies assessment and their selected applications also taking into account issues of cost efficiency, effective life span, production, handling, maintenance, environmental impact, ecotoxicological profile and end of life. The assessment of environmental sustainability will follow a Life Cycle Analysis methodology in order to determine the environmental impacts of constructing and operating phases. In that regard, this approach will be based on ISO 14040:2006 and in the methodology presented in Machado et al., (2007). The data (inventories of energy supply life cycle, resources extraction, chemicals, waste management services, etc) and the correspondent assumptions will be supported by literature. A matrix for a first assessment of economic viability in terms of construction and operating costs will be developed also.

### EXPECTED OUTPUT

- **New broader screening tool and better detection limits of emerging contaminants.**
  The development of a novel nanoparticle (NP)-based environmental sensor may lead to high performance devices for in situ sensing of antibiotics and pesticides.

- **New methods to remove emerging contaminants**
  The use of adsorbent property of powdered M. oleifera seeds and the development of a biofilter using powdered seeds as a solid support to remove antibiotics and pesticides. On the other hand, the optimization of the electrochemical oxidation method will be achieved by obtaining a suitable electrode material. Finally, the use of an innovative biodegradation method will, mainly, permit to understand the biological effects of both antibiotics and pesticides.

- **Survey of contaminated areas**
  This information will help researchers and managers to relate environmental occurrence, fate and transport processes to the original sources and pathways of emerging contaminants.

### RELEVANCE TO DECISION MAKERS

Water quality is regulated at the EU level by various regulations such as the WFD (2000/60/EC) and subsequent amendments and Decisions 2455/2001/EC, 2008/32/EC and 2008/105/EC. The new Proposal for a Directive amending the WFD and Environmental Quality Standards Directive (EQSD) (COM(2011)876) includes a revised (second) list of priority substances, and provisions to improve the functioning of the legislation. The proposal accompanies a report (COM(2011)875) from the Commission to the European Parliament and the Council on the outcome of the review of Annex X of the WFD on priority substances in the field of water policy, first including emerging contaminants among the new regulated substances.

### DURATION

36 months

### BUDGET ESTIMATION

550.000 €

### CONTACT

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# JAP ACTION

## RIVER RESTORATION AS A TOOL FOR INTEGRATED WATER RESOURCES MANAGEMENT

### FRAMEWORK

- **JAP Objective.** Management of interior surface water bodies
- **JAP Theme:** River restoration as a tool for Integrated Water Resources Management/River ecosystem management
- **Correlation with SWOT:** W.1, T.6

### DESCRIPTION OF THE ACTION

Under the WFD, watershed management plans (WMP) must be accompanied by a Program of Measures (PoM), a list of budgeted actions identified as necessary to be performed to reach WFD objectives (water quality and good ecological status being the core ones).
Listed items are supposed to be implemented by the end of the second planning cycle (2010-2015). However, several issues may affect the implementation and success of PoMs:

- Not all countries met the 31st December 2009 deadline. As their WMPs have been (or will be) approved later of that date, effective time remaining for the implementation of the PoM is reduced.

- Economical crisis hinders the capacities of member state countries. With fewer economical resources, not all listed measures can be implemented.

- There is a strong difficulty in linking ecosystem health (good ecological status) and effort of the measures (the degree or cost of implementation of a measure, in economic value, environmental flow, pollution reduction, etc.)

Under the view that river restoration should be part of integrated river basin management and that river restoration is an effective tool to implement EU WFD, the project aims to review the range of measures suitable to ensure a good ecological status for surface waters, to enhance the value of ecosystem services and to promote sustainable development at the local/regional scale.

The research main actions aim to contribute to the implementation of the PoMs in the following issues, in selected river reaches:

- Diagnosis of impacts on the river ecological status derived from river infrastructures
- Identification of synergies between river restoration plans and rural development plans
- Alternatives for river management and river intervention for the enhancement of environmental services
- Alternatives for river management and river intervention for achieving good ecological status (e.g. watercourses intervention, restoration of river banks)
- Alternatives for river management and river intervention for minimizing the negative impacts of flooding

The project will emphasize the link between both the strategic and operational levels, by improving the knowledge base of decision makers (capacity and knowledge building) on the relevance and complexity of river processes. By designing an adequate stakeholder power analysis, the project will provide river users, scientists and practitioners the opportunities to exchange experiences and best practices on river restoration. This aiming to facilitate the integration of research into the planning process under a participative approach.

### EXPECTED OUTPUT

- **Sustainable use of hydropower** based on environmental flow requirements (EFR).
- **Habitat reconnection** and improvement of fish migration. Improved and more productive habitats.
- **Habitat restoration** and reconnection of alluvial floodplains. Ecosystem goods and services.
- **Higher erosion control,** increase in the lifespan of reservoirs.
- Implementation of green/blue **infrastructures for flood mitigation.**

### RELEVANCE TO DECISION MAKERS

Restoration of fluvial morphology and its associated ecosystem values and services have a strong contribution in the achievement of the general objectives of the WFD. This restoration is aligned with the revised PoMs, particularly in regards with the achievement of the good ecological status in a cost-effective manner within the river basin scale.

In particular, fluvial morphology restoration addresses basic requirements of EU water-related directives such as the aforementioned WFD, the Floods Directive and the Habitats Directive, while some other policies approaches, like the energy and the rural development ones, may benefit from this JAP action.

### DURATION

36 months

### BUDGET ESTIMATION

3 000 000 EUR

### CONTACT

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Sea Erosion - Kyrie Sitea, Alkyonides Gulf
Valia Management Plan project

# 5. STEPS TOWARDS THE IMPLEMENTATION OF THE JOINT ACTION PLAN

Asprokremos Dam, Cyprus (A.Kontou)

It is within the scope of NOVIWAM to facilitate the implementation of the JAP both by improving the capacities of the actors involved as well as gaining the support of the relevant authorities and decision makers.

These objectives go one step further in the sense that they allow for the possible improvement of the JAP and the inclusion of further regions into its activities.

But the NOVIWAM partnership goes even further, since we intend to continue working together and expanding beyond the end of the project in early 2013.

In this context, a series of measures are introduced by NOVIWAM partnership to ensure a high impact for its activities and its proposed actions within and beyond the initial framework of the project.

*"The main goal is to expand the NOVIWAM consortium to other regions consolidating a wide research-driven network of clusters on IWRM"*

## EXPLOITATION OF THE NOVIWAM PARTNERSHIP JOINT RESEARCH CAPACITIES AND EXPLORATION ON COLLABORATION POSSIBILITIES IN FUTURE TRANSNATIONAL CO-OPERATION PROJECTS SERVING TO THE IMPLEMENTATION OF THE JAP

Further collaboration between the partners and other organisations from the involved regions will be promoted as a mean to further develop the objectives contained in the JAP. One example is the work on the already described five JAP actions. This activity will be directly linked to the promotion of the JAP, but will also focus on co-operation possibilities in other areas.



## IN-HOUSE AND EXTERNAL TRAINING ACTIVITIES TO IMPROVE CONCRETE CAPACITIES NEEDED FOR THE IMPLEMENTATION OF THE JAP

Some of the objectives included in the JAP may involve a need for some of the participating organisations to acquire certain knowledge or capacities. To achieve this, the project sets up training sessions dealing with these necessities. They are complementary to mutual learning activities such as staff exchanges or thematic workshops. Whenever possible, the training activities are carried out by other partners of the project, but these are not closed to the participation of external experts.

## CREATION OF A REMOTE ADVISORY FACILITY OR HELPDESK

Both as a direct mailing system and as an online discussion and debate forum. An online forum is open to discuss issues affecting both the project and its scope. Also, a remote helpdesk was created to answer the queries of the members in which different experts have been selected to answer the incoming queries on property rights or water. The users can also share case-studies and choose which posts they want to be publicly available in an simplified version of the helpdesk embedded in the project website.

## INTERNATIONAL MATCHMAKING EVENTS FOR THE SECTOR

These matchmaking events aim to promote international cooperation between entities at all levels, from simple commercial agreements to collaborative RTD projects, exploiting synergies existing with initiatives such as the Enterprise Europe Network. They also represent an opportunity to transform proposed JAP actions in actual projects.

## CONFERENCES

Researchers, authorities, business and other stakeholders will join to share knowledge and good practices in the field.

## EXPLORATION OF THE POSSIBILITIES OF CONSOLIDATING A RESEARCH-DRIVEN NETWORK OF CLUSTERS ON IWRM

The project results confirm the similarity of the IWRM related problems and necessities faced by very heterogeneous regions. The potential of the triple helix approach to face those problems also became evident straight from the beginning. Therefore, the potential impact of the outputs of the NOVIWAM project, and specifically of the Joint Action Plan are not exclusive to the involved regions but are susceptible of being adapted and implemented elsewhere. The collaboration with other regions and the possibility of exporting the projects results is studied and promoted by the NOVIWAM partnership. Eventually, the main goal is to consolidate a wide research-driven network of clusters on IWRM that should last beyond 2013. Following the triple helix concept, it would preferably be composed of entities with complementary profiles. It would increase its potential to push knowledge-based economic development in the participants regions as well as to help dealing with some of the most pressing technical and institutional challenges on the water sector.

# LIST OF ACRONYMS

**DSS**: Decision Support Systems
**EU**: European Union
**FP7**: 7th Framework Program
**GWP**: Global Water Partnership
**IWRM**: Integrated Water Resources Management
**JAP**: Joint Action Plan
**NOVIWAM**: Novel Integrated Water Management Systems for Southern Europe
**RTD**: Research and Technological Development
**SME**: Small and Medium-sized Enterprise (plural SMEs)
**SWOT**: Strengths, Weaknesses, Opportunities, Threats
**WFD**: Water Framework Directive



NOVIWAM Joint Action Plan

Executive Summary

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