

**Thematic Workshop for the definition
of the Science and Technology
Euro-Mediterranean Policy within FP7 (project MED7)**

“Water Risk Management and Renewable Energy Sources”

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INTRODUCTION

Experts on Water issues and Renewable Energy Sources from both sides of the Mediterranean met in Athens to propose topics of mutual interest to be considered for the new (7th) EU Framework Programme.

The experts reviewed the state of the art and highlighted the best practices in EU Member States and in the MPCs.

The general understanding concerning the two themes was as follows:

Considerable research has already been performed in the field of Water technologies. In contrast, very important issues such as Integrated Water Management have not been addressed sufficiently. It is therefore important, beside some still remaining technological research topics, to give a specific attention to the above mentioned issues.

On the other hand, there is a variety of topics to investigate concerning Renewable Energy Sources (RES), especially for new applications, increased efficiency and improved reliability.

Finally, RES and water can have a common area of investigation and innovation on water processing using RES.

For every theme the experts proposed key topics for research of particular importance and potential positive impact in the MPCs.

Report of the RENEWABLE ENERGY SOURCES' GROUP

Five main fields of intervention have been identified, namely:

- Sustainability in building design and retrofitting for Mediterranean Areas;
- New sources for renewable energies;
- Technology adaptation to Mediterranean conditions;
- Renewable energy and water;
- Socioeconomic issues.

For every field, the state of the art and the relevance to the Mediterranean region are briefly described along with the proposed topics for research.

Sustainability in building design and retrofitting for Mediterranean Areas

State of the art

Even though passive concepts and techniques for heating and cooling of buildings have received considerable scientific and technical attention, which guarantees their feasibility, in practice their implementation is rather limited mainly due to:

- Lack of knowledge about the techniques that can be used to a scale justifying industrial production.
- Lack of knowledge, guidelines and tools allowing the designers and promoters to apply those techniques as an alternative to conventional systems including their appropriate design, integration, sizing and control.

Relevance to the Mediterranean Region

The severe summer climate, the actual trends in building design (imported from northern latitudes) and the rising living standard in Mediterranean countries have promoted a massive and unnecessary use of air conditioning systems.

Consequently, the energy consumption for cooling of new and existing buildings will become a serious problem in the near future.

It is proposed to recuperate the indigenous traditional architectural concepts adapted to the present construction practices.

Proposed topics

- Domestic solar cooling
- Passive techniques/ bioclimatic architecture
- Integration of solar energy in design of buildings

New sources from renewable energies

1. Hydrogen from renewable energy sources (mainly solar)

State of the art

Hydrogen is an essential energy carrier. Researchers are developing a wide range of processes for the production of hydrogen in an economically and also environmentally friendly way. Hydrogen can be derived from water by electrolysis, using electricity generated from renewable energy

sources such as solar, wind, or hydropower. Electrolysis requires substantial amounts of electricity. Many developed countries are working on solar hydrogen production systems. They are developing their systems by using existing energy sources. In parallel, recent research is focusing on producing hydrogen rich gas (syngas) from biomass by thermo-chemical gasification. In subsequent syntheses liquid fuels are produced, that can be used in motorcars.

Relevance to the Mediterranean Region

Due to the abundant resources of RE in the MED region and the need of storage technologies, hydrogen in various synthesis paths is a promising option in this field. Therefore, research should be carried out to develop and optimize such systems, which can produce and store hydrogen at competitive costs.

2. Energy from organic waste and crops

State of the art

Biomass offers many applications for power generation, from co generation to distributed generation. Biological resources are still mainly used for heat production, as in combined heat and power plants, and can be used and stored in different forms (solid, liquid and gaseous).

The most economic forms of biomass for generating electricity are residues and wastes. Energy crops are still in the early stages of development, although progress has been made. In the long term, energy crops could be a very important biomass fuel source. At present, however, wastes (wood, agricultural, municipal or industrial) are the major biomass sources. The most important technical issue for biopower relates to feedstock and conversion technologies.

. Technologies such as combustion, gasification, anaerobic digestion, fermentation, biodiesel will still benefit from mass to energy efficiency improvements. The advent of energy crops for power production might open a new market for agriculture

Relevance to the Mediterranean Region

Although energy production from organic waste and crops has been developing in many countries, application in Mediterranean region is very limited.

The use of crop residues and livestock manure obtained from Mediterranean region as fuel can improve the economics of farming while solving environmental problems.

Technology adaptation to Mediterranean conditions

State of the art

PV and solar thermal systems have been relatively well developed for moderate climatic conditions and small to medium scale applications. The climate and weather conditions in MED countries are quite different in some aspects (sand and dust, higher radiation, hot ambient temperatures, different types of heating and cooling systems, crops...). In order to meet these conditions and to speed up market growth, equipment and systems of RE have to be adapted and optimised.

Relevance to the Mediterranean Region

MED environment allows large RE-plants (PV, solar thermal, crops in some areas) and these countries have high potential of self-supply with RE and are potential exporters of RE to central Europe. Furthermore, there are many remote areas (islands, oases,...) where decentralised multi-functional systems (heating, cooling, power) are required.

Further research of operation under severe external conditions, in small grids, in areas with weak grid, which are problematic for absorbing bigger quantities of changeable renewable energy, will assure higher efficiency, better performance and long term acceptance by the investors.

Proposed topics

1. Improving PV systems performance under severe external conditions (cooling, coatings, cleaning)
2. Improving solar thermal systems performance under severe external conditions (coatings, cleaning, stagnation)
3. Improving solar collectors and systems efficiency
4. Big solar power plants (stability, control, simulation of operation)
5. Integration of solar energy in industrial applications
6. Distributed electricity generation including storage and microgrids in remote areas (control, connection to the grid, small communities, islands)

Renewable energy and water

State of the art

Various RES are presently used for seawater and brackish water desalination: PV and wind power for reverse osmosis, solar thermal and geothermal for multi-effect distillation and wind power for mechanical vapour compression. These technologies are not yet commercialised. Problems are still the variability of the RE power source, missing control strategies and economic constraints.

In wastewater treatment RES are applied for disinfection in form of high concentrated solar radiation. Another application of RES is drying of sewage with low-temperature solar thermal energy. For solar drying some technical solutions are in the first steps of commercialisation but still research has to be done to optimise the process.

Relevance to the Mediterranean region

Water scarcity is increasing in Mediterranean regions, where potential of RES is high at the same time. Desalination of water is an option to improve life conditions in remote areas. Anyhow, this is an energy consuming technology and harnessing of RES would decrease input of fossil energy and thus costs and CO₂ emission. Furthermore, treatment of wastewater with RES would contribute to safety and security of water supply via increased hygienic status and potential reuse.

Proposed topics

1. Use of renewable energy sources for desalination and water supply
2. Use of renewable energy sources for waste water treatment

Socioeconomics issues

Despite the strong political support of RES in many countries, their deployment has been often delayed for reasons related to local acceptance and readiness to use. In certain cases, although working successfully during their commissioning period, they fail later because lack of proper maintenance and due to the lack of continuous financial support.

It is therefore essential, in parallel to the development of the technology, to prepare the grounds for its deployment. In some cases this, by itself, implies a research effort, especially when the local conditions are not very well known or understood.

Proposed topics

Actions to be undertaken to counteract the abovementioned situation are:

- Development of participative approaches for dissemination of RES technologies to the local populations and stakeholders to obtain large acceptance.
- Education and training in maintenance activities, both for end users and professionals.
- Networking schemes at local, regional and national level, including demonstration and deployment activities.
- Identification and improvement of the legislation and policy framework in order to support the technological development and implementation of RES.

Recommendation

The group recommends that the Commission promotes the construction of large renewable energy power plants in the Mediterranean region. The plants will be used to demonstrate the basic concepts under a proper scale and will enable the introduction and testing of many new related relevant technologies.

Report of the “WATER RISK MANAGEMENT’S Group

State of the art

The scientific literature produced during the last decades in the Mediterranean shows that research in the water sector has been very much oriented to developing sector perspectives in water resources, or exploring and assessing new conventional water resources to meet the increasing demand, or assessing water related natural hazards (drought and floods) or the control of water quality to protect the functional and structural characteristics of the ecosystem, or explore more and more water saving options. Water quality and quantities are at risk, this condition putting at risk also the cohesion and the socio-economic development of the entire region. In Mediterranean countries water shortage generally limits the development of industry, agriculture and tourism. Conflicts in the Southern Mediterranean due to water are higher than anywhere in the world, undermining efforts for global peace and stability. The main consumer of water resources in the southern Mediterranean is the agriculture that absorbs about 75% of the available resources. Therefore the development of new technology for water saving, best water management practices and the obligation to use non-conventional water resources become a necessity. This obligation can only be approached with an integrated vision. Policies and decision-making processes on water issues have to be based on appropriate information and modelling results, as widely acknowledged in literature. This information is mostly provided by the environmental monitoring networks that assume a fundamental role also in the Water Framework Directive implementation. Environmental monitoring has demonstrated its capacity in supporting the decision process in such areas as: characterization of baseline conditions, surveillance, detection of change, description of recent status and trends, long-term understanding or prediction of processes, resource management, and establishing the need for, or success of, interventions. Moreover, the Mediterranean region is subjected to extreme events, therefore the risk of flood and drought needs to be investigated.

Floods, in a general sense, can be described as situations of extreme water run-off during which human lives, property and infrastructure are threatened.

Drought is a recurrent feature of the Euro-Mediterranean climate, occurring in both high and low rainfall areas and in any season. It can affect large areas and recent events have demonstrated the vulnerability of the Mediterranean countries to this natural hazard. The impacts depend on the severity, duration and spatial extent of the rainfall deficit but also, and to a large extent, on the environmental and socio-economic vulnerability of the affected areas.

Expected impacts in the Mediterranean Partner Countries

MPC experience chronic water scarcity and increasing incidence of extreme events which might be pronounced by global environmental change. Technical solutions, improvement of managerial capacity, and modernization of governance structures are urgently needed to improve livelihoods and mitigate water conflicts. Some advance has been made on technical solutions but more

emphasis should be put especially on management and governance. Linking up with the European Water Initiative could have considerable impact on

- Expanding the knowledge base on sustainable water resources management
- Harmonization of standard procedures in Water Risk Management approach (set up of common methodologies, data collection procedures etc)
- Strengthening the MPC's capacities to cope with water resources conflicts
- Tightening the strategic partnership between EU and MED to develop a sustainable common space for research and innovation in the MED region based on the ERA recommendations for Water Risk Management in order to enhance competitiveness
- Improve access to financial and juridical tools
- Improve capacity of self-networking, participation to management, and co-decision rights
- Integration of gender dimension in water management
- Increase transparency and public participation
- Improve coordination among water boards
- Strengthen public communication and confrontation on water

Key topics for FP7

1. Integrated water risk management

Water management risk in the Mediterranean is generally linked to the concept of limited water resources, as the great part of the region is characterised by arid and semi-arid conditions. However, management of water risk should encompass both quality and quantity aspects of water as well the impact of extreme events and the linkage with health. In particular, risk to water supply and quality, and risk due to flood and drought should be at the centre of research and public discourse in the region.

Topics to be considered are:

1.1. Risk to water supply and quality

- Water saving in agriculture promoting water productivity and pollution control.
- Development of integrated methodologies for modernization of irrigated areas
- Water savings in urban uses by improving efficiency and reliability of distribution system
- Risk assessment of water security in urban area and planning of emergency measures
- Management of dynamics of whole demand from catchment to regional scale
- Development of non-conventional water resources such as brackish, sea and waste waters, accounting also for the use of renewable energy sources
- Setup of appropriate tariff rules
- Protection and restoration of coastal and endangered water bodies.
- Erosion and hydrogeological control in vulnerable areas to protect the landscape morphology, reduce siltation in reservoirs, secure production systems.

1.2. Risk due to extreme events

- Assessment of flooding risks and planning of flood technical and non-technical emergency measures, accounting also for input from historical information and paleo-data.
- Support the needs for more pro-active (risk management) approaches rather than reactive ones (crisis management), requiring the use of all phases of the drought management cycle and flood.
- Drought management to improve the effectiveness of preparedness and response efforts, by enhancing monitoring and early warning, risk and impact assessment, and mitigation and response.

1.3. Horizontal issues (support to decision making)

- Improving water monitoring technologies and modeling on natural water bodies and existing water infrastructures.
- Decision-making processes to be based on appropriate information & monitoring systems (e.g. community-based monitoring), and on consolidated technical and sustainability indicators, development of water knowledge-base systems and tools.
- Development of guidelines for sustainable development of basin management, trans-boundary issues, climatic variability and global change impacts.

2. Water policy and regulatory framework

One of the major issue in water management at both EU and MED partner countries is the building of operational interlinkages between policy and the specific requirements of the water sector-self to enhancing sustainable water management accounting for social, economic, environmental dimensions and technology-innovation. In addition, water policies are still inhomogeneous among MPCs, inducing unavoidable negative effects in regional or trans-boundary water management (conflicts, fragmented knowledge and actions, only partial understanding of large scale water yields, and water supply-demand dynamics). Moreover, the alignment of relevant policies of MPCs towards the EU Water Framework Directive and EU future water strategies need to be improved. Addressing water policy as such calls upon the need of addressing water governance, as adequate policies are derived if a system of minimum governance regime is in place, where societal shared knowledge (among institutions, stakeholders and citizens), networking and participation, collective (institutional and community) capacity and ability to develop innovation and technology are important pillars. Securing sustainability and efficient allocation of water resources will benefit from the improvement of water policies. Harmonisation and alignment of MPC's different regulatory frameworks will enable more effective regional water management; open exchange of information to strengthen Euro-Mediterranean scientific cooperation on water; stronger MPC's capacity to mitigate conflicts and EU-MED partnership; ensure water system efficiency and performance.

- Water policy analysis and improvement of interlinkages with water governance.
- Develop common indicators to assess water policy objectives and policy implementation in function of sector technical and sustainability targets.

3. Socioeconomic aspects

Increasing public awareness on water in terms of sustainability is a priority, meanwhile promoting and enhancing public participation in decision-making. Concerning the economic aspects of water, the implementation of economic instruments like pricing, taxation and the application of the “polluter pays” principle is among the most effective ways to achieve Water Demand Management and Control. Managing water not only as an economic good, but also as a part of the ecosystem having an intrinsic natural value, should be seen as an important target for the sustainable development of natural resources.

- **Public Participation** (Actions promoting Public Participation; Public Involvement to Decisions; Establishment of pilot groups consisting of stakeholders coming from the Government, the Administration, NGO’s, end-users, etc.).
- **Public Awareness** (Actions promoting and enhancing public awareness through education, seminars, media, Internet, Networking; Publication of journals, books with information on the water problems).
- **Putting the European W.F.D. (2000/06) into practice** (Taking advantage of its socio-economics provisions for use and implementation in the Mediterranean Countries).
- **Assessment and development of Economic Incentives to control water demand** (Use of economic instruments as incentives to improve efficiencies; Application of the “Polluter Pays” Principle; Economic instruments to provide social acceptance and reducing social reaction to the reform; Definition of water demand curves in various uses).

Proposed activities for their implementation

Joint research

Clusters of research on the proposed topics should be created in order to develop specific research projects and share experiences and results. Joint research should be accompanied by training and learning efforts.

- Promote collaborative research
- Selection of pilot studies
- Training and joint PhD programs
- E-Learning platforms

Networking

Networks such as the Mediterranean Basin Organization (MedBO) are very useful in developing lasting relations among investigators, water managers and stakeholders. Activities to support networking could be:

- Collaborative research networking
- Sustainable multi-stakeholder networking
- Mobility
- Short courses decided on participatory basis