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Adaptation Framework for Action for the Mediterranean Region:

Views from the Athens Roundtable

Climate Change, Water and Wetlands

Building linkages for their integrated management

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CENTRE FOR Mediterranean COOPERATION

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Indicators suggest 8 of the 12 South and Eastern Mediterranean (SEMC) countries now use more than 50 per cent of their renewable water resources annually (surface and ground water sources). With current trends, by the year 2025, eight of these 12 countries would consume more than 100 per cent of their renewable supply. Source: PlanBleu Mediterranean Vision Report

Roundtable views on an "Adaptation Framework for Action"

This note summarizes the 2-day roundtable held in Athens, Greece, in December 2002, on the anticipated effects of climate change on water resources and wetlands in the Mediterranean, and views that emerged on the preparation of national adaptation frameworks for action. The aim was also to establish a better sense of the important policy and planning linkages to improve the integrated management of water resources and wetlands, and to identify key follow-up activities to profile successful initiatives to share experience across the region[1].

The Mediterranean roundtable was one of five regional dialogue processes facilitated by IUCN's global initiative on Water, Wetland and Climate Change, as noted in Box 1. The dialogue was supported by the Global Water Partnership (GWP), the Dialogue on Water and Climate Change and IUCN – The World Conservation Union. The Athens roundtable brought together government, non-government, civil society, research and private sector organizations from countries across the Mediterranean region.

Why is climate adaptation on the agenda in the Mediterranean?

Scientific consensus is that climate change will have a pervasive influence on the future demand, supply and quality of fresh water resources in the Mediterranean and alter the frequency, spatial distribution and intensity of drought and flood hazards. It is widely acknowledged that the present water economy of many countries in the region is wholly, or partly unsustainable – and as a consequence, these systems are potentially more vulnerable to the effects of climate change. Recent experience also shows the high degree of vulnerability even to today's extremes of drought and flood. Changes in the climate system promise to amplify these extremes and add pressure to those water resource systems and coastal areas that are already under

Box 1: Objectives of IUCN's Water, Wetlands and Climate Change Initiative

In 2002, five regional dialogues held in Central America, Southern Africa, West Africa, South and Southeast Asia, and the Mediterranean. These dialogues looked at the need for and possible elements of an analytical framework to address climate change in the context of managing adverse impacts on water resource and wetland systems in each region:

Here it was envisaged that:

- Key information needs would be identified, including assessments of specific watersheds, basins and wetlands to analyse impacts and resilience to projected climate change;
- Climate change adaptation options would be identified and evaluated in the context of sustainable management of water resources and projections for climate change;
- These options would form the basis for the development of adaptation frameworks for action appropriate to the circumstances in each country and region;
- The adaptation framework(s) for action would include steps that could be undertaken by NGOs, the private sector, community organizations and Government agencies and partnerships; and
- The activities would help strengthen the capacity of Governments, NGOs, private sector and community organizations to minimize the costs and enhance the effectiveness of climate change adaptation measures.

The results of each dialogue were to be made available within the respective regions, and together inform the preparations for the *Third World Water Forum* (WWF3), held in Japan in March 2003.

[1] This note should be read in conjunction with the minutes of the Athens roundtable and the presentations of the twelve country baseline studies and thematic working papers that informed these discussions. These are available in the accompanying CD on the Mediterranean Water, Wetlands and Climate Change initiative, or they can be accessed on the IUCN Mediterranean Centre for Cooperation website at www.uicnmed.org.

multiple stresses from human development activities, and from the resultant combination of water scarcity, soil erosion, habitat loss, and deteriorating water quality. All sectors of the economy, environment and society are potentially vulnerable to the additional pressures from climate change, to one degree or another.

Over a decade ago the United Nations Convention on Climate Change (UNFCCC-1992), to which Mediterranean countries are Parties, called for measures on two fronts: to mitigate (emissions) and to adapt to the effects of climate change. Following ratification of the Convention, efforts were largely focused on the mitigation side of the equation and GHG emission stabilization. Less attention was given to adaptation. The situation is now starting to change. In view of the steady accumulation of evidence of an accelerated change in the global hydrological cycle, consensus is that adaptation now requires more immediate and systematic attention. This concern was reflected in the Ministerial Declaration from the Conference of Parties to the UNFCCC (COP-8) held in New Delhi (Nov 2002).

In its Third Assessment Report in 2001, the Intergovernmental Panel on Climate Change (IPCC) confirmed the rapid convergence of scientific opinion, that the gradual elevation in global mean temperatures, associated changes in hydrological variability, and longer-term sea level rise is a reality, and it is starting to happen. The ACACIA Project Report (2000) prepared for European Commission's 3rd Communication to the UNFCCC, also reinforced the interpretation of the likely effects of climate change on water resource systems and water-dependent sectors in the Mediterranean and southern Europe.

The climate change phenomenon is not new. Climate has always influenced patterns of human development in the Mediterranean where societies have lived with extremes of flood and drought. What is different today is the vulnerability to changes in the climate system is arguably greater today than in previous times. Moreover, because we now consume a significant portion of the water resources in many river basins, coupled with dramatically larger populations and higher density of settlement in vulnerable floodplains, also means there will be less room to manoeuvre in future.

As Box 2 shows, Cyprus has already taken steps, to change water sector management practices due to climate change.

Box 2:

A Signal from Cyprus - Adapting to climate change over the past century

Cyprus an island in the Mediterranean that relies exclusively on rainfall, for what is referred to as its water "crop". Hydrological monitoring stations cover the entire island and records have been well kept. They show that over the last 100 years precipitation has reduced at an average rate of 1 mm per year, while the temperature has increased by 0.5°C over the same period. This has implications for the islands water balance. Compared with the Cyprus Water Master Plan prepared in the 1970's, the current water plan shows as 40% reduction in available water "crop". As a consequence, Cyprus advanced its plans for desalination of seawater, and domestic effluent re-use projects and has intensified water demand management measures.

Source: *Cyprus Country Baseline Study*, 2002

What effects will climate change have on Mediterranean water resource systems?

The outlook for the Mediterranean is one of more unpredictable and extreme weather events outside the bounds of recorded climate variation. "First order" impacts will be felt on the different components of the hydrological cycle (i.e. the closed system of water evaporation from the ocean, precipitation over land, surface runoff, interception and infiltration, evaporation and evapotranspiration, and river and underground flow through the

Climatic events are non-linear and most often irreversible. Major uncertainties do remain and have to be handled in scenarios

There has been a greater number of flood-connected disasters for the last 25 years than for the previous 100 years (one main reason being the increasing occupation of areas vulnerable to flooding)

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watercourse back to the sources). These first order effects will feed through as secondary impacts on water-dependent sectors and ecological systems (e.g. on irrigation and water supply systems, coastal systems, and ecosystem functions and wetlands), as hydrological variability and extremes are increasingly amplified.

The Table 1 illustrates the range of impacts anticipated for the Mediterranean hydrological systems.

The general circulation models that are used to study the interactive effects of global warming on climate systems all point to more precipitation in the winter, and less in summer over the region. The mean annual precipitation is expected to decline south of 45°N. Northern parts of the Mediterranean would become wetter, and the southern parts drier. As a whole, the Mediterranean region would warm at a rate of between (0.1°C/decade and 0.4°C/decade), twice that of northern Europe.

Table 1:
PROJECTED FIRST ORDER EFFECTS OF CLIMATE CHANGE ON MEDITERRANEAN HYDROLOGICAL SYSTEMS

Aspect	Representative Impacts
More extreme weather events: • More frequent and intense storms • Increased number of days of heavy rainfall events and torrential downpours • More frequent and longer lasting droughts spells • Greater seasonal and year-to-year variation in precipitation, especially in semi-arid areas in the southern and eastern areas of the region	• Higher surface runoff and drainage from catchments with less infiltration • More frequent and severe floods, especially over northern parts of the Mediterranean basin • Greater incidence of flash floods in small catchments • Increased soil erosion and sediment in rivers from intense storms • More sever floods in winter and autumn coupled with shifting seasonal precipitation patterns
Wetter winters and dryer summers • More precipitation in winter, less in summer over the Mediterranean region as a whole, with variability in basins • Earlier snowmelt (e.g. shifting to Jan, Feb, Mar) • More winter precipitation falling as rain and less as snow (in mountainous and colder climate regions)	• Changes in the seasonal distribution of flows in the watercourse (runoff in a particular basin may increase or decrease on average) • Shifts in peak flows in rivers from spring to winter, especially in rivers fed by snowmelt • Earlier low water periods in most rivers • Lower groundwater recharge in dry summers, compensated (in some basins) with increased winter recharge • Marked deficits at the local scale during dry years • Less rainwater infiltration feeding inland and coastal water tables and fragmentation of aquifers
Hotter summers and heat waves • Warming trends greater in summer than in winter • Hotter and longer summers • Heat waves becoming the norm	• Increased evaporation from reservoirs, lakes and rivers • Increased soil evaporation, plant evapotranspiration • Dryer and more erosion-prone soils coupled with less summer precipitation • Acceleration of desertification effects • Increasing water needs in human, agriculture and ecological systems

Changes in the mean level of the Mediterranean Sea are even harder to predict accurately. Analysis suggests that globally, average sea levels may rise another 0.15 to 0.95 meters by the year 2100, with a best guess of about 0.50 meters in that timeframe. This is about four times the rate of seal level rise in the last century. Here, much of the 46,000 km of Mediterranean coastal zone that is characterized by rapidly intensifying land use and economic development (urbanization, tourism and agriculture) would be increasingly exposed to combined sea level change and storm effects, including permanent flooding, storm surges and salinization of coastal groundwater and estuaries. About 145 million inhabitants, or roughly one third of the population of the Mediterranean now reside in these coastal zones, and island groups will be affected by sea level change (directly and indirectly). Coastal wetlands would face increased threat from saltwater intrusion and lower flows in the upstream watercourses.

Despite the changes on the way, the UNFCCC indicated that there is room for optimism that many of the more adverse impacts can be moderated. However, successful adaptation will require the integration of adaptation measures with national economic, social and regional development planning, and the harmonization of these measures with other resource and environmental management activities.

One clear message from the roundtable was the longer this task is left unattended in the Mediterranean, the more costly and disruptive it may be for society and the environment. Moreover, many measures, referred to as "least regret", or actions (many are also low cost) can help Mediterranean societies better adapt to current climate variability and extremes of floods and drought, even without the threat of accelerated climate change. Small changes now can make a huge difference over time, as the beneficial effects compound.

However, it is not just new water management interventions that are needed to prepare for climate change. Major infrastructure components of existing water resources systems in the region such as dams, reservoirs, river diversions and flood protection systems have been largely designed for past hydrological conditions. There are, for example, over 4,000 large dams in the region and many thousands more of smaller embankment dams for irrigation and water supply that will need attention, particularly as regard to sediment management and ensuring spillways and other physical structures and outlet works are adequate to pass larger floods, and also to improve environmental performance. Because of this, re-planning and adjustment of existing water resources systems to new and different precipitation and streamflow regimes will be high on the agenda.

It is also clear that technical measures and conventional approaches alone will not be adequate. The challenge is to ensure that all the ingredients – the right priorities, policies, institutions and programmes – are in place to reduce vulnerabilities to today's climate variability, and from this base, increase the capacity to adaptively respond to changes that are on the horizon. We know the direction of climate change and its certainty. What we do not know with precision is the rate of onset of the changes, and how they will manifest at local levels.

Do the present water resource management policies and practices in the Mediterranean provide a basis for an adaptation framework for action?

The consensus view in the Athens roundtable was that all Mediterranean countries need to continuously adjust their water resource systems to climate variability and balance human sector and nature needs for water. Adaptive management would build upon policies that promote sustainable management of water resources, socially optimal and environmentally sensitive water allocation, and efficient use of water within society. Broadly, climate adaptation planning processes would not be seen in isolation, but rather integrated with existing sustainable water resources and environment planning and management activities.

Egypt is the most sensitive country to sea level rise (UNEP, 1993)

A third of Malta's water supply is now provided by desalination of seawater, at roughly three times the cost of limited conventional supply

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Although drought recurs relatively frequently in the region, drought response is mostly focused on short-term relief operations, implemented at considerable cost. In Morocco, the National Programme for Drought Emergency Response during 2000 cost about € 700 Million

The country studies prepared for the roundtable indicated that many new water management policies and measures are being introduced that will help societies better adapt to climate change, but they are not labelled specifically as adaptation measures. On the other hand, many of these measures have not been implemented in practice, or only partially. Public sector water managers, utilities and facility operators have also started to look at climate change in planning, design and operational activities, but for the most part, in a piecemeal way.

To effect real change new planning instruments are needed, and further:

- Many existing water policies, planning procedures and practices need to be re-orientated or reinforced (e.g. methods for calculating the flood return periods and over reliance on structural interventions);
- Maladaptive policies and practices need to be eliminated, or phased out – which in many cases they are not (e.g. settlement in vulnerable flood plains and over pumping of groundwater beyond sustainable yields); and,
- Additional steps are needed purely to moderate specific climate change effects, such as to deal with rising sea levels (e.g. with a selection of retreat, accommodate, protect strategies in affected areas by storm surges and flooding);

Integrated water resources management (IWRM) approaches were seen as providing the conceptual basis for identifying adaptation actions and how they may be mainstreamed in water resource sector and basin-level planning systems. Here, it was noted that the EU Water Framework Directive that came into force in December 2000, incorporates IWRM principles on a basin level. Implementation of the Directive will improve capacity to adapt to climate change in the longer term. The consensus of the roundtable was that these processes should be viewed as a necessary, but not a sufficient basis for increasing preparedness for climate change.

Despite the difficulties currently encountered by some EU Mediterranean countries in implementing the Directives, they also provide a valuable point of reference for non-EU countries in the Mediterranean region.

What guidance was already available to countries to prepare a framework for action: with a regional, local or national orientation?

The establishment of a visible national process for adaptation planning was considered to be an essential, first step to produce an adaptation framework for action. Such processes would provide a mechanism to debate, plan and coordinate responses to climate change across sectors, and harmonize assessments and actions at different administrative levels. It would help to ensure consistent planning assumptions and approaches are used. And it would be an open process with evaluation, feedback and opportunity for public consultation.

The view of the roundtable was that both the planning and implementation process would necessarily engage policy-makers and resource managers at all levels of government, and involve water users, the private sector, civil society and non-government organizations at each step. Ultimately, there may be a hierarchy of formal and informal plans, policies and facilitation mechanisms at the community, municipal, sectoral, basin and national levels.

Ongoing UNFCCC activities were seen to provide one source of guidance to establish a national process: Specifically:

- Article 4 of the UNFCCC, called for all Parties to implement a package of short, medium, and long-term strategies and measures in a phased manner, taking into account the different socio-economic contexts Recently, some National communications of Annex and non-Annex countries provide preliminary assessments of climate change impacts and adaptation priorities for different sectors in the country;
- IPCC's Third Assessment Report (2001) provides a comprehensive assessment of

climate change impacts, vulnerability and adaptation, which by analogy, provides guidance on more detailed approaches, frameworks and generic measures appropriate for different sectors of the economy, and

- The Guidelines for National Adaptation Programmes of Action (NAPAs) approved by the UNFCCC (COP-7 in 2001 suggest a framework that makes the best use of available methods and tools, recognizing that many countries have limited institutional capacity and financial resources for extensive study.

A regional strategy to mitigate the impact of climate change on water resources and wetlands for the Mediterranean was also seen to be desirable. Here also, a number of countries in the Mediterranean face common challenges including those with shared basins and ground water aquifers. The RAMSAR Convention was considered to offer key advice on a policy framework and technical guidance for protecting, maintaining and restoring wetlands. The Conference of Parties to the Ramsar Convention (COP8), held in Valencia, Spain (2002) provides guidance on assessing climate change impacts, adaptation and mitigation in respect to wetlands.

What were seen as generic priorities for developing an adaptation framework for action?

A clear strategy that creates flexibility and "climate headroom" is needed

A broader theme of strategies discussed was the need to build in "climate headroom" for water management and water allocation decisions. This will create greater flexibility to manage risks, in the face of uncertainty.

Here, strategies appropriate to address the incremental effects of climate change, common to all Mediterranean countries were seen as:

- Introducing greater flexibility to allocate water to different uses (e.g. introducing trading water rights and physical provisions to transfer water between lower and higher value end-uses)
- improving the capacity of wetland systems to autonomously adapt and contribute to the solution (e.g. environmental flows and restoring wetland areas);
- reducing the vulnerability to extreme flood and drought events by starting with fixing current risks;
- introducing measures in other water-dependent sectors, particularly in the agriculture and tourism sectors that address demand side-management and water quality concerns;
- integrating climate adaptation measures with development and management programmes in other key areas such as energy, health, forestry, fisheries and biodiversity; and
- maximizing opportunities for non-conventional water supply.

Measures to reduce water demand, improve water-use efficiency and reduce sources of pollution in watercourses (e.g. agriculture chemicals such as fertilizers and pesticides in runoff to water bodies, wetlands and ground water aquifers) in agriculture systems were emphasized. Here discussion touched on how agricultural policies in the Mediterranean today are overwhelmingly influenced by regional and international agriculture trade policies (EU agriculture policies and WTO policies). Thus the scope and means to effect transformations in agriculture systems that respond to climate change issues must ultimately reflect these external factors.

As shown in Table 2, three broader strategic orientations to classify climate change adaptation measures for the water resources sector, were seen as:

(1) reducing the risk associated with hydrological variability, and to extreme events;
(2) closing the demand-supply gap in water resources; and,
(3) balancing human and nature needs

The mix of policies and non-structural and structural measures would be determined by assessing vulnerabilities in relation to current management practice and scenarios for climate change.

More than 10 years after creation of legislation in France requiring Plans of Exposure to Risk (PERs), by 1995 only 347 municipalities had approved PERs, as compared to an estimated 10,000 municipalities that required them

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The roundtable also felt there was a need to clarify what measures reinforce current water resources management practices, and those measures that are additional – that is, needed to improve adaptive capacity, specifically to the incremental effects of climate change.

"Least regrets" measures as a starting point in an adaptation framework for action

Essentially these are a set of measures that would improve the performance of water resources systems in today's climate conditions, whose further delay could increase vulnerability, or lead to increased adaptation costs at a later stage. It was highlighted that many systems are

Table 2:
STRATEGIES AND MEASURES TO BUILD IN "CLIMATE HEADROOM" INTO WATER RESOURCE SYSTEMS AND THEIR MANAGEMENT AND RELIEVE PRESSURE ON WETLANDS

Strategies and Strategic Orientations	Representative Responses / Measures
Reducing the risk to hydrological variability, and extreme events	Reinforcing or introducing: • flood and drought preparedness programmes • decision-support systems to optimise operations of water infrastructure (e.g. reservoir operating strategies in advance of floods and in drought cycles) • restricting vulnerable development in floodplains • catchment management to improve water retention and infiltration, regulate intensified runoff, reduce erosion • retrofit or removal of water infrastructure for public safety and performance in more variable/extreme conditions (e.g. enlarging or lowering spillways, decommissioning unsafe or redundant dams; set back, raising or removal of structures for flood protection to restore floodplains and reduce flood peaks)
Closing the demand-supply gap in water resources	Reinforcing or introducing: • water allocation policies to provide greater flexibility to allocate between competing demands • bulk metering, progressive tariffs, fees for ground water use • demand management measures (end-use technologies, recycling and conservations) • supply-side efficiency measures (leak reduction in delivery systems, optimising existing water regulation infrastructure (operations and retrofit) • new supply conventional and non-conventional sources) • matching water quality with demand • conjunctive use of surface and ground water
Balancing human and nature needs	Reinforcing or introducing: • environmentally sensitive water allocation policies (e.g. IFR policies for different hydrological conditions); • water quality standards linked to hydraulic variability (river flow conditions and pollution concentration levels); and: • recognizing and sustaining ecological services from rivers and wetlands (e.g. for ground water recharge and water purification); • adapting minimum environmental flow provisions (surface and groundwater) to the hydroperiod of wetlands; • Decommissioning water regulation infrastructure (in certain situations) to restore environmental flows.

Box 3:

Representative "least regret" measures: Adapting to Climate change

- Improving, extending and updating flood zoning and land use controls in high-risk areas
- Evaluate and optimising operation of reservoirs for flood responses and for environmental flows (as policies are developed)
- Improve infrastructure design standards (safety, and flexible performance)
- Improve coordination between water services and hydro-metric monitoring agencies,
- Reinforce hydrometric monitoring and flood warning systems in the basin and introduce or improve radar monitoring of storm systems
- Promote risk reduction strategies via creation of Drought Observatories and Centres within countries to provide timely information to aid decisions
- Enable/facilitate farmers use of insurance and taxation measures to cope with income shortfalls during droughts
- Raise public and political awareness of water scarcity / costs of new supply and the impacts of climate change (increasing variability and extremes); how water users can adapt
- Stronger encouragement of demand-side management measures (and water recycling and re-use)
- fixing leaking pipes and introducing metering into previously unmetered areas
- Introducing environmental flows policies (low cost in some situations)
- Incorporating buffer zones in designated areas for wetland migration
- Strengthening environmental flows policies for a range of conditions and linking to drought measures

ill adapted to the current conditions and variability, and tackling these issues is a good starting point. Representative "least regret" measures are shown in Box 3. The roundtable also emphasized the need to be practical when selecting "least regret" measures. For example, it was important to distinguish between measures that could be introduced relatively easily in policy or legislation, but were actually difficult to implement in practice, and those measures that were both easy to introduce and implement. Institutional capacity to enforce such measures would also be one factor to consider.

The consensus view of the Athens roundtable was that climate change adaptation was not high on the political agenda, and certainly not in all Mediterranean countries. Comparatively few water managers are even aware of Article 4 of the UNFCCC that commits all countries to develop adaptation frameworks for action, albeit with no prescribed timeframe. Lack of awareness translates to low levels of resources, and limited political support delays the process for adaptation planning.

Building Awareness and Capacity: The importance of linking climate science with policy and practice

Improving information flows between the climate science community, policy-makers, water-users, water managers and stakeholders were seen as an immediate priority to help build awareness and improve the quality of adaptation planning efforts. Essentially, more specific and precise information on climate change, better aligned to the needs and interests of the constituencies involved was seen as essential to build awareness, and improve understanding and consensus on a precise line of action for different situations.

This information dynamic discussed by the roundtable is represented in the Figure 1 below.

The availability, quality, reliability and specificity of information on climate change were also seen as influencing public and political opinion about the urgency of investing in adaptation measures.

What information do policy-makers require from the climate science community?

Policy-makers need better information to get the right mix of policies, set the ground rules for interactions of all the actors, and establish regulations that serve as a catalyst and enabling environment for investments and actions by others. Political levels also need information to debate allocations of public funds for climate change adaptation, and to reconcile competing interests in water allocation policies.

There is no specific legal framework where adaptation to climate change is expressly mentioned

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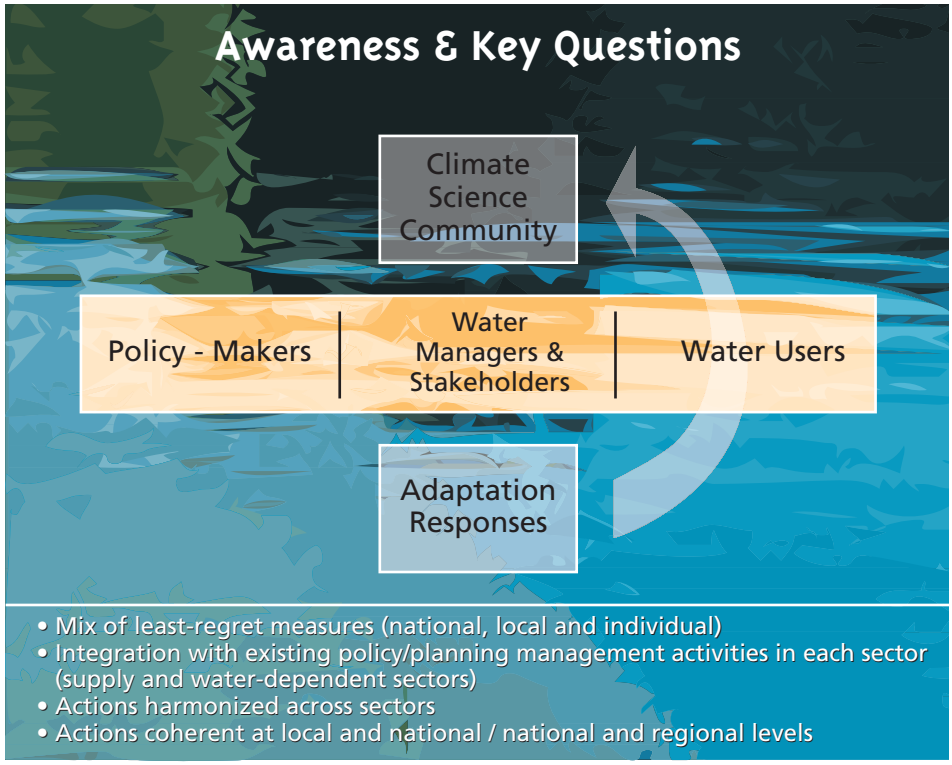
Figure 1



In France, insurance costs for natural disasters are 1 billion euros per year, which includes all natural risks. In comparison, funds allocated for prevention policy and warning are less than 15 million euros (in 2001)

The roundtable felt that policy-makers needed better information of the implications of climate change in order to take more informed decisions, such as:

Scenarios for climate change: e.g.

- How can adaptation assessment methods and guidelines connect better with policy?
- What scenarios for climate change will be applicable for the country, as opposed to results at more generalized regional or global scales?
- How reliable is the available information?

"Hot spots", to understand where significant vulnerabilities exist: e.g.

- What regions and basins are most affected or at risk from climate change?
- What human sectors are most affected or at risk?
- What International Conventions and Treaties are affected?
- What transboundary issues (such as shared watercourses) are involved and what form of inter-state collaboration is needed?

The costs and risks of actions and inaction: e.g.

- What are the likely costs in economic and financial terms?
- How can the measures be financed through the public or private sector?
- What are these costs in political terms?
- How would decisions impact on different constituencies and what positions do they take on the measures?

Other implications of climate change, in terms of:

- How will climate change influence the timeframe for making key decisions on water resource investment and management?
- How are risks spread in society among different groups?
- What are the regional commitments for cooperation and collaborative action?

Policy-makers also need to know if appropriate processes and institutional arrangements are in place to adequately answer their questions; and, secondly, to be assured that water managers, water users and stakeholders are able to act upon the information that the climate science community makes available. The roundtable also felt that better information was needed to present the case of the direct connection between wetland protection and adaptation, and the detrimental effects of climate change. For example, the driving forces, pressures, the impacts and responses needed to go both to opinion formation processes (e.g. general public, stakeholders and interest groups), and more precise information needed to flow to decision-makers.

What information do water managers and stakeholders need from the climate science community?

This group was broadly identified as government, public, community and private organizations involved in water resources and wetlands planning and management and water service provision. It also includes the various private sector, non-government, civil society and research organizations from natural, physical and social science disciplines involved in activities ranging from policy dialogue, to implementation, monitoring and evaluation and research.

Here the Athens roundtable saw a need for better information relating to questions such as:

- What regional or national scenarios for climate change should sector-based professionals use to analyse impacts and vulnerabilities? (e.g. we need to prepare for what - a 10%, 20%, or 30 % reduction in river flows in summer periods?)
- What information is available to define scenarios in terms of economic indicators?
- What information is available for risk analysis and assessing the distribution of risks?
- What are the best ways to classify and define drought situations?
- What is the quality, accuracy and reliability of the available information on climate change?

A major concern noted is that Global Circulation Models are at present not capable of simulating the current climate variability at the sub-regional scale, and therefore they cannot provide projections with the precision that is required by water planners and managers. New scenario tools are needed to overcome this problem. It is also important that professional groups in each sector and discipline have access to and interact with a common set of climate science information and scenarios.

In order to consider wetland-water resource interactions under the influence of climate change, better and more accessible information was needed in a number of areas: e.g.

- on how flow regulation and water quality infrastructure such as dams and water treatment plants are managed, and what flexibility is there for beneficial operational changes
- on hydrological data (all types including ground water sources)
- on administrative overlaps and jurisdictions in managing water resources-wetlands interactions
- on indicators for key thresholds (that are reliable and comparable)
- for recommending water allocation for human sectors and wetlands (and their negotiation / determination)
- on the resource base (specifically on wetlands the trends such as area, quality, functionality and threats)
- on public infrastructure and land use pressuring wetlands (e.g. urbanization and settlement trends)
- for modelling and simulation studies of impacts of climate variability on wetlands
- on the positive and negative aspects of floods on wetlands

Other site-specific data on wetlands was needed to define specific actions to safeguard wetlands functions. Apart from data on pollution levels, sediment, and water needs matched to the hydroperiod, there was a need for use of scenarios to assess the possible range of impacts of climate change on specific wetlands, to link environmental flows to drought indexes, and to

Countries with long-term drought management policies are better able to cope with drought, through early warning systems and drought planning, compared to countries that manage only the ensuing crisis

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assess the interactive effects and critical thresholds.

In regard to drought preparedness, broadly there is need for more collaboration and coordination efforts between subject matter specialists working on different facets of drought for effective drought monitoring, drought planning, preparedness and response. And an efficient information delivery system is needed to exchange data, methodologies, tools and devices, and to increase public awareness about drought and water shortages.

What information do water users need?

Water users including communities, individuals and industries continuously take decisions that have short and long-term implications for water demand. Decisions such as what crops to plant, or where to locate a new industry, ultimately determine the individuals vulnerability to climate change, and through collective decisions, that of larger society. Often individual decisions by water users are made independent of what climate science indicates, or what governments plan. This may be due to a combination of lack of awareness, or because information is not accessible.

At present, there are few mechanisms that disseminate information to water users on climate adaptation specifically, and steps to reduce vulnerability. This is particularly the case for small-scale water users, especially farmers. The view of the roundtable was that adaptation frameworks for action need to incorporate provisions for awareness and information outreach to water users. In the Mediterranean this will often be through agriculture extension or similar outreach programmes. Whether this is best accomplished through civil society or government depends on the circumstances.

What were the main conclusions of the Athens roundtable on frameworks for action?

The core concern was a need for a national process and framework for action on climate change adaptation. It was also seen as a local and regional issue simultaneously. Here the means of identifying and implementing measures in action programmes would be based on principles of dialogue and partnership between government, business, civil society and water users at all three levels. Collaborative processes are required.

In most Mediterranean countries institutional coordination mechanisms are already in place that could be used to initiate national-level processes. These include the focal points for UNFCCC or IPCC responses and Ramsar, as well as interdepartmental panels or working groups, and in some cases Commissions that have already established to study and coordinate responses to climate change issues. These mechanisms can be used initially to guide processes to develop national adaptation frameworks for action.

The larger issue is that climate change is a reality. The longer that adaptation is left unattended, the more costly and disruptive it will be for society and the environment to make the necessary adjustments. ■

Adapting water management to climate change will require building the capacities of people and institutions. Coalitions will be needed to make adaptation work for people and involve them through national and local forums

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