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TOWARDS A REGIONAL ADAPTATION FRAMEWORK FOR CLIMATE CHANGE IN THE MEDITERRANEAN

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INTRODUCTION

This document provides a basis for exploring the principles, objectives and priorities for action for climate change adaptation in the Mediterranean. It is a first draft that will need further extensive consultation before finalization. As a first draft, it is aimed to stimulate discussions at the next meeting of the Mediterranean Commission for Sustainable Development in Montenegro (May 30 – June 1, 2011).

Climate change adaptation is sought in the context of UNEP/MAP, the cooperation of the Contracting Parties of the Barcelona Convention and its Protocols for the protection of marine and coastal areas in the Mediterranean.

In the context of UNEP/MAP cooperation there are several key areas of concern which provide a basic platform for seeking climate change impacts and relevant adaptation actions. These include pollution, biodiversity, freshwater and costal zones. The eventual impacts and risks associated with climate change in these key areas have to be assessed as to their effects on key socioeconomic sectors for many Mediterranean countries, notably fisheries, agriculture, tourism and coastal urbanization, and of course energy. These provide the basic frame of reference for seeking climate change adaptation actions.

This document outlines a basic Framework of cooperation at the regional level in strengthening national capacities to take early action in climate change adaptation through their National Strategies for Sustainable Development. It is intended to identify opportunities, actions and tools for incorporating climate change adaptation in sectoral policies, plans and programmes. It is also expected to identify the necessary actions at regional level to collaborate towards that end particularly in terms of sharing knowledge, best practice and capacity building.

BACKGROUND AND SCOPE

The 15th Ordinary Meeting of the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its Protocols, known as Barcelona Convention, was held in Almeria (Spain), 15 - 18 January 2008. The "Almeria Declaration"[1] recognized the importance of conservation of the Mediterranean Sea from anthropogenic stress and particular attention was paid to climate change. The signatories, Ministers and Heads of Delegation called for the challenge of climate change to be seriously addressed, in order to reduce as rapidly as possible its effects on the Mediterranean coastal and marine environment.

During ministerial discussions held at the 16th Contracting parties meeting in Marrakech, Morocco (November 2009), the need for the Mediterranean region to collectively build a strong coalition and partnership for action on adaptation to climate change, the need for regional coordination for adaptation to climate change and for sharing of domestic adaptation related experiences and tools including the needs for capacity building was emphasised. The need for enhanced knowledge and scientific assessment as tools for policy makers to incorporate measures into adaptation plans was also underlined. The

[1] Report of the 15th Ordinary Meeting of the Contracting Parties to the Barcelona Convention, Almeria, 2008. UNEP(DEPI)/MED IG.17/10 Annex III

"Marrakech Declaration"[2], adopted at the meeting stressed that adaptation to climate change in marine and coastal areas is a major priority for the Mediterranean region and that it requires regional guidance and coordination.

Aware of the role of usable knowledge as a pre-requisite for successful adaptation efforts, the Marrakech Declaration also called for strengthening the Mediterranean cooperation by enhancing the institutional mechanisms, particularly to provide a mechanism for exchanges and the sharing of experience and knowledge with other regions of the world, and ensuring the sharing of experience in the field of surveillance (early-warning systems) and the development and implementation of adaptation and risk-management strategies.

Finally, it mandated UNEP/MAP to explore the possibility of enriching the Mediterranean Strategy for Sustainable Development (MSSD) adopted in 2005 with regional action plans including one on adaptation to climate change as well as to integrate adaptation into development policies at the national and regional level.

Climate Change affects all components of the environment and all sectors of human activities. According to the Cancun Adaptation Framework [3] enhanced action and international cooperation on adaptation is urgently required to enable and support the implementation of adaptation actions aimed at reducing vulnerability and building resilience in developing country Parties, taking into account the urgent and immediate needs of those developing countries that are particularly vulnerable. In the context of the marine and coastal environment, the Regional Adaptation Framework for Climate Change in the Mediterranean could pay particular attention to the sectors of biodiversity and ecosystems, freshwater resources, coastal and marine zones, urban areas, and coastal tourism.

MEDITERRANEAN CONTEXT

The Mediterranean region has been assessed by the Intergovernmental Panel on Climate Change (IPCC) as one of the most vulnerable region to the impacts of climate change, particularly its southern and south-eastern parts and a lot of material is available in the Fourth Assessment Report. A dedicated chapter for the Mediterranean region is in preparation for the Fifth Assessment report to be released in 2014-2015.

Main impacts of climate change in the Mediterranean coastal and marine zones are related to the consequences of changes in the meteorological conditions, mainly temperature, precipitation patterns, and extreme events, and changes at sea, temperature, acidification and sea level rise.

Profound changes may occur at the level of ecosystems and their richness in terms of biodiversity. The gradual increase of terrestrial and marine temperatures will cause the modification of natural habitats, which in the Mediterranean are already subject to intense pressures (pollution, over fishing, habitat degradation, invasive species). Equilibrium conditions of ecosystems will be disrupted and there are many uncertainties about the way in which different species will be able to adapt or otherwise to these changes – their pace of evolution being indeed slower than that of the expected climate changes. A massive loss of biodiversity, in addition to that already projected as a result of direct human pressures, is possible during the 21st century, with a drastic reduction in associated ecosystem services (supply of fresh water, productive soil conservation, resistance to invasive pests, pollination of plants, reproduction of fish resources, moderation of coastal erosion, climate

[2] Report of the 16th Ordinary Meeting of the Contracting Parties to the Barcelona Convention, Marrakesh, 2009. UNEP(DEPI)/MED IG.19/10

[3] http://unfccc.int/adaptation/cancun_adaptation_framework/items/5852.php

regulation...). Ecosystems on land will also be affected by climate change in addition to pressures from human activity. One of the domains where increased risks are already felt is the occurrence of forest fires.

The expected rise in sea level will generate submersion of low coastal areas and the intrusion of marine water into aquifers will cause problems of groundwater salinisation. Furthermore, growing littoralisation of activities and settlements has led to the proliferation of coastal developments, most of which continue to have catastrophic effects in terms of coastal erosion.

Changes in precipitation and evapo-transpiration patterns will affect run-off, river flow and ground water, therefore the availability of freshwater. Climate change will tend to increase the differences of water availability which already exist between the North and South shores of the Mediterranean. A concerted adaptation strategy for water resources is certainly one of the most crucial needs for Mediterranean countries.

Tourism may directly suffer from problems of temperature increase, water supply scarcity, coastal erosion, changes in the marine environment, reduced marine water quality, and possible restrictions or new regulations on coastal infrastructures. Urban areas are particularly sensitive to heat waves, water scarcity, extreme events, and coastal cities may in addition be affected by sea level rise. Energy services and resources will be increasingly affected by climate change, changing trends, increasing variability, greater extremes, and the availability of water.

REGIONAL ADAPTATION FRAMEWORK FOR CLIMATE CHANGE –ADDED VALUE

The Regional Adaptation Framework for Climate Change is intended to be the first regional document that enables establishment of regional institutional mechanisms for successful cooperation between all Mediterranean countries, in dealing with adaptation to climate change impacts in coastal and marine areas. Its strategic objective is to ensure the Mediterranean countries build their capacity to be resilient to the risks and impacts of climate change through implementing adaptation measures; improving decision making and good governance, improving understanding of climate change and their effects; education and awareness; and developing and strengthening partnership and cooperation.

The Regional Adaptation Framework for Climate Change can guide countries to improve and share understanding of climate change impacts, particularly in coastal and marine areas of the region. It will stimulate national capacity building and awareness raising by reviewing and revising policies to incorporate climate change risks in sectoral policies, plans and programmes, improving awareness and mobilization among key stakeholders. In addition, the Framework will help establish a regional system of exchange of information and best practices on adaptation to climate change impacts in key thematic areas of Mediterranean interest, such as freshwater resources, energy, urban areas, tourism, coastal agriculture and fisheries. It will, also, assist establishing partnerships and cooperation between the countries in the Mediterranean and with other regions.

The Regional Adaptation Framework for Climate Change can indicate long term goals, to be further developed in objectives that have to be achieved in the mid-term period (8-10 years), and relevant type of activities at regional and national levels for achieving the established objectives. It will be a flexible document that would be amended or revised over a certain period of time, depending on the monitoring results of its implementation and new findings concerning adaptation to climate change impacts.

By adopting a Regional Adaptation Framework for Climate Change, the Mediterranean

countries may enhance their capacity to introduce climate change issues in policies, plans and programs and for the timely implementation of relevant adaptation measures to address the climate change impacts.

AIM AND OBJECTIVES OF THE REGIONAL ADAPTATION FRAMEWORK FOR CLIMATE CHANGE

The long term vision is that the Mediterranean people, their livelihoods and their environment are resilient to the risks and impacts of climate change.

The overall objectives of the Regional Adaptation Framework for Climate Change are to:

- Help raise awareness and build-up capacities in the Region to take adaptation actions;
- Support adaptation policy setting and planning in coastal and marine areas at the regional and national levels;
- Help countries to identify and undertake concrete adaptive actions to be taken in coastal and marine areas particularly vulnerable to climate change impacts;
- Help establish mechanisms to exchange experience and disseminate knowledge, information and best practices on adaptation to climate change impacts throughout the region and with other regions.

PROCESS TOWARDS ADAPTATION

Development and implementation of comprehensive and reliable adaptation measures is a process that, in principle, consists of five main steps:

1. **Building adaptive capacity**: Establishing systems for data collection and monitoring, evaluation processes, awareness-rising initiatives, and policies to encourage, support and require responsible persons to incorporate climate change risks and adaptation into decision-making.
2. **Integration of Climate Change into Planning**: Integration of consideration of the potential impacts of climate change into policies, plans and programmes. Conducting participatory climate risk and vulnerability assessment. Incorporation of climate change risk into strategic planning exercises.
3. **Identification "Win-Win" opportunities**: Identification of a suite of potential adaptation options. Valuation of the options based on the costs and benefits relative to "doing nothing". Identification and deploying activities that reduce risks across a spectrum of climate change conditions.
4. **Financing:** Allocating funds for implementing the selected activities.
5. **Monitoring and re-assessment:** Monitoring of performance routinely; seeking out for new data and emerging climate science, and re-assessing strategies and actions. Integration of scientific and local knowledge and perspectives.

PRIORITIES FOR ACTION

Three main issues need to be addressed in most of the Mediterranean countries in order to strengthen national adaptation responses to climate change impacts, and they will be dealt with in the coming up chapters:

A. Building information, understanding and capacity to cope with climate change and impacts;

B. Integrating climate change risks and adaptation measures into national policies, plans and programs, and

C. Strengthening national adaptive capacity in priority sectors and developing tools needed to adapt to climate change.

A. Building information, understanding and capacity to cope with climate change impacts

In order to make a proper decision for planning and implementing adaptive measures decision makers have to be well informed. There are substantial gaps in knowledge on impacts of climate change, vulnerabilities to those impacts and effectiveness of adaptation options. Better understanding of climate change and its consequences, not only at the global scale but at the regional scale, is needed in order for better planning and implementation of adaptive measures. This requires research developments focused on the Mediterranean region with respect to atmospheric and oceanic patterns, biological aspects and socio-economic issues, the reinforcement of observation capabilities and of means to collect and make use of data in the various relevant domains. There is also a need to improve the synthesis and dissemination of information for decision-makers. Decision-makers need improved information, guides and tools which are tailored to their field and scope of operation to enable effective adaptation. Translating climate change science into applicable information products through user-friendly materials and tools is necessary to inform decision makers at all levels.

The understanding of climate change and their impacts will be improved by:

- Enhancing human resource capacity for generating, analyzing and managing climate change and their impacts data;
- Sustaining and upgrading existing observation systems, both on climate change and their impacts;
- Developing and implementing scenarios, models and tools for predictions of regional climate change, and risk assessment;
- Developing and strengthening technical data sets and tools for climate observations; and
- Establishing baseline data in different sectors.

B. Integrating climate change risks and adaptation measures into national policies, plans and programmes

Climate change represents a serious threat that policy makers must confront, as it is necessary to plan for this challenge. Adaptation measures implemented now will greatly increase the countries capacity to better adapt to future climate change impacts. Adaptation measures need to be integrated into national/sectorial sustainable development documents at all levels. Priority should be given to adaptation measures that would generate net social and/or economic benefits irrespective of uncertainty in future forecasts,

and to measures that are beneficial for both mitigation and adaptation.

The definition of the proposed measures should fit within the framework and benefit from guidance already agreed or being developed at the international level, and from strategies defined by the Euro-Med countries, the European Union and the League of Arab States. Adaptation measures considered here relate to the coastal zones of the Mediterranean. Measures proposed should obviously be in line with measures already proposed or in preparation in the participating countries at the national level.

C. Strengthening national adaptive capacity and capability in priority sectors and developing tools needed to adapt to climate change.

Most sectors are likely to be affected to some extent by the impacts of climate change. However, the Regional Adaptation Framework for Climate Change focuses on the following priority sectors: biodiversity, freshwater resources, tourism, agriculture, fisheries, urbanization and energy, where:

- There is national significance for social, economic and biophysical or cultural outcomes;
- Actions have a high level of potential to capture the benefits from early adaptation planning.

Adaptive capacity to respond to climate change impacts includes:

- The ability to generate, access and interpret information about climate change and its likely impacts;
- Suitable methods for identifying and assessing potential adaptation strategies;
- Appropriately skilled people;
- Adequate financial and other resources;
- Governance systems with sufficient flexibility and foresight to embrace adaptation planning; and
- Willingness to adapt.

<u>1. Marine and coastal biodiversity and ecosystems</u>

Climate change is a great threat to the Mediterranean ecosystems, whose resilience is already weakened due to pollution, destruction and fragmentation of habitats or over-exploitation of natural resources. The most critical phenomena reported in the Mediterranean are: flooding, inundation, coastal erosion, extreme events, droughts, change of marine mass movements, affected ecosystem functioning, northward shifting of ecosystems, populations migration and distribution; impacts on endemic and rare / endangered species.

The increase in water temperature has been shown to affect organisms and entail constraints which sometimes lead to some physiological adaptations. In some cases when the stress exceeds the tolerance threshold, the life cycle or the distribution of species can be modified and ecosystem will be changed. At present in the Mediterranean, among the direct consequences of global warming, there is a simultaneous increase in the abundance of Mediterranean thermophilic and allochthonous species and the disappearance or rarefaction of “cold” stenothermic species. The southern part of the Mediterranean will be increasingly occupied by tropical exotic species. The northern part is likely be invaded by indigenous warm water species. The cold water stenothermic species will be confined to the north of the basin. They may become rarer with the probable possibility of extinction if

the warming trend continues. On the basis of a moderate climate change scenario, a hypothesis has been forecast for the extinction of 15 to 37% of the species occupying the north-western Mediterranean by 2050. For the time being it does not seem possible to foresee the magnitude of the proliferation of thermophilic species.

For low-mobility species, the consequences of climate change are much more often presented as ecological catastrophes that could lead to local extinctions of species and thus an erosion of Mediterranean biodiversity.

The potential effects of acidification of the oceans on the Mediterranean marine ecosystems have been insufficiently evaluated so far. Even if very little published information is available on the effects of ocean acidification on specific marine organisms inhabiting the Mediterranean Sea, it is agreed that one of the main consequences of an elevated *p*CO2 in seawater will be a reduction in the rate of biogenic calcification in many marine species (e.g. corals, coccolithophores, pteropods, foraminifera, benthic molluscs, echinoderms and crustacea). It is also proposed that ocean acidification will act to increase the oligotrophic nature of the Mediterranean Sea and increase the degree of phosphorus limitation which will contribute to reduced productivity and carbon export[4] (CIESM, 2008).

Freshwater ecosystems will be affected by higher temperature, increased variability in rainfall causing flooding or drought, and changing water quality. Higher water temperature will reduce Dissolved Oxygen (DO) affecting the tolerance of some species. Higher water temperature and reduced DO might alter the REDOX potential resulting in trace metals speciation and bio-availability. Severe water scarcity due to climate change, particularly in South Mediterranean Countries, will reduce rivers flow and nutrients to the coastlines affecting ecosystem and resulting in reduced biodiversity. Extreme events such as flash floods might transport of shocking loads of pollutants to the near-shore marine environment.

Littoral wetlands and river mouths would be affected by sea level rise, changes in the rainfall pattern and erosion. Depending on their configuration they will shrink or retreat landward. Relevant marine and coastal ecosystem and services may be lost with coastal wetlands disappearing. Current plant species richness in the Mediterranean area might be reduced over the twenty-first century due to the projected decreases in precipitation, more frequent forest fires, increased soil erosion and the lack of new species.

With climate change, longer and intense summer droughts, heat waves, strong air dryness and very strong winds, are becoming frequent in the Mediterranean region. As a result large-scale forest fires are fostered, with consequent soil erosion in burnt areas further aggravated by the heavy rains. Forest fires ravaged Spain in 1985, 1989, 1994, burning from 400,000 to 500,000 ha each time – and now again and including Portugal, Italy France, Greece and Morocco in particular.

Overview of possible adaptation measures

The range of adaptation measures to protect coastal and marine biodiversity and ecosystems from climate change impacts is very limited because of human inability to predict ecosystem responses. A key adaptation strategy is to maintain ecological structure and processes at all levels and reduce existing pressures on natural ecosystems, such as pollution, building etc. Reviewing existing and selecting new protected costal and marine

[4] CIESM, 2008. Impacts of acidification on biological, chemical and physical systems in the Mediterranean and Black Sea. No 26 in CIESM Workshop Monographs [F. Briand Ed.], 124 pages, Monaco.

areas, defining conservation objectives and goals, assigning priorities and proposing and implementing adaptive measures is also of a high importance for protecting biodiversity and ecosystems.

In addition to this, it is very important to incorporate adaptive measures for biodiversity and ecosystems protection into adaptation strategies for other key sectors (by applying the ecosystem approach), such as tourism, urban areas, fisheries, freshwater resources, etc.

2. Coastal Freshwater resources

The Mediterranean basin has been identified among the regions in the world most exposed and vulnerable to extreme events mainly drought and floods. Drought trends in this region have increased significantly in the last decades registering serious economic, social, and environmental consequences resulting in land degradation, human migrations, famine, diseases, and loss of human life. Global and regional climate change scenarios foresee a growth of the average annual temperature higher than that of the world level projecting and increasing frequency of drought episodes adding to the complexity of water scarcity management and its future sustainability.

Overview of possible adaptation measures

Adaptation measures for water resources in the countries that are already severely water stressed involved new challenges. Climate change represents a serious threat that policy makers must confront, as it is necessary to plan for this challenge. Though few adaptation and sectoral policies do address, indirectly, risks for human security linked to water and climate change; unfortunately very few national policies in the region explicitly address the link between climate change, water, human security and conflict. [5]

In addressing this uncertain future, it is critical to draw as much strength as possible from the lessons of the past, so as to ensure that the measures chosen, which may vary from country to country, are effective and sustainable. The growing number of competing water management requirements under changing climate conditions place a heavy burden on water managers. Therefore, it is urgent to plan adaptive strategies at river basin, country and at sub-regional level in case of shared water basin, and to work towards strengthening national capacities to deal with climate change issues. It is equally important that country governments integrate climate risk-based approaches, which address climate change, into water policy frameworks.

Freshwater adaptation measures are numerous and can be divided into two major groups:

- **Supply adaptation measures**, which include modification of existing infrastructure, construction of new infrastructure, and alternative management of the existing water supply systems; and
- **Demand adaptation measures**, which include conservation and improved efficiency, technological change (including changes in agriculture), and market/price-driven transfers to other activities.

Soft and hard adaptation measures such as building dams, reservoirs, desalination plants, wastewater recycling, etc. will undoubtedly affect the near-shore marine environment and biodiversity in terms of quality and quantities.

[5] Gerstetter C., Kampa E., McGlade K., Timeus K. ‘Review of international and national policies and institutional frameworks, CLICO, 2011), p.2.

3. Coastal zones management

Mediterranean coastal zones are becoming increasingly vulnerable to impacts of climate change such as sea level rise, coastal erosion, loss of valuable coastal resources, decline in biodiversity etc. Sea level rise is a global phenomenon, and research and data on regional estimations are rather limited. However, some projections indicate a rise of 35 cm by the end of 21st century with differences between West (slight rise) and East Mediterranean (major rise). Sea level rise leads to increasing salinization of the estuaries, reduction of freshwater-tables and saltwater intrusion into coastal aquifers, groundwater and agricultural land. This will seriously affect the water availability and agricultural production in the future.

Due to their topography, low lying coastal zones, lagoons and deltas tend to be the most vulnerable coastal systems to sea level rise, coastal erosion and other climate change effects. In some deltas in the Mediterranean, such as Rhone and Nile delta, vulnerability to sea level rise and erosion is been aggravated with human interference, such as construction of dams which retain sediments and therefore intensify the effects of sea level rise. Aswan Dam on the River Nile, for example, retains around 90% of total sediment that would normally be discharged downstream. The disruption of natural sediment and hydrological flux will also impact the transportation systems through the flooding of roads, railways and transit systems, especially in coastal zones.

Coastal adaptation programmes, projects and initiatives have been undertaken throughout the Mediterranean on different scales and concerning different specific themes. However, there seems to be a lack of a co-ordinated approach to climate change action in the Mediterranean. Implementation of adaptation actions appears to be based mainly on regional directives (for example through the EU) or sometimes by countries proactively sourcing funding. Adaptation to climate change in coastal zones should be incorporated within a comprehensive management framework with strong emphasis on Integrated Coastal Zone Management (ICZM), in which reduction of coastal water abstraction and climate change adaptation should be mainstreamed.

The importance of climate change adaptation is being increasingly recognized in the Mediterranean. The key tool for implementation of adaptation initiatives within the Mediterranean Region under the UNEP/MAP structure will be the ICZM Protocol. In this context, the main challenge today is the building of adaptive capacity throughout the region within the existing framework of the ICZM Protocol.

4. Coastal Tourism

Coastal tourism is a very important economic activity for the entire Mediterranean region. The Mediterranean region hosts a variety of touristic activities, ranging from the visit of historic and cultural sites to organization of conferences, environmental and recreational tourism.

The impact of climate change on infrastructure and the natural environment has the potential to affect the tourism industry. In some cases this could result in social and economic impacts in areas with a high dependency on tourism as a source of income and employment. According to various climate change predictions, the Mediterranean will be too hot during summer, but climatic conditions will improve during spring and autumn. Considering the increasing summer temperatures in northern Europe, it is likely that the Mediterranean and its tourism industry will encounter a decrease in international tourist arrivals in summer and an increase during the shoulder periods (spring and autumn), and the winter season will become more attractive in North Africa. Temperature increase and

drought will enhance forest fires which will affect coastal tourism. Temperature increases may enhance phytoplankton blooms and cause red tide phenomenon, which decreases quality of marine bathing water and negatively impact tourism. Increases in species such as jellyfish also will impact tourism. Many beaches are being eroded, and this will be exacerbated by sea level rise and changes in precipitation.

Moreover, Climate change will negatively affect a country's sustainable development in diverse ways, including water resources, agriculture, biodiversity, energy, all of which can influence the tourism industry. Adaptation measures taken in other domains, with respect for example to water management, coastal protection and construction rules in coastal areas will affect tourism development. Mitigation measures in other domains such as energy policies, transport policies will also affect tourism development. Therefore, adaptation measures in tourism cannot be developed and implemented in isolation. They need to be placed in the context of a country's sustainable development policies and strategies and consider climate change impacts and measures in other sectors.

Overview of possible adaptation measures

Tourism sector has a relative high adaptive capacity. However, the capacity to adapt to climate change is thought to vary between three main groups of actors, e.g. Tourists - tour operators/transports providers/travel agents - hotels/resorts/communities. Tourists have the greatest adaptive capacity, since they have freedom to avoid destinations negatively impacted by climate change. Tour operators and transport providers have less adaptive capacity. Destination communities and hotel owners with large investments in immobile capital assets have the least adaptive capacity.

The tourism industry will adapt in terms of dedicated response to certain changes in given areas, and adaptation measures will be taken by private actors on local level. However, governmental policies have an important role to play in support for the tourism sector and its adaptation efforts, for example, by providing the incentives necessary to the implementation of adaptive measures. Moreover, governmental policies on promoting a more rational management of natural resources on which tourism rests, as well as policies on adaptation to climate change for other sectors of activities will help the touristic enterprises to sustain.

5. Agriculture

Climate change is expected to impact both rain fed and irrigated agriculture, including feed and fodder for livestock. Climate change, particularly temperature increases, changes in annual and seasonal precipitation patterns and in the frequency of extreme events will affect the volume, quality and stability of food production and the natural environment in which agriculture takes place. In extreme cases, the degradation of agricultural ecosystems could mean desertification, resulting in a total loss of the productive capacity of the land in question. Seasonal variations in precipitation patterns and the increased frequency and intensity of extreme weather events would have the most serious impacts on agriculture in the short term.

Based upon climate change scenario in the Mediterranean basin, changes in agricultural crop yields using a well-established numerical model show a general reduction in crop yields basically in the southern Mediterranean rim where a decrease in precipitation and salinity increase are expected. It was estimated for the Middle East region there would be decrease of over 170,000 km^2 in viable rain-fed agriculture land by the late-century. Groundwater recharge will decrease dramatically, by more than 70% between now and 2050 along the southern coast.

Crop growing may become unsustainable in some area at the south. Some models indicate that maize yields in North Africa could fall by between 15 and 25% with $3^{o}C$ rise in temperature. Climate variations will have consequences for the availability of water resources, pests and diseases of soils, leading to significant changes in the conditions for agriculture and livestock production. The frequency and intensity of extreme weather events and seasonal variations in precipitation patterns are the factors likely to have the most serious consequences for agriculture.

Overview of possible adaptation measures

Adaptive measures range from technological solutions to adjustments in farm management or structures, and to political changes, such as adaptation plans. In short-term autonomous farm level adaptation may be sufficient, but in the longer term adaptation in the form of technological changes will become necessary.

6. Fisheries and Aquaculture

Climate change is modifying the distribution and productivity of marine and freshwater species and is already affecting biological processes and altering food webs. The consequences for sustainability of aquatic ecosystems, fisheries and aquaculture, and the people that depend on them, are uncertain.

It is highly probable that the likely effects of climate change, such as seawater temperature increase, acidification, coastal erosion, etc., will contribute towards the perturbation in fisheries in the Mediterranean where the pelagic and benthic species are severely affected by artisanal, semi-industrial and industrial fleets. There could be changes to fish migration pattern, survival, maturation patterns and food webs that would lead to changes in fish opportunities, some positive and some negative, thought it is difficult to predict how this would be balanced. Climate change may also have effects on survival and growth of marine species.

Climate change affects aquaculture. Increased temperature brings about associated changes in the hydrography of water bodies, exacerbates the occurrence of algal blooms and red tides, factors that could have important negative impacts on aquaculture, primarily due to reduced dissolved oxygen concentration. This would affect productivity but also increase vulnerability to diseases. Extreme weather events might have negative impacts on fishing vessels and on aquaculture installations.

Interactions of fisheries and aquaculture subsectors could create other impacts. For example, extreme weather events could result in escapes of farmed stock and contribute to reduction in genetic diversity of the wild stock, affecting biodiversity more widely. According to FAO, certain general impacts on marine and aquatic systems as a result of large-scale changes related to temperature, winds and acidification can be predicted "with a high degree of confidence.

At "rapid time scales" of a few years increasing temperatures will have impacts on the physiology of fish due to limited oxygen transport to tissues at higher temperatures. This will result in changes in distributions of both freshwater and marine commercial species, with most marine species ranges being driven toward the north, expanding the range of warmer-water species and contracting that of colder-water species.

So in addition to changing where fish are found, there is "high confidence" that climate change will cause changes in abundance as well as in "recruitment," the life cycle

processes through which young fish enter the fertile and exploitable adult population as they reach maturity.

Overview of possible adaptation measures

A wide range of adaptations is possible in fisheries, either carried out in anticipation of future effects or in response to impacts once they have occurred. Some of them are implemented by public institutions, others by private individuals. The preparation of anticipatory measures should be commensurate with risk, as excessive protective measures could themselves have negative socio-economic impacts. Concerning the management, there is a need for implementing adaptive holistic, integrated and participatory approaches to fisheries management, as required for an ecosystem approach.

Adequate site selection and aquaculture zoning can be important adaptation measures to climate change. When selecting aquaculture sites it is very important to determine likely threats through risk assessment analysis. When selecting the best location for aquaculture farms weather related risks must be considered.

Activities in other key sectors and related adaptation measures may significantly impact fisheries and aquaculture, by affecting and/or destroying spawning, breeding and nursery areas. In order to avoid it, it is very important to incorporate adaptive measures for the protection of fisheries and marine aquaculture into adaptation strategies for other key sectors.

7. Urban areas

Mediterranean urban areas are mainly concentrated in the vicinity of coastline, where some climate change effects (such as storm surges, sea level rise, flooding episodes, erosion etc.) tend to have particularly strong impacts. The number of coastal cities in the Mediterranean that comprise of minimally 10,000 inhabitants has almost doubled during the second half of the twentieth century.

Southern and Eastern Mediterranean rims are particularly vulnerable, due to the fact that more 50% of the urban population are currently living in area within 10 m of the current sea level. In addition to this, urban areas are usually very densely populated, meaning higher exposure to climate hazards for the residents, with ones living in informal settlements in flood-prone areas being the most vulnerable.

Mediterranean urban areas are also increasingly vulnerable to health hazards, which are partly related to the impacts of ‘urban heat island’ (UHI). UHI is phenomenon of cities absorbing and radiating more heat than non-urban areas due to the large heat capacity of constructed areas. Furthermore, mortality in Mediterranean cities was higher than in the other European cities during the heat waves over the 1990-2000 periods.

Climate migrations in arid countries are already occurring towards cities, which also presents increasing pressure on urban areas. More people moving into urban areas means more infrastructure development such as roads, airports (112 along the Mediterranean coast with more than half having an annual traffic > 500,000 passengers) or the commercial ports and marinas (more than 1,000 in total). This is also followed by construction of other infrastructural facilities, such as those used for freshwater supply, wastewater treatment, energy production and desalinization.

Most of the Mediterranean areas have recently experienced a drought, which can be attributed to climate variability. Climate variability as well as climate change is expected to

alter the present freshwater resources and add pressure on the adaptability of future freshwater resources. This will affect freshwater supply of many of the Mediterranean cities. Sea level rise will affect coastal installations.

8. Energy

A) Climate Resilience of Energy Systems

The energy supply and demand systems are independently and cumulatively sensitive to climate. It is affected by hydro-meteorological and climate factors. While potential climate impacts have been recognized strongly within the energy sector it is mainly as a responsibility for greenhouse gas mitigation rather than the management of impacts on infrastructure and generation capabilities, as well as demand.

To date, decision makers have focused on maximizing energy supplies to satisfy industrial and societal demand for energy while managing the risks perceived to be of immediate concern. Some actions to help mainstream climate considerations into energy sector planning and management in the near-term are envisaged.

B) Energy and water, and climate change

In the Mediterranean, the interactions between water and energy are very strong and extremely vulnerable to climate change. Water is essential to the production of electricity. It is the "fuel" of hydroelectric power, but also the cooling media of thermal power stations. 13% of the electricity generated in the Southern and Eastern Mediterranean countries is hydroelectric, with the rest coming from thermal power stations. This reinforces the need to develop strategies for integrated management of water resources and energy, with a prospective vision.

Climate variability is the source of many hazards and has a very strong impact on almost all of the electricity production-consumption cycle. Some countries have already registered a significant drop in their hydroelectric production due mainly to the decrease in the amount of surface water at the dams. The increased temperature of rivers may result in a significant decrease in electricity production in so far as the discharge temperature downstream power stations must not exceed a limit value.

Within a context of rising trend in demand for water and power supply, the countries bordering the Mediterranean are faced with a number of challenges: manage sustainably water and limited energy resources, provide access to safe drinking water and electricity to non-served populations and encourage users to saving behaviour. These challenges are all the more important as tensions over resources are likely to be exacerbated by the effects of climate change. The expected temperature increase and the decrease in precipitations would lead to both a reduction in resources and an increase in water demand. They would equally create a drop in the production of electricity (hydroelectricity, thermal power plants) and increased demand for energy for the production and mobilization of water (electricity demand for water production already represents nearly 10% of the total demand for electricity in the South and East of the Mediterranean).

NEXT STEPS

This document is a first draft that will need consultations at the national and regional level before it is further developed. The 14th MCSD meeting will provide the first opportunity for suggestions on its content, revision and mechanisms for its future implementation. Following the MCSD meeting a revised draft of the Regional Adaptation Framework for Climate Change in the Mediterranean will be prepared, potentially including targets with indicators, for further consultations. The amended document will be subsequently submitted to the MAP Focal Points meeting scheduled for September 2011, where based on its recommendations, the framework will be further developed for presentation to the Contracting Parties of the Barcelona Convention if appropriate.

Appendix 1. Draft goals, outcomes and potential actions of the Regional Adaptation Framework For Climate Change In The Mediterranean

Objectives	Targets by 2020	Actions at the regional level	Action at the country level
A. Building information, understanding and capacity to cope with climate change impacts			
Enhanced capacity for monitoring of climate change. Enhanced capacity to assess socioeconomic and environmental impacts of cc	Data collection systems and institutional arrangement sustained and upgraded; Technical data sets developed and strengthened and tools for climate observations developed.	In order to improve the understanding of climate change and their likely impacts and strengthen national adaptive capacity in the Region to respond to climate change impacts at the regional level it is planned to: • Developing a regional framework monitoring programme for climate change and variability and their impacts, including reinforcement of research actions and observation networks; • Establishing a regional Clearing House mechanism on information concerning adaptation best practice to climate change impacts; • Establishing an early warning system for climate type alerts; • Establishing a regional programme for training and education of national experts on climate change monitoring, vulnerability assessment and adaptation planning; • Establishing a regional programme for awareness raising of national stakeholders on climate change impacts, vulnerabilities and adaptation measures; • Strengthening partnership and cooperation among the Mediterranean countries; • Recognizing and strengthening some of national or regional institutions as regional/sub-regional center(s) of excellence for providing technical assistance to countries on various issues concerning climate change impacts, vulnerability assessment and adaptive measures; • Developing common methodologies and tools for assessing environmental and socio-economic impacts of climate change and variation; • Developing a methodology and tools for calculating costs of climate change and variation impacts and relevant adaptation measures.	In order to establish a national decision making system, it is important to create a designated national climate change coordinating unit or institution, as appropriate, with appropriate operational branches (e.g. dedicated to climate change monitoring and climate change response) involving relevant responsible authorities, ministries, public institutions and academic/research institutions with the following mandate: • Enhancing existing institutional and human capacity to observe, predict and monitor climate change and impacts; • Developing and implementing national monitoring programmes focused on climate change; • Improving climate-related research and systematic observation for climate data collection, archiving, processing and modelling in order to provide decision makers at the national level with improved climate-related data and information; • Strengthening education and public awareness; • Identifying vulnerable areas at the national coast and assessing risks to climate change and variation impacts; • Assessing environmental and socio-economic impacts of climate change at all national vulnerable areas in order to define adaptation measures as precisely as possible. • Scientists and Coastal Engineers better understand the marine dynamic systems related to climatic variability and sea level rise.

Objectives	Targets by 2020	Actions at the regional level	Action at the country level
B. Integrating climate change risks and adaptation measures into national policies, plans and programmes			
Climate change impact issues are considered in all development documents concerning and adaptation measures to expected climate change impacts are integrated and implemented.	Climate change related issues introduced into National Strategy for Sustainable Development and other policy documents at all levels and across all sectors; National legislation concerning integration of climate change and variation issues into national policies, plans and programmes concerning management of coastal zones developed and adopted; Adaptation measures to the adverse effects of climate change and variability developed and implemented at all levels; Appropriate adaptation measures integrated into national/sectoral developing documents and linked to the budgetary process	• Developing methodology and tools for integrating climate change adaptation issues into national policies, plans and programmes • Developing methodology and tools for developing national adaptation plans	• Developing and adopting national legislation on introducing climate change issues into national policies, plans and programmes concerning coastal zone managements; • Developing, implementing and reviewing policies, plans and programmes concerning management of coastal zones, which contain provisions on climate change impacts. This includes integrating climate change considerations into existing policies and strategies; • Identifying national adaptation priorities, with stakeholders participation; • Developing national sectoral adaptation plans and programmes based on the priorities identified; • Designing national adaptation programmes; • Establishing and maintaining community and essential services to deal with the impacts of climate change; • Committing budgets for adaptation programmes as appropriate; • Developing and implementing legislation to ensure that climate impacts are taken into account when preparing SEA and EIA.

Objectives	Targets by 2020	Actions at the regional level	Action at the country level
C. Strengthening national adaptive capacity and capability in priority sectors and developing tools needed to adapt to climate change.			
1. Marine and coastal biodiversity and ecosystems			
Coastal and marine ecosystems are resilient to the impacts of climate change as much as possible Climate change related biodiversity issues are better integrated into national policies and planning practices	Selected coastal and marine areas are protected from climate change impacts by appropriate adaptive measures Climate change impacts on biodiversity and ecosystems are introduced into national policies plans and programmes	• Developing regional guidelines for preparing national adaptation strategy for protecting coastal biodiversity and ecosystems from climate change impacts. • Developing and elaborating an assistance programme to countries to address the climate change issue and its impacts on natural marine habitats and endangered species • Implementing a regional raising programme on climate change and biodiversity to increase public/institutional awareness on the effect of climate change on marine and coastal biodiversity • Creating and managing an open-access, regional database (including scientific literature, GIS-based thematic maps, etc.), usable at several levels, to feed relevant existing Clearing House Mechanisms on climate change • Elaborating indicators of climate change impact on biodiversity in specially protected areas • Establishing a network of sampling sites, preferably within the system of Mediterranean Marine Protected Areas, to measure biodiversity variables linkable to climate change • Developing adequate research lines addressing gaps on knowledge about the effect of climate change on marine and coastal Mediterranean biodiversity	• Introducing adaptive measures for protecting coastal and marine biodiversity and ecosystems into adaptation strategies for various key sectors • Developing and adopting national adaptation strategy for protecting biodiversity and ecosystems from climate change impacts • Inventory the hot- spots (more endangered sites and areas by climate change) in coastal and marine zones • Reviewing existing and selecting new protected costal and marine areas, defining conservation objectives and goals, assigning priorities and proposing and implementing adaptive measures • Developing national specific awareness actions and initiatives (conferences, expositions, other manifestations • Organizing regional, sub-regional and national training on the topic • Developing adequate national research lines addressing gaps on knowledge about the effect of climate change on marine and coastal Mediterranean biodiversity • Reinforcing legislation on coastal land use by adapting it to climate change predictions

Objectives	Targets by 2020	Actions at the regional level	Action at the country level
C. Strengthening national adaptive capacity and capability in priority sectors and developing tools needed to adapt to climate change.			
2. Coastal freshwater resources			
National freshwater resources, by water quantity and quality, meet needs of every Mediterranean country	Freshwater quality is resilient to climate change impacts.	• Developing regional guidelines on mainstreaming climate change impact issues into national policy framework on freshwater management • Developing regional guidelines and tools to ensure that the River Basin Management Plans are climate-proofed; • Enhancing regional cooperation and stressing the importance of regional initiatives facing climate change effects	• Assessing of national legislation in terms of its capacity to support adaptation to climate change and improving it, if necessary; • Mainstreaming climate change impact issues into national policy framework on freshwater management; • Mainstreaming climate change issues into river-basin management plans; • Developing and implementing National Water Resource Management Plans and Priority Catchment Plans; • Addressing impacts of climate change on potential contamination of drinking water; • Assessing need for new or revised standards of discharges of various types effluents into water body to protect water quality; • Implementing measures to reduce water leakages from water distribution network • Developing and implementing measures to enhance water efficiency in key sectors of consumption (tourism, agriculture and households); • Strengthening national capacities to deal with climate change issues within the water sector. • Enhancing institutional coordination to improve the ability of countries to progress towards innovative interventions for addressing threats of climate change and water scarcity.

Objectives	Targets by 2020	Actions at the regional level	Action at the country level
C. Strengthening national adaptive capacity and capability in priority sectors and developing tools needed to adapt to climate change.			
3. Coastal zone management			
Effective and proactive adaptation to climate change, leading to reaching sustainable development of coasts and healthy environment	Coastal zones well protected from climate change and variability hazards due to the well performed adaptation plans, projects and programs	• Developing regional guidelines on adaptation to climate change impacts in coastal and marine zones • Encourage sharing of good practices, experiences and tools for adaptation at the regional level. • Promote ICZM Protocol as priority tool for encouraging adaptation efforts on regional level	• Developing the national framework as a consistent approach for coastal adaptation to climate change. • Incorporate climate change and variability issues into national policies, plans and programmes concerning management of coastal zones • Use capacity building and climate change mainstreaming as tools to support operative climate change adaptation. • Identifying coastal adaptation prerogatives on national scale, with assistance of stakeholders • Supporting stakeholders in their adaptation efforts, through the development or strengthening of legal, economic and financial instruments that are essential to encourage the implementation of adaptation strategies • Performing pilot projects based on knowledge management and dissemination in order to ensure that lessons-learned can be widely disseminated beyond the pilot site. • Combine top-down and bottom-up approaches in coastal adaptation, with decentralized project management when comes to projects at local scale

Objectives	Targets by 2020	Actions at the regional level	Action at the country level
C. Strengthening national adaptive capacity and capability in priority sectors and developing tools needed to adapt to climate change.			
4. Coastal tourism			
Mediterranean coastal tourism industry is resilient to climate change impacts.	Coastal tourism sector in the Region is accommodated to climate change impacts	Developing of regional guidelines and tools for integrating of climate change issues into national adaptation strategy for tourism	• Developing and implementing a national adaptation strategy for tourism; • Developing and implementing national policies, plans and programmes, based on the strategy; • Developing and implementing legislation concerning energy efficient touristic buildings; • Implementing measures for sustainable water use in touristic complexes; • Developing and implementing regulations for building touristic complexes and installations to avoid impacts of sea-level rise; • Developing and implementing measures to avoid forest fires, and an emergency plan in the case of forest fires.
5. Agriculture			
Agriculture in the region resiliant to climate change impacts.	Farmers are aware on climate change impacts on agriculture and implementing adaptive measures.	Developing of a regional adaptation strategy to climate change in agriculture	• Developing and implementing national adaptation strategies to climate change in agriculture. • Identifying vulnerable areas and sectors and assessing needs and opportunities for changing crops and varieties in response to climate change; • Supporting agricultural research and experimental production aiming at crop selection and development of varieties best suited to new conditions; • Building adaptive capacity by awareness raising and provision of salient information and advice on farm management; • Enhancing investment in improved efficiency of irrigation infrastructure and water use technologies, as well as management of water resources; • Developing irrigation plans based on thorough assessments of their impacts, future water availability and water needs of different users, taking account of the balance between demand and supply.

Objectives	Targets by 2020	Actions at the regional level	Action at the country level
C. Strengthening national adaptive capacity and capability in priority sectors and developing tools needed to adapt to climate change.			
6. Fisheries and Aquaculture			
• Sustainable fisheries respecting climate change impacts and implementing the ecosystem approach established in the entire Mediterranean region. • Aquaculture is sustainable in the region and does not affect negatively key ecosystems for wild commercial species.	Ecosystem approach applied in establishing national adaptation strategies for protecting fishing resources from climate change impacts	• Reinforce regional bodies for fisheries management regarding climate change influence on fisheries and aquaculture • Developing adequate research lines addressing gaps on knowledge about the effect of climate change on fisheries • Implementing a multilateral programme of monitoring links among climate change and seasonal and long term stocks fluctuations • Implementing a multilateral programme of monitoring links among climate change and commercial alien species trends • Develop a programme for ecological restoration of near shore, wetlands and river-mouth nursery areas • Undertake a feasibility study on the creation of a lethal osmotic barrier within Suez Canal to stop further Eritrean alien species transit	• Introducing adaptive measures for protecting key coastal and marine live resources and their ecosystems into adaptation strategies for fisheries and aquaculture • Developing and adopting national strategies for the conservation of commercial fishes breeding and nurseries hot spots • Developing socioeconomic studies on commercial alien species trends and their links to eventual native species depletion
7. Urban areas			
• Mediterranean urban areas are resilient to the impacts of climate change • Reduced vulnerability of urban dwellers and reduced economic losses in respect to climate change	All large Mediterranean cities have developed their City Climate Change Adaptation Plan		• Developing a City Climate Change Adaptation Plan • Revising the city land use strategy and action plan to incorporate climate change issues and adaptation measures; • Auditing existing infrastructure and development plants and orientations • Retrofitting adaptation measures in existing infrastructure; • Preparing adaptation monitoring and audit guidelines to keep track of adaptation performance; • Improving early warning systems for floods, storms and tidal conditions, when necessary

Objectives	Targets by 2020	Actions at the regional level	Action at the country level
C. Strengthening national adaptive capacity and capability in priority sectors and developing tools needed to adapt to climate change.			
8. Energy			
A) Climate Resilience of Energy Systems			
Energy systems in the Mediterranean countries are resilient to climate change	National adaptive strategy for energy sector developed in all Mediterranean countries	• Supporting awareness raising and knowledge exchange on climate risks and adaptive responses in the energy sector; • Transferring best practice for the management of current hydro-meteorological/climate variability to energy projects in developing countries and ensuring access to relevant data and information; • Developing project screening tools to screen individual energy projects for climate vulnerability and risks, either retrospectively or during project planning and implementation; • Developing adaptation standards for the energy sector, tailored to developed and developing countries (as necessary).	• Developing national adaptive strategy for energy sector • Assessing climate impacts on the energy supply chain and information needs to identify the climate data/ information needed to plan an effective response; • Identifying no regret measures that make sense regardless of the degree of climate impact; • Translating scientific data and knowledge into information relevant to energy sector decision-making; • Expanding economic assessments at all levels including detailed assessments of the costs and benefits of adaptation for site specific investments and national/ sector policies; • Identifying policy Instruments needed to support climate change impacts management.
B) Energy and water, and climate change			
Biodiversity and ecosystems are protected from climate change impacts on the energy sector	Climate change impacts on coastal biodiversity and ecosystems are mainstreamed into national policies on adaptation to climate change in the energy sector		• Introducing of climate change impact issues on coastal biodiversity and ecosystems into national planning; • Analyzing long-term climate change impacts on water flows and river temperatures for the design and future management of electricity production plants; • Improving the efficiency of existing hydroelectric plants and installing energy transfer stations; • Planning and constructing micro-hydroelectric power plants; • Developing demand management policies likely to reduce losses and misuses, to manage water resources equitably while ensuring that the different uses are satisfied; • Increasing energy efficiency in various sectors.

Appendix 2: Some of the Partnerships and Initiatives in the Region

Project/Initiative	Objective
NATIONAL PROJECTS SUPPORTED BY GEF	
Adaptation of the Nile Delta to climate change through integrated coastal zone management: GEF-UNDP Project (2009-2014)	The main objective is to integrate the management of sea lever rise risks into the development of Egypt's Low Elevation Coastal Zone (LECZ) in the Nile Delta.
Identification of adaptation response measures in the Drini - Mati River Deltas: GEF-UNDP Project (2008-2012) http://www.ccalb.org/	The overall development goal of this Medium Size Project is to assist Albania in establishing a mechanism by which strategies to moderate, cope with, and take advantage of the consequences of climate change are enhanced, developed, and implemented.
REGIONAL PROJECT SUPPORTED BY EC	
Med-CLIVAR: Mediterranean CLImate VARiability and Predictability: (2008-2011) http://www.medclivar.eu/	The main objectives of the project are: Description of climate past evolution; Assessment of climate variability at different space and time scales; Understanding the mechanisms responsible for the observed climate variability; Identifying trends and providing climate prediction in relation to future emission scenarios; Study of the occurrence of extreme events and climate change impacts
CIRCE: Climate Change and Impact Research: the Mediterranean Environment: (2007-2011) http://www.circeproject.eu/	CIRCE aims at developing for the first time an assessment of the climate change impacts in the Mediterranean area. The objectives are: to predict and to quantify physical impacts of climate change in the Mediterranean area; ·to evaluate the consequences of climate change for the society and the economy of the populations located in the Mediterranean area; to develop an integrated approach to understand combined effects of climate change; to identify adaptation and mitigation strategies in collaboration with regional stakeholders.
CIRCLE –MED: Climate Impact Research Coordination for a Larger Europe - Mediterranean Group http://www.circle-med.net/	CIRCLE-MED is a geographical group in the frame of CIRCLE ERA-Net. It aims at creating a Mediterranean research community network through collaborative research projects on Climate Change Impact Research, with the objective to bring the results of this research to policy and decision-makers.
The ACQWA Project (Assessing Climate impacts on the Quantity and quality of Water) (2008-2012) http://www.acqwa.ch/	The goal of the project is to use advanced modelling techniques to quantify the influence of climatic change on the major determinants of river discharge at various time and space scales, and analyze their impact on society and economy, also accounting for feedback mechanisms. The focus will be on continuous transient scenarios from the 1960s up to 2050

Project/Initiative	Objective
REGIONAL INITIATIVES	
The Mediterranean Climate Change Initiative (Athens, 22 October 2010) www.medclimatechangeinitiative.org	This initiative is designed to be an autonomous political initiative as well as a projects-based initiative eligible for Union for the Mediterranean (UfM) branding. It aims to accelerate the region's responses to the impacts of climate change. This new initiative is envisaged as both an autonomous Mediterranean political initiative influencing international and regional agreements through common policy positions, as well as an initiative implementing projects under the auspice of the Union for the Mediterranean. The proposed Priority Work Areas for the Mediterranean Climate Change Initiative are as follows: *Mediterranean Climate Sensitive Development Charter:* Building on existing UNFCCC, EU and national strategies, this document would ensure that the full extents of climate change impacts are fully understood for the region. *Sustainable Mediterranean Cities:* Cities, and how they can be a key part of the solution to climate change, will be a major component of the Mediterranean Climate Sensitive Development Charter above. *Mediterranean Climate Change Fund:* The Mediterranean Climate Change Fund would attract funding from existing sources – the UN, EU, central governments, development banks, and sovereign and infrastructure funds. *Mediterranean Climate Change Service Network***:** The Climate Change Service Network could build on the work of existing scientific research institutes in the region to offer analysis on environmental, economic and social impacts at the regional and local level, assure fast response and facilitate efficient and timely cooperation.

Project/Initiative	Objective
Sustainable MED program www.cmimarseille.org/Sustainable-MED.php	The overall objective of this World Bank program is to "integrate environment within the economic development agenda of the Mediterranean following a shared common vision." Climate variability is among the three areas of intervention for the first phase. As regard to the participating countries, projects under implementation are as follows: • Egypt: Alexandria coastal zone management project; • Croatia: Coastal Cities Pollution Control 2 (Phase II); • Bosnia and Herzegovina: Neretva and Trebisnjica Coastal Management Project; • Syria: Coastal and Orontes River Basins Water Resources Management; • Libya: Integrated Coastal Zone Management for Conservation and Economic Development; • Morocco: Integrated Coastal Zone Management for Lake Nador

Project/Initiative	Objective
European Investment Bank (EIB) - Climate Action http://www.eib.org/projects/topics/environment/climate-action/index.htm	The EIB supports the EU's goal of low-carbon and climate-resilient growth within and **outside the Union**. The EIB's financing in these sectors is one of the largest among international financial institutions: **in 2010, the Bank invested EUR 21bn in climate action, of which EUR 19 bn in the EU**. Acting as a financial leader supporting innovative clean and climate-resilient technologies, the EIB is committed to catalyzing investment with partners both within and outside Europe. The Bank already dedicates 20% of its overall lending to climate action. This target, established by the EIB in 2010, is meant to progressively increase in future years. The EIB's climate action focuses both on low-carbon investments that mitigate greenhouse gas emissions and on climate-resilient projects that improve adaptation to climate change impacts. The Bank considers mitigation and adaptation measures to be complementary in the fight against climate change. Financing activities in these two areas are developed within the framework of the EIB's sector lending policies and approaches, particularly those concerning energy, transport, water, wastewater, solid waste, forestry, and research, development and innovation.
Southern and Eastern Neighbours Instrument http://ec.europa.eu/europeaid/where/neighbourhood/overview/index_en.htm	The European Neighbourhood and Partnership Instrument (ENPI), within the EU (for the period 2007-2013). The ENPI is the main source of funding for the 17 partner countries[6]. The main purpose of ENPI is to create an area of shared values, stability and prosperity, enhanced co-operation and deeper economic and regional integration by covering a wide range of co-operation areas. For the period 2011-2013 it foresees actions on climate change under its priority area 3, "A Sustainable Development for the Mediterranean".

[6] Algeria, Armenia, Azerbaijan, Belarus, Egypt, Georgia, Israel, Jordan, Lebanon, Libya, Moldova, Morocco, Occupied Palestinian Territory, Russia, Syria, Tunisia and the Ukraine.

Project/Initiative	Objective
The New Partnership for Africa's Development (NEPAD). http://www.nepad.org/	The NEPAD is a program of the African Union, adopted in Lusaka, Zambia in 2001. Climate Change and Natural Resource Management programme within NEPAD plays a co-ordinating and advocacy role to promote regional and national programmes aimed at counteracting these environmental threats. NEPAD believes that addressing environmental issues is a pre-condition for its other goals of sustainable growth and development. The programme works to bring together all relevant regional and continental players to con-ordinate, share knowledge and encourage one another in addressing the threat of climate change. The objective of the programme is to assist countries in integrating climate change responses into their national development processes. The programme aims to strengthen skills in adaptation, mitigation, technology and finance to combat environmental change. The climate change programme works through a variety of mechanisms to meet its goals, including: • Facilitating brainstorming and conferences across the continent; • Assisting where possible with the work of climate change scientists in the region; • Supporting the African Ministerial Conference on the Environment meetings; • Participating in relevant climate change conferences; and • Preparing policy briefs and providing technical support in building African positions. The programme is also looking to start collecting data and information on climate change mitigation and adaptation on the continent. The objective is to establish a database of relevant climate change information. The programme is also looking to develop sub-regional climate change frameworks. The programme focuses on three key areas: • Environment; • Water; • Energy.

Project/Initiative	Objective
The Arab Climate Resilience Initiative (ACRI) www.arabclimateinitiative.org/	ACRI is based on the *Arab Declaration on Sustainable Development* of the Arab Ministers Responsible for Development, Planning and Environment, of 2002; on the *Arab Ministerial Declaration on Climate Change* issued by the Council of Arab Ministers Responsible for the Environment, of 2007; and on the resolution of the Arab Summit on Climate Change, of 2010. The overall objective of ACRI is to build the foundations of a regional platform to provide support for Arab countries in their processes of building and gaining knowledge related to climate change priorities, develop capacities to respond through strategic programmes and policies, and establish partnerships and other cooperation modalities to undertake joint work to address this challenge that has both local and global effects. The programming areas of the ACRI framework include the following: 1. Supporting institutional capacity to address the impacts of climate change; 2. Supporting local approaches to climate change adaptation; 3. Enhancing resilience in the three priority areas of water and food security, sea-level rise and coastal erosion, and sustainable energy

Project/Initiative	Objective
MENA Regional Business Strategy to Address Climate Change:	The World Bank has adopted this strategy in 2008. The overall objective of the strategy is to support MENA countries in their mitigation and adaptation efforts to climate change. The Bank is concentrating on interventions expected to have large benefits and to achieve rapid institutional reform that increases the climate resilience of vulnerable sectors, as well as on pilot projects with the potential to be scaled up quickly or transferred broadly. The World Bank is supporting studies as well as projects to enhance the region's resilience to the impacts of climate change in the key sectors. Examples include: development of localized climate scenarios for the MENA region; evaluation of climate change impacts on water and agriculture in Morocco and on oak forest ecosystem in Tunisia. On mitigation, the Bank is promoting, with support from the Clean Technology Fund, a number of initiatives aimed at reducing the carbon footprint of the energy and transport sectors in Egypt and Tunisia. The Bank is also helping develop the region's huge potential in renewable energy resources.
The Euro-Mediterranean Clearing House for the Environment - An Internet Portal to navigate the Mediterranean "Sea" of Information on the Environment http://smap.ew.eea.europa.eu/	This Clearing House Portal is an open access, web based information system designed to facilitate access and exchange of environmental information in the Mediterranean region. It collects, organizes and provides brief descriptions of information available in various other web sites, portals and online databases through consistent metadata. The information in the Clearing House is collected and published through joint efforts of a network of environmental actors of the region including regional environmental projects and organisations, Ministries of Environment and affiliated agencies, universities etc. The Clearing House provides shortcuts to information on a wider range of environmental topics, including climate change.