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Overview of climate variability and change adaptation in coastal zones in participating countries



Together for the Mediterranean

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September 2013

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List of Abbreviations

CLIM-RUN	Climate Local Information in the Mediterranean Region Responding to User Needs
GWP-Med	Global Water Partnership Mediterranean
ICZM	Integrated Coastal Zone Management
IPCC	International Panel on Climate Change
IWRM	Integrated Water Resources Management
MAP	Mediterranean Action Plan
MCCI	Mediterranean Climate Change Initiative
MCSD	Mediterranean Commission on Sustainable Development
NSSD	National Strategy for Sustainable Development
PAP/RAC	Priority Actions Programme Regional Activity Centre
PB/RAC	Plan Bleu/Regional Activity Centre
PEGASO	People for Ecosystem-based Governance in Assessing Sustainable development of Ocean and coast
TNA	Technological Needs Assessment
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WMO	World Meteorological Organisation

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0 Introduction

0.1 The “Climate Variability & ICZM” Project

The “*Integration of climate variability and change into national strategies to implement the Integrated Coastal Zone Management (ICZM) Protocol in the Mediterranean*” project (in further text: the “ClimVar & ICZM Project”) is a three year project (2012-2014) funded by the GEF and coordinated by UNEP/MAP. The countries participating in the project are Albania, Algeria, Bosnia and Herzegovina, Croatia, Egypt, Libya, Morocco, Montenegro, Syria, Tunisia, and Palestine. The project’s executing partners are Plan Bleu / Regional Activity Centre (PB/RAC), Priority Actions Programme / Regional Activity Centre (PAP/RAC) and Global Water Partnership – Mediterranean (GWP-Med).

The overall goal of the project is to promote the use of ICZM in the participating countries as an effective tool to deal with the impacts of climate variability and change in coastal zones, by mainstreaming them into the ICZM process. Specific objectives of the project are:

- To strengthen knowledge on regional climate variability and change and their impacts and define their specific characteristics in the Mediterranean region;
- To strengthen partnerships, improve capacity building and establish mechanisms for exchange of data and information for integration of climate variability and change into concrete ICZM policies, plans and programmes.

0.2 Scope and structure of the report

The present report forms the Annex IV of the project’s Inception Report which is expected to be discussed and adopted by the 4th Steering Committee of the MedPartnership.

It is viewed as a first step towards the further development of activities by co-executing partners with an ultimate aim (by the end of the project in 2015) to develop policy recommendations for discussion with policy makers on the integration of climate issues into coastal zone planning.

The first part of the report presents an overview of the participating countries’ national communications to the UNFCCC and their Technology Needs Assessments (TNA) reports. It also presents the regional and national assessments undertaken in the preparation phase of the project as well as other relevant major reports published since.

Based on the above discussion, the second part of the report presents an overview of the climate change impacts and hotspots in the participating countries.

The third chapter presents an overview of other relevant projects and initiatives in the Mediterranean including those mentioned in the National Reports.

1 National and regional reports on climate variability and change

1.1 Countries' communications to the UNFCCC

All the participating countries in the project are Contracting Parties to the UNFCC Convention and as such have the obligation to submit national reports on implementation of the Convention to the Conference of Parties (COP).

Except Croatia, which is part of the Annex 1 countries, all the participating countries are Non-Annex 1 Parties. With the exception of Libya and Palestine, all countries have submitted their Initial National Communication (NC1). Croatia is the only one to have submitted its fifth communication to the Convention. Five countries (Albania, Algeria, Egypt and Morocco) have recently submitted their Second National Communication (NC2).

The national communications submission status is summarized in the following table:

Country	National Communications (year submitted)				
	NC1	NC2	NC3	NC4	NC5
Albania	2002	2009			
Algeria	2001	2010			
Bosnia and Herzegovina	2010				
Croatia	2002	2007	2007	2007	2010
Egypt	1999	2010			
Libya					
Montenegro	2010				
Morocco	2001	2010			
Palestine					
Syria	2010				
Tunisia	2001				

Table 1: National Communications to the UNFCCC

In these communications, climate vulnerability assessments of coastal zones and marine ecosystems were based on qualitative and sometimes quantitative analyses of the impacts of climate change and especially sea-level rise using the IPCC scenarios up to the year 2100. Sensitivity analyses were carried out by projecting high- and low-emission scenarios on future sea level changes and predicting impacts on coastal zones and resources.

The following negative impacts were commonly identified: erosion and setback of coastlines; increase in salinity in estuaries and wetlands; degradation of coastal ecosystems; saltwater intrusion into aquifers; beach and land losses; decrease in productivity of coastal fisheries.

The degree of detail of the climate impacts specifically on the coastal zones varied among countries. For example Egypt has conducted a detailed study and scenarios on the biogeophysical and socioeconomic impacts of sea level rise on the Nile delta, while Albania has focused on coastal biodiversity.

The main findings of these National Communications as well as the potential environmental and socioeconomic impacts together with the relevant findings of the National Reports under the project's preparatory phase are presented in Chapter 2.

1.2 Countries' reports during the project's preparation phase

During the preparation phase of the project, each participating country was requested to produce a National Report on the current status of climate variability and change, the national experience in dealing with climate issues, vulnerable areas from climate-related impacts and on country needs for improvement of national capacity for climate change monitoring, vulnerability assessment and adaptive measures implementation.

As of September 2013, all participating countries have submitted their reports but the Libyan and Tunisian reports are still pending.

More specifically, the reports were requested to have the following structure:

1. Assessment of the current practice in dealing with climate variability and change (also mentioning any integration of climate issues to ICZM strategies and plans)
2. International, bilateral and multilateral projects on climate variability and change, vulnerability assessment and adaptation measures
3. Monitoring Programs, data base and registered climate variability and change (including an overview of observed climate variability, models in use, impacts, capacity gaps)
4. Vulnerable areas in the coastal zone

5. Country's capacities in dealing with climate variability and change issues (including a list of institutions dealing with climate variability and change issues, information on public awareness, relevant stakeholders and mechanisms to ensure exchange of information and knowledge)
6. Proposals for the full-size project (including information on the assessed needs for training of national experts, national priorities for the full-size project)

A major objective for the preparation of these reports is the countries' initial contribution to Component 1 of the project whose aim is to assess national programs and capacities for monitoring and tracking Climate Variability and Change and its impacts, to achieve a consensus among the participating countries on a mechanism for climate data sharing and to develop an online multi-country Information Sharing Platform on climate data in coastal areas.

The present report focuses on the status, trends and potential impacts of climate variability in the participating countries' coastal zones as presented in the above mentioned reports as well as the national communications to the UNFCCC. This overview for each country is presented in the following chapter.

1.3 Regional reports prepared during the project's preparation phase

During the preparation phase of the project (2011), two regional reports were prepared in order to assess the climate monitoring and predicting capacities in the participating countries and the expected climate impacts in the region.

More specifically, the two reports are:

- *“Regional Assessment of regional experience on climate variability and change monitoring and predictions in the Mediterranean area”* prepared by the Euro - Mediterranean Center for Climate Change, Bologna, Italy.
- *“Regional experience on assessing impacts of climate variability and change in the Mediterranean area”* prepared by Maria Snoussi from the «Environnements Côtiers et Changements Climatiques» Research Group in the Université Mohamed V, Rabat, Morocco.

This section gives an overview of the main findings of these two regional reports.

1.3.1 Regional report on climate monitoring and predictions

This report objective was to perform a regional assessment of the countries' experience on climate variability and change monitoring and prediction, existing data, gaps, and of the needs for the improvement of national capacities.

The report initially presents and discusses a short overview of the main features of the Mediterranean basin climate and its possible changes as a result of climate change.

The report then provides an overview of regional climate monitoring programmes in the region presenting a number of relevant observing programmes and networks involving Mediterranean and North African countries, along with related data archives.

Furthermore, an overview of existing datasets and climate modelling in the Mediterranean region is presented with a focus on the CIRCE models which allow a more detailed and realistic investigation of Mediterranean climate variability and change.

The report then provides an analysis of the different types of indicators suitable for climate studies in the Mediterranean Region.

The sixth chapter of the report in order to overcome the knowledge deficit in the human capital of the participating countries proposes training programs including the development of an extensive, jointly managed, Fellowship and Exchange programme for the Mediterranean Region and developing Twinning Initiatives between institutions to strengthen regional ties and improve management skills, and recommends that implementation projects contain a strong component of training aimed to make sure that local personnel will be able to maintain and operate the systems after the conclusion of the project.

Finally, the report provides a set of key recommendations aimed at

- o the improvement of climate modelling of the Mediterranean area,
- o supporting the full implementation of regional systematic observation activities and enhancing national capacities for climate monitoring,
- o enhancing the indicators-based studies over the Greater Mediterranean Region
- o supporting training activities over the Mediterranean region

1.3.2 Regional report on the experience on assessing climate change impacts

The aim of this report is to provide information on experience in dealing with climate variability and change impacts on the coastal zone and on the needs for improvement of their national capacity for climate change and variability monitoring and impacts assessment.

The report firstly provides an overview of existing monitoring programmes and relevant data and indicators on climate change and variability impacts in the participating countries, a list of the implementing institutions and a preliminary analysis of relevant capacity gaps. A list of 47 environmental, socio-economic and governance indicators is proposed, structured in 9 sub-categories as follows:

<i>Category</i>	<i>Sub-category</i>	<i>Indicator</i>
Environment	Climate and atmosphere	1. Temperature
		2. Precipitation
		3. Atmospheric CO2 and other GHG concentrations
		4. Climate Indices (T, P, humidity)
		5. Storms
		6. Droughts
	Marine and coastal zones	7. Sea Surface Temperatures (SST)
		8. Relative Sea Level Rise
		9. Characteristics of Storm Surges
		10. Coastal Erosion / Coastal Retreat
		11. Thermohaline Circulation
		12. Sea water intrusion
		13. Coastal setback
	Marine/coastal ecosystems and biodiversity	14. Biodiversity (genetic, species, ecosystems, invasive)
		15. Distribution of species (spatial, trophic level)
		16. Abundance of species (biomass, number, density)
		17. Production and reproduction (incl., prim./second.)
		18. Trophic interactions (e.g. predator-prey relationships)
		19. Species health (at-risk, bioaccumulation, pathogens)
		20. Water quality
		21. Habitat quality (types and status, sea level change, sediment quality, land-/bottomscape integrity)
	Terrestrial/ Coastal ecosystems	22. Growing Season
		23. Plant Phenology
		24. Changes in Species behavioral patterns
		25. Storm Events
		26. Changes in Ecosystem Composition
		27. Ecosystem Fires
	Hydrology and water resources	28. Annual river discharges
		29. Frequency of low and high river flows
		30. Fresh Water Availability

Socio economic	Economic sectors	31. Energy Consumption
		32. Number of Weather Related Catastrophic Events / Insurance
		33. Tourism / Number of Tourists in coastal resorts
		34. Infrastructures at risk of inundation
		35. Beaches at risk of erosion
		36. Agriculture: Crop suitability; pest and diseases
	Human security	37. Number of Weather Related Catastrophic Events (Floods, droughts)
		38. Population at risk of inundation
	Human health	39. Distribution of Vector-Borne Diseases
		40. Catastrophic Weather Related Events
Governance		41. Death Attributable to Heat
		42. Seasonal Peak of Food-/Water-Borne Diseases
		43. Institutional coordination mechanism
		44. Enabling legislation (existence and adequacy)
		45. Monitoring and evaluation
		46. Administrative resources (human, technical, financial)
		47. Incorporation of climate change into ICZM strategy

Table 2: Preliminary proposed list of indicators

Then an analysis of existing vulnerability and impact scenarios is presented, including an identification of the participating countries' most vulnerable sites. Key requirements in terms of assessment of sites vulnerable to climate variability and change and in terms of the relevant modeling and tools are also presented.

Finally, in order to address capacity gaps and the ongoing need for informed decisions, the report proposes training programs at the national and regional level, with objectives including:

- o To enhance the capacity of National Meteorological Services to effectively monitor, detect and predict climate change scenarios in the region
- o To strengthen the capacity of national experts to track and monitor sea level rise impacts on the coastal zone
- o To integrating the climate change dimension into ICZM strategies and plans

1.4 Technology Needs Assessments reports

The UNFCCC has encouraged non-Annex I Parties to carry out Technology Needs Assessments (TNAs) with the objective to identify, evaluate and prioritize technological means both for mitigation and adaptation, in order to achieve sustainable development ends.

More specifically, TNAs:

- Are a set of country-driven activities that identify and determine the mitigation and adaptation technology priorities of developing country Parties.
- Involve different stakeholders in a consultative process to identify the barriers to technology transfer and measures to address these barriers through sectoral analyses.
- May address soft and hard technologies, such as mitigation and adaptation technologies, identify regulatory options and develop fiscal and financial incentives and capacity-building.

The submission status of TNA reports to the UNFCCC from the countries participating in the project is summarized in the following table:

Country	1 st Round of TNAs	2 nd Round of TNAs	Technology Action Plans
Albania	2004		
Algeria			
Bosnia and Herzegovina			
Croatia	2005		
Egypt	2001		
Libya			
Montenegro			
Morocco		2012	
Palestine			
Syria			
Tunisia	2001		

Table 3: Submission of TNAs

Although Algeria has not submitted a TNA, a relevant discussion is made in the National Report prepared during the project's preparatory phase.

An overview of the participating countries' technology needs relating to adaptation as presented in the previously mentioned reports, is presented below.

1.4.1 Albania

The criteria for selecting technologies for TNA will depend upon the following factors:

- o Contribution to the achievement of most of the Millennium Development Goals;
- o Social acceptability and suitability for Albania's conditions;
- o Market potential;
- o Contribution to climate change mitigation/adaptation.

The technologies selected are categorized as below:

1. Data gathering technologies

- 1.1. Establishment of a network of automatic meteorological stations
- 1.2. Establishment of a network of automatic hydrological stations
- 1.3. Monitoring of sea and shoreline
- 1.4. Modernization of hydraulic laboratories
- 1.5. Satellite remote sensing
- 1.6. Geographical Information System (GIS)

2. Coastal protection technologies

- 2.1. Coastal defense structures

3. Other sector technologies

- 3.1. Agriculture
- 3.2. Livestock
- 3.3. Fishery
- 3.4. Forestry
- 3.5. Health

All the adaptation technologies classified as priority ones are represented briefly as the following project ideas:

Project 1: Establishment of a meteorological automatic station network for the measurement and transmission of meteorological data.

Objective: Use of new technologies to measure and transmit meteorological data.

Project 2: Satellite remote sensing

Objective: Use of satellite remote sensing technology to acquire and process information of environmental data.

Project 3: Water Observation and Information System in Albania

Objective: Provision of scientists, researches and end users dealing with Global Change with real time data on the quantity and quality of water resources of Albania thorough promotion of Water Observation and Information System

Project 4: Information system for an integrated and sustainable use of water resources in Drini River

Objective: The main objective of the project is to offer knowledge database and associated tools for decision support to the scientific community and to decision makers.

Project 5: Preparing of sustainable development projects for 10 districts.

Objectives: Promotion of sustainable development of forests for 10 districts through development of optimum land use and sustainable development scenarios.

Project 6: Study and experimentation on the best cultivation systems to adapt forests to climate changes.

Objective: Adaptation of cultivated systems to the expected climate changes through selection and utilization of the best cultivation systems.

Project 7: The experimentation on rehabilitation of burned forest area

Objective: Enhancement of adaptation capability of burned forests through experimentation of planting of forest tree species that can better adapt to new conditions.

Project 8: Study of genetically variation among forest tree species and inside each species.

Objective: Enhancement of adaptation capabilities of forests through selection best adapted forest tree species and races to the expected climate changes.

Project 9: Forest tree provenance and progeny tests in different climate conditions

Objective: Enhancement of adaptation capability of forests through selection an planting of the best adapted forest tree provenance and progeny to the expected climate changes.

Project 10: Experimentation of fast growing species to better adapt to the expected climate changes.

Objective: Enhancement of adaptation capabilities of forests through selection and planting of the best adapted fast growing species to the different expected climate changes.

Project 11: Geographical Information System (GIS)

Objective: Use of Geographical Information System (GIS) to collect, manage, retrieve, integrate, manipulate, combine, visualize and analyze spatial data.

1.4.2 [Algeria](#)

The Algerian National Report under the project's preparatory phase states that scientific research and transfer of technology and know-how is necessary to:

- Encourage research laboratories to focus their work on the areas of climate change and capacity building.
- Develop and manage the software and hardware of information technology: GIS, remote sensing, GPS and specialized software on the assessment and simulation of coastal areas.
- Establish a network and monitoring system parameters relating to climate change and its effects on the most sensitive and vulnerable areas of the coastal zone .
- Evaluate and monitor fisheries production and establish a monitoring mechanism of the exploitation of fisheries resources and to define the performance of adaptation strategies.
- Rethinking coastal development by incorporating the effects of climate change in order to anticipate and reduce the impact of rising sea levels on coastal and marine habitats , infrastructure and human activities.
- Develop a climate change information system for decision making and broad public awareness.
- Develop and implement a program of activities for the development of coastal management systems relating to climate change.
- Focus on university research teams and specialties to allow for a more integrated approach.
- Improve coordination between institutional actors and academics involved or interested in this topic.
- Improve the capacity of expertise at the university level through greater involvement in networks, projects and programs in the Mediterranean and worldwide.

1.4.3 [Croatia](#)

In the Croatian TNA report, only mitigation issues and technologies are addressed.

1.4.4 [Egypt](#)

The Egyptian TNA report from 2001 states that the major gaps are the incomplete spatial coverage of existing monitoring networks and the inadequate facilities due to high cost of equipment and proper collaboration between national institutions.

The report identifies the following needs:

- Cooperation protocols between different institutions
- Organise and coordinate national efforts in order to develop an integrated systematic terrestrial observation network covering all elements of land use and their changes.
- An electronic network is urgently needed to connect local oceanographic measuring sites and overseas centers to allow regional and international data exchange.
- Shortages of large-scale monitoring and institutional management capabilities in the coastal zone have constituted a severe limitation for proper adaptation.

Specific needs include support for regional monitoring, modeling and assessments as well as scientific and technical investigation of various options for adaptation and socio-economic implications and awareness.

Some specific projects are suggested in the report:

- Building a centre for evaluating coastal zones and suggesting ways to protect them
- Studying the land use strategies and increasing the agriculture of rice and fish farms
- Increasing environmental awareness for decision makers
- Studying the effect of climate change on coral reefs
- Studying the effect of sea level rise on archaeological areas
- Studying the effect of salination on coastal zones
- Innovate a comprehensive approach for coastal zones planning

1.4.5 [Morocco](#)

The Moroccan TNA report identifies the following technologies (in order of priority) for the adaptation to the adverse effects of climate change:

1. Water Sector:

1.1. Sub-sector of water resources:

- 1.1.1. Rainwater;
- 1.1.2. address systems and flood warnings;
- 1.1.3. Inflatable Dams;
- 1.1.4. Artificial recharge of groundwater.

1.2. Sub-sector of drinking water:

- 1.2.1. Desalination of sea water for the production of drinking water;
- 1.2.2. coupling desalination with renewable energy;
- 1.2.3. Disposal of toxic cyanobacteria in treatment units for drinking water.

2. Agriculture Sector:

- 2.1. Technical drip irrigation;
- 2.2. Equipment of New Irrigated Perimeters downstream of existing dams;
- 2.3. Development of Agricultural Information System in Irrigated and Dissemination of Best Practices of Conduct Dryland Crops;
- 2.4. Technical direct seeding.

A list of project ideas using the technologies mentioned is also presented in the report:

- o Collecting rainwater
- o Strengthening the system of flood warning
- o Inflatable dam in the town of Ouarzazate
- o Artificial recharge of groundwater in Guelmim
- o Artificial groundwater recharge in Berrechid
- o Desalination of seawater and brackish water desalination for drinking water in some cities
- o Fight against the development of toxic cyanobacteria in drinking water works
- o National Saving Water in Irrigation Programme
- o Offset Program between dams and irrigation schemes
- o Hydro-Agricultural Development in the province of Chefchaouen
- o Hydro-Agricultural Development in the province of Essaouira
- o Hydro-Agricultural Development in the province of Tetouan
- o Developing an Information System for Irrigated Agriculture and Dissemination of Good Agricultural Practices

- A million and a half hectares of direct seeding in rainfed agriculture by 2020

1.4.6 Tunisia

The Tunisian TNA report identifies the following themes in technology needs:

- Reinforcing knowledge in:
 - Evaluation of technology needs;
 - Identification of selection criteria of these technologies;
 - Analyse the adequacy of these technologies to the needs of the country and the most appropriate pace of their introduction.
- Reinforcing the capacity to control and acquire technologies
- Implementation of programs to reduce GHG in the following sectors:
 - Energy;
 - Forest
 - Waste;
 - Agriculture;
- Launch of a profound study on vulnerability, in particular:
 - Monitoring sea level rise;
 - Direct and indirect effects of climate change on natural ecosystems;
 - Direct and indirect effects of climate change on economic activities such as agriculture and health.

2 Potential impacts and hotspots of climate variability and change in the participating countries' coastal zones

This chapter provides an overview of potential impacts on sectors and specific hotspots, as presented in the participating countries' national communications to the UNFCCC and the national reports during the project's preparation phase.

2.1 Albania

Physical and environmental impacts

- Higher temperatures will shift the snowline upwards and likely change the seasonal patterns of snowfall with the snow season beginning later and ending earlier.
- Reduction of long term mean annual and seasonal runoff for the Drini water basin resulting in a decrease of the reservoirs and a reduction in ground water supply.
- Likely increased frequency of extreme events (heavy rains, strong winds, droughts, flooding)
- Sea level rise will likely result in a long-term decrease in forest and wetland areas in coastal zones. The national parks of Kune-Vain (Lezha District) and Velipoja (Shkodra District) are located along the Drini and Buna river deltas, between 0.8 to 2 m and 0–1.2 m above sea level, respectively.
- Beach erosion at Shengjin and inundation of dwellings built on low-lying swamps.
- The Mediterranean alpine pasture area is expected to reduce more than ten times.

Socioeconomic impacts:

- The expected climate change and sea level rise will largely influence the geographical distribution of the residence areas, their economic activity in general and tourism in particular. At the beach of Shengjin the tourism constructions are all threatened by sea level rise in the coming 50–100 years.
- The extent of arable land will likely decrease due to soil erosion and alteration. In coastal zones the growth cycles, harvest time and the quality of the agricultural production will be affected due to the sea level rise and intrusion of salt water into the soil.
- The increase in summertime temperature is likely to affect the public health.

Vulnerable coastal hotspots:

- The Vlorë region, close to the mouth of the Vjosë river. In this area the erosion is already a well-known phenomenon. The city of Vlorë is a major seaport and commercial centre, with a significant fishing, agricultural and industrial sector.
- Lalzi bay in the central part of the Adriatic coast of Albania, between Rodoni cape in the north and BishtiPalles cape in the south. The catchment area of the Lalzi bay is estimated at about 250 km². The area has been subject of extensive reclamation and deforestation during the last 50 years and during the last 20 years a big change of the seashore line has been observed.
- Patoku Beach in the Rodoni bay that starts north from the mouth of Drini river and ends south at the basis of Rodoni cape. The coastline is about 8 km long. Patoku lagoon seems to be endangered since the dune shoreline has locally disappeared.
- Velipoje area in the District of Shkodra, close to the border of Montenegro. The borderline follows lower Buna River. The Velipoja area has about 8 km of coastline and includes Franc Jozefi Island (which is changing frequently in shape, presently joining the coast with a sand bar). It is characterized by a sandy shore, supplied by Buna River joining Shkodra Lake to the sea.
- Karpen, a tourism hotspot in the north of the Lagjit Cape in the ending part of the Durres Bay where erosion and sea intrusion is already observed.
- The delta of Hoxhara Chanel which includes several types of habitats: sand dunes, Mediterranean pine forest, old river bed and small coastal wetlands.

2.2 Algeria

Physical and environmental impacts:

Impacts of climate change on the coastal zone of Algeria have not yet been fully assessed. The National communications have analysed the Cheliff River Basin basin showing a reduction of average flows by 34 and 35 % in winter for all scenarios, and a decrease of the potential of groundwater.

Prospective analysis estimates that Sea-level rise will increase coastal erosion in almost all the sandy beaches.

The impact of climate warming upon coastal and marine ecosystems will intensify the problems of eutrophication and stress on the biological systems. Réghaïa Lake may be affected by these phenomena due its low depth, slow water exchange and its current eutrophic state.

Socioeconomic impacts:

Two thirds of the population live along the coastline where tourism activities are also concentrated, resulting in significant degradation of natural resources which is expected to increase due to climate change.

Qualitative assessment of climate change effects on the Réghaïa basin estimated that water lake volume will not be influenced by global warming directly but from the sea level rise and the resulting water salinisation. Agricultural and drinking water uses may be compromised. Water salinisation, eutrophication and the long dry period will reduce the productivity of major crops and increase their water requirements.

Vulnerable coastal hotspots:

The area most vulnerable to erosion remains the central part of the Bay of Algiers between the mouth of the Oued El Harrach and Mohammedia.

2.3 Bosnia and Herzegovina

Physical and environmental impacts:

Bosnia and Herzegovina has a small coastal zone of only 26 km length and no specific research has been done in how it will be affected by climate change.

Most climate change issues are associated with agriculture, coastal erosion, flooding risk and soil deficiency due to sea level rise.

Ecosystems that will be directly exposed to the impacts of climate change include low coastal areas e.g., coastal sands, salt marshes and estuaries. Changes in physical, hydro-dynamic, biological and chemical parameters may be expected, with accompanying quality and quantity changes in the components of biocenoses.

Ongoing intrusion of salt water into freshwater habitats in the lower Neretva delta has already caused habitat degradation and habitat loss, and this effect might be increased. In addition, species that are adapted to the freshwater rivers may be threatened or even may disappear.

Damage or disappearance of certain valuable coastal habitats in these erosive processes may be expected. The direction of changes or impacts on individual taxonomic groups is hardly predictable. Rivers in the Dinara catchment basin will be greatly affected, particularly the Neretva and Trebišnjica Rivers.

Socioeconomic impacts:

Significant sea level rise could endanger commercial and fishing ports, contaminate coastal freshwater sources in karstic zone, disrupt touristic and recreative activities depending on coastal areas.

More intense rainfall will increase the cost of flood protection works, as well as that of associated infrastructure such as roads and storm-water drains. It is predicted that floods and droughts that previously occurred once in a lifetime, every 50 years, may now occur every 5 or 10 years.

Lower river flows will affect non-reliable water supply, electricity production and tourist activities, as well as resulting in lower water quality caused by flow variations.

The national report mentions proposed adaptation measures in key sectors including the creation of multifunctional water reservoirs, adapting the technology of agricultural production and livestock breeding, while changes are also required in spatial and urban planning and building design.

Vulnerable coastal hotspots:

- The river Bojana and Velika plaža. Even with a sea level rise of just 35 cm, the natural flow of the Bojana river could be disabled until its estuary into the sea and its delta disappear. Large areas around rivers could be flooded and lost, particularly where the sea shore is low, like Velika plaža in Ulcinj;

2.4 Croatia

Physical and environmental impacts:

Sea-level rise is likely to cause inundation in low-lying coastal areas including the Neretva Delta, the island of Krpanj, some parts of Split, and natural areas such as Vrana Lake near Biograd and the River Krka. Projections indicate that with 50 cm of sea-level rise, more than 100km² of the mainland will be flooded, and in the case that sea-level rises for 88 cm, additional 12.4 km² will be under water. Historical town centres, the alluvial plain of the Neretva River, and Vrana Lake on the island of Cres would be seriously endangered.

Wetlands and swamps may also be damaged by sea level rise including the Vrana Lake National Park.

Changes in oceanographic and hydrological characteristics will influence the composition of Adriatic ichthyofauna resulting in biological changes such as horizontal or vertical migration of cold water species into colder areas and the arrival of invasive species.

Socioeconomic impacts:

- The tourism sector may face challenges due to uncomfortably hot summers, but also opportunities due to better weather during the spring and autumn. Additional threats may result from damages to particularly important tourist destinations and/ or increases in severe weather related events such as heat waves and forest fires. Since the tourism industry is predominantly seaside-oriented, sea-level rise can threaten the coastal tourist and cultural sites (hotels, historical sites) and the freshwater springs, water-pipes and sewerage systems.

- Human health – especially among older people– will experience increased risks due to heat waves during the summer. However, mild winter temperatures are likely to reduce the health problems caused by cold weather. Additionally, changes in allergen patterns may also cause problems for certain groups.

- Hydropower production may decrease due to reduced river flow, and wetlands benefits may be endangered due to less precipitation.
- Agricultural production may experience a drop in the yields of various crops.
- The fisheries and mariculture industries should benefit from the increased production of certain types of fish and shellfish, although invasive species and sea temperatures may reduce the number of other species.
- The number of Croatians who are vulnerable to coastal flooding will increase from fewer than 2000 people per year from 1960-1990, to 6000-8000 people per year in the 2080s
- A number of commercial fishing ports and fixed marinas may be affected as well as infrastructures in shallow and densely populated areas.
- Contamination of coastal freshwater springs (salt water intrusion) affecting drinking water supply may occur
- The economic damage due to increased flooding from sea-level rise in Croatia distributed over the next century is estimated at EUR 2.80-6.50 billion for a sea-level rise of 0.50 meters and EUR 3.22-7.18 billion for 0.88 meters

Vulnerable coastal hotspots:

- Cities: Nin, Zadar, area of Šibenik, Split, Stari Grad on the island of Hvar and Dubrovnik
- Rivers: the Raša, the Cetina, the Krka, the Zrmanja and the Neretva
- Lakes: Vransko lake on the island of Cres and Vransko lake near Biograd
- Western Istrian coast
- The island of Krapanj.

2.5 Egypt

Physical and environmental impacts:

The coastal zone of the Nile Delta in Egypt is perceived as vulnerable to the impacts of climate change, not only because of the impact of sea level rise, but also because of the impacts of climate change on water resources, agricultural resources, tourism and human settlements.

Several studies were undertaken, to assess climate change impacts on low land areas in Alexandria, Beheira, Port-Said and Damietta governorates. For Alexandria, under a scenario involving a sea level rise of between 0.5 m and 1.0 m over the next century, an area of about 30% of the city will be lost due to inundation if no action is taken.

There is an expected serious negative effect on birds. The expected submerged wetland will form grounds for an increase in rooted aquatic plants, will increase the wintering grounds for migrating birds and can also be used for aquaculture activities. The impact of climate change on coral communities in the Red Sea will include coral bleaching due to increasing temperatures, loss of habitats and loss of biodiversity.

Socioeconomic impacts:

The Nile delta covers 5.5% of Egypt's land area, but contains 95% of the country's population. For Rosetta city, as a result of an estimated 0.5 m sea level rise it is estimated that 1/3 of the employment in the city will be affected and \$2.9 billion will be lost over the next century. The most affected sectors are expected to be the industrial, transportation and urban sectors.

Sea level rise will have a significant impact on human habitat and settlements with a projection of at least two million people migrating from the Delta coastal areas due to the inundation and loss of fertile land.

The vulnerability of Egypt's water resources to climate change entails those affecting Nile flows, rainfall (possible 50% reduction of rainfall on Egypt's Mediterranean coast), and ground water (increased levels and salinity due to sea level rise and consequent sea water intrusion). With 4°C warming and 20% reduction in precipitation, Nile flows may decrease by 98%. Water logging and water bogging problems are expected to exacerbate soil salinization which will lead to deterioration of crop quality and productivity. This will in turn lead to increasing health problems and loss of tourism.

Agriculture: Increase of severity and frequency of extreme events will reduce crop yield. Increase of temperature and shortage of water resources will negatively affect marginal land and induce changes of the agricultural distribution of crops. Studies predict a reduction in the productivity of two major crops in Egypt - wheat and maize - by 15% and 19% respectively by 2050. Losses in crop productivity are mainly attributed to the projected temperature increase, crop-water stress, pests and disease, as well as the inundation and salinization of 12% to 15% of the most fertile arable land in the Nile Delta as a result of sea level rise and salt water intrusion.

Aquaculture and Fisheries: A slight to moderate sea level rise may be quite beneficial. Fish production may go up due to an increase in lake area and in more valuable marine fish species. Climate change is expected to increase sea temperature causing fish distribution to shift northwards and to go into deeper waters. In addition, increased water salinity in the coastal lakes in Egypt is expected to affect fish species in these lakes.

Tourism: coral reefs, constituting a major attraction in Red Sea resorts, are highly vulnerable to climate change. On the other hand, sea level rise on the low elevation Mediterranean coast will definitely lead to losses of beaches. In addition the impact of increasing temperatures and frequencies and severity of extreme events are expected to negatively impact the archaeological heritage in Egypt. Heat waves in the summer months are likely to negatively impact on tourism.

Health: For the health sector, climate change will contribute to the burden of diseases through direct effects (heat strokes) and indirect effects (the shortage of water supply and decreased agricultural land area leading to shortage of essential food with the possible emergence of malnutrition).

Vulnerable coastal hotspots:

High-risk areas include parts of Alexandria, Behaira, Kafr El-Shiekh, Port Said, Damietta and Suez. Other vulnerable areas include Lake Bardawil, coast of Obayedh near Matruh and the coasts of the Bitter lakes. Many other areas on the Red Sea are also vulnerable.

2.6 Montenegro

Physical and environmental impacts:

- Reduction of annual precipitation that ranges even up to 20% in certain areas.
- Water resources will be also generally reduced. Analysis shows that the discharge of the Morača water resource through Podgorica will be reduced by 31% during the period 2071-2100 compared to the normal period 1961-1990.
- The Bojana river flow will be stopped much before its current end, resulting to the disappearance of its delta and the flooding of areas practically even with the surface of the river.
- The coast is relatively short and narrow, because of the steep, high mountains in the immediate hinterlands and thus less vulnerable to sea-level rise.
- Shifting of vegetation zones; disappearance of certain species; changes in composition of biocenoses; fragmentation of habitats and changes in the functioning of ecosystems.
- Faster eutrophication of shallow and confined parts of the sea waters, as well as the introduction of new thermophilic (invasive) species from southern marine biogeographic zones.
- Possible degradation of plant and animal life in the sea, significant damage to coral reefs, some migration as a result of increasing temperature and temperature amplitudes.

Socioeconomic impacts:

The economic and tourism potential of the coast will be reduced, while an investment risk will be increased. Economic activities, such as maritime transport, fisheries, agriculture etc. will constantly be under stress.

- The safety of infrastructure, ports, water breaks, marinas, shipyards, etc. will be endangered.

- Wave storms will put a strong pressure on the water sources adjacent to the coast, which are used for water supply.

- The increase in temperature, especially in the summer months will negatively affect the health condition of high-risk groups, while on the other side a temperature increase during the winter will lead to lower morbidity and mortality, particularly for chronic patients.

Vulnerable coastal hotspots:

- The river Bojana and Velika plaža, as already mentioned above

2.7 Morocco

Physical and environmental impacts:

- The frequency and intensity of droughts and floods is expected to increase, the snow cover period on the peaks of the Rif and the Atlas mountains will decrease, the spatial-temporal rainfall distribution will be modified.,

- Coastal areas will likely be affected by inundation, erosion of sandy beaches and salinization of coastal aquifers due to sea level rise.

- The impact of climate change on forests will be marked by desertification progressing inside the territory, mortality of standing trees, and extinction of some crops and some tree species (such as the Argan)

- The itinerary and passage dates of migrating birds will be altered.

Socioeconomic impacts:

Water resources: an average and general decrease in water resources in the order of 10 to 15 % is estimated by 2020 resulting to the need of great investments (dam construction, drilling of deep wells). As a result, dam capacity will decrease, as well as water levels, leading to a decrease in the natural outlets for water tables and an increase in their salinity in the coastal areas. River flow rates are also expected to be disrupted.

The coastal zone will be affected by erosion, soil and water salinisation and marginalisation due to the harsh inland environment. Development in the coastal strip has been increasing the potential susceptibility to the impacts of climate change

A decrease of wheat crop yield by 15% to 10% is expected by 2020 depending on the drainage basin and by 50% in dry years. The growth period will be shifted and reduced. The needs for the water necessary for irrigated crops will be increased by 7-12%.

Vulnerable coastal hotspots:

- The low lying areas, especially estuaries and lagoons (coastal plains of Cabo Negro, Martil, Lao, Ghiss, Neckor, lagoon Marchica, Moulouya Delta);
- The coastlines, subjected to dynamic erosion associated with high pressure from urbanization (Bay of Tangier, Bay of Al Hoceima, Mdiq-Fnideq cornice, Saidia coast).

2.8 Palestine

Physical and environmental impacts:

- Annual precipitation rates are likely to fall with an increased risk of summer drought. In the Gaza strip, the precipitation rate dropped from 370 to 310mm during 1990-1999 and again dropped to 220mm in the period 2000-2010. The average rainy days per year is decreasing during the last three decades from 43 days per year during the period 1980-1990 to 38 days per year during the period 2001-2010. The over exploitation of the coastal aquifer has significantly outpaced the annual recharging of the aquifer by precipitation.
- Drought damages are also expected to increase with the anticipated decrease in water availability, hotter temperatures and shorter winters. Under such conditions, more pests and pathogens will increase crop diseases.
- Even a sea level rise of 35cm will pose a serious threat to the Gaza Strip, through saline intrusion.

Socioeconomic impacts:

Increases in seasonal temperature variability, storminess and frequency of temperature extremes may endanger cold- and heat-sensitive crops. Greater rain intensities and resulting floods may also damage crops. Drought damages are also expected to increase with the anticipated decrease in water availability, hotter temperatures and shorter winters. Under such conditions, more pests and pathogens will not only increase crop diseases but also their sensitivity to drought, and loss of biodiversity may reduce the natural control of agricultural pests.

Drought would not only exacerbate the problem of providing residents with adequate water for drinking and other basic domestic needs, but it could deal a huge blow to the backbone of the Palestinian economy – agricultural production and food security. Additionally, if left unaddressed the impacts of climate change would most certainly compromise the ability of the Palestinian Authority to achieve any of the Millennium Development Goals (MDGs).

Vulnerable coastal hotspots:

The most vulnerable area is the coastal zone of the Gaza Strip with an elevation of less than two meters. Sea level rise could contaminate coastal aquifers.

2.9 Syria

Physical and environmental impacts:

Syria's coastal area will be susceptible to accelerated erosion, flooding and inundation as a result of sea level rise and an increase in wave height. In the extreme risk scenario 118.90 km² will be inundated affecting nearly 3.8% of coastal populations.

There is no space for landward migration of ecosystems as a result of sea level rise due to the existence of a high mountain range behind the coastal zone.

Climate change is also expected to exacerbate desertification, water shortages and low forage productivity in marginal steppe and grazing zones. Moreover, it will introduce new threats to herders and livestock owners' wellbeing, rangeland ecosystem services and national economy.

Climate change may add additional pressure on already stressed ecosystems and species, especially wetlands. A further rise in sea water temperature might also increase the rate of the Mediterranean Sea's —tropicalization , contributing to the problematic arrival of invasive species along the Syrian coast.

Socioeconomic impacts:

Syria obtains 36% of its renewable annual water resources from the Euphrates River. Hence reductions in flow discharge will affect several sectors relying on water derived from Euphrates river flow, especially decreasing cropping area and yield and increasing pumping and irrigation costs.

Under the climate change scenario, the crop production will be reduced by 15.7 % for irrigated wheat, 21% for rainfed wheat, 7.5 %, for cotton and 17 % for olive trees.

Based on land use categories in the affected areas, a rough examination of economic losses as a result of sea level rise alone, the amount reaches 50 billion Syrian pounds according to an average scenario. This figure represents direct average economic losses resulting from permanent disappearance of 4,108 hectares of agricultural and forested areas, 450 hectares of beach and 1,090 hectares of urban area.

Sea level rise and erosion would also affect the beach resorts and other tourism activities in the coastal area.

Vulnerable coastal hotspots:

The areas of JounJablah (south of Lattakia) and Al Hamidiah, (south of the City of Tartous) are specifically vulnerable to sea-level rise, as the slope of these areas is very gentle.

Erosion is most pronounced in the northern part of the lower coastal plains between Oum Al Tiur and Ras Al Bassit area, north of Lattakia. This area is characterized by lateral promontories running directly from the coastal mountains down to the sea. The large number of rivers and streams, combined with the sandy structure of soil (on the shoreline and in the lower coastal plain) make the land susceptible to various levels of erosions, especially where the coastal mountains steeply project towards the sea.

Saltwater intrusion is evident in the coastal plains at Al Hamidyeh close to the border with Lebanon, AlBassa near Banias, and Dimsarko north of Lattakia. A serious impact could be the eastward migration of saltwater up the coastal rivers of AlKabir, AlShimaly, AlHussein, and AlKabir Al Janoubi Rivers.

2.10 Tunisia

Physical and environmental impacts:

The coast is very fragile and low-lying islands are at particularly high risk. 100 km of coastline are prone to marine erosion, 40 km of which are priority beaches. 53% of coastal water resources will be lost by salinization due to sea level rise.

Water resources are projected to decline by 28% where the loss of groundwater reserves in particular will be problematic.

Loss of land to sea water, particularly on some islands (KerKenna Islands) and swamps (Maritime swamps and Sebkhas)

Socioeconomic impacts:

Agriculture would be among the sectors most affected by sea level rise which will lead to important losses of agricultural lands by erosion or salinization and deterioration of the drainage and irrigation infrastructures. There is projection of a 20% loss in arable cropland by 2030.

Over 90% of tourist accommodation are on coastal zones, which could be highly affected by sea level rise.

Vulnerable coastal hotspots:

Major zones at risk to Sea-level rise identified in Tunisia are the coastal segments that belong to the city of Bizerte and its lakeside system, to the northern and central parts of the Gulf of Tunis, to the oriental coast of the Cap Bon peninsula, to different segments of the Gulf of Gabes, and to the low islands of the eastern coast.

The most exposed beaches to erosion are those of the Gulf of Hammamet and from El Kantaoui port, going toward Sousse and Mahdia where some tourist hotels have even lost an important part of their sandy beaches.

The Kerkenna islands, which are especially characterized by their low topography, made by a succession of flat lands, occupied by some sabkhas, appear like one of the places most threatened. With the scenario of 0.50m sea level rise, the archipelago risks even to be transformed in a great number of small islands.

3 Overview of recent relevant projects

Since the idea of the present project was developed, many projects and initiatives relating to climate change and particularly its impacts on the coastal zones of the Mediterranean have been developed. Very few of those are dealing with the issue of ICZM, and none of the projects deals specifically with the issue of integration of climate variability and change and ICZM. In this respect, the Project is unique and is, essentially, creating its own niche. Close coordination with ongoing projects and initiatives is expected to be established and maintained throughout the project's implementation.

This section presents a brief overview of recent projects relevant to the objectives of the present one, relevant initiatives of international institutions, the projects mentioned in the National Reports prepared under the project and a list of other relevant projects.

3.1 *Recent relevant Projects*

3.1.1 CIRCE Project

The Project CIRCE - Climate Change and Impact Research: the Mediterranean Environment (2007-2011) is an FP6 EU Integrated Project Coordinated by A. Navarra (CMCC, Italy) and L. Tubiana (IDDRI, France).

CIRCE, for the first time, studies the Mediterranean climate through a multi-disciplinary scientific staff to evaluate the best strategies of adaptation to climate change in the Mediterranean.

One of the objectives of the CIRCE project is to provide an analysis and an assessment of the observed past and present climate changes in the Mediterranean area. The detection and attribution of the observed climate trends is based on an extensive analysis of available data sets, both from stations and from gridded sources available for the region.

The main novel characteristic that distinguishes the CIRCE models from state-of-the-art climate models commonly used to produce scenario simulations is the inclusion of a realistic representation of the Mediterranean Sea into the climate system.

The CIRCE projections for the 21st century suggest that remarkable changes in the climate of the Mediterranean region might occur already in the next few decades, showing a substantially steadily increase of the near-surface temperature that leads the Mediterranean lands to be about 2°C warmer in the 2021-2050 period with respect to the 1961-1990 mean. The change in the simulated near-surface

temperature is accompanied by a change in precipitation, with a clear tendency to dryer conditions for the Mediterranean area during both seasons and some tendency to increased winter precipitation over the Alpine region. In the CIRCE simulations, the 2021-2050 mean steric sea level rise with respect to the reference period (1961-1990) is in the range +6.57 and +11.56 cm.

Website: <http://www.circeproject.eu/>

3.1.2 MedCLIVAR

MedCLIVAR is a scientific programme financed by the European Science Foundation. Its objectives are the following: (1) To reconstruct the past climate variability; (2) To investigate the connections between Mediterranean and global climate variability; (3) To understand the mechanisms responsible for the Mediterranean Sea circulation, for sea level trends and variability; (4) To assess of the possible feedbacks of the Mediterranean dynamics on the global climate system; (5) To identify the environmental and climatic effects caused by the strong anthropogenic influence at regional scale to which the Mediterranean region has been exposed since ancient time due to heavy demographic pressure; (6) To understand and predict the response of the Mediterranean climate to the increase of radiatively active gases and aerosols; and (7) To make available scientific information and data on regional climate variability, trends and changes to public opinion, authorities and stakeholders in the Mediterranean countries. The initial phase of MedCLIVAR was completed in 2011, although it will most probably continue in the future (see <http://www.medcordex.eu>).

Website: <http://www.medclivar.eu/>

3.1.3 CLIM-RUN

CLIM-RUN is an EU financed project with 16 partners from 11 countries which started in March 2011 and is expected to end in February 2014. One Project partner (Plan Bleu) and institutions from 2 participating countries (Tunisia and Croatia) are involved. Three major objectives of CLIM-RUN are: (1) Design and implementation of a protocol for optimizing the two-way information transfer between climate experts and stakeholders; (2) Advancement of the science underpinning the production of detailed climate information at regional to local scales tailored for stakeholder needs; and (3) Test of the protocol via its application to a number of real world case studies.

Website: <http://www.climrun.eu/>

3.1.4 PEGASO

PEGASO has 24 partners from 16 countries. It started in February 2010 and is expected to end in January 2014. Two Project partners (PAP/RAC and Plan Bleu) and institutions from 2 participating countries are involved (Morocco and Egypt). The main objective of PEGASO is to build on existing capacities and develop common novel approaches to support integrated policies for the coastal, marine and maritime realms of the Mediterranean and Black Sea Basins in ways that are consistent with and relevant to the implementation of the ICZM Protocol for the Mediterranean. More specifically, its three most important actions are: (1) constructing an ICZM governance platform as a bridge between scientist and end-user communities, going far beyond a conventional bridging; (2) refine and further develop efficient and easy to use tools for making sustainability assessments in the coastal zone (indicators, accounting methods, models and scenarios), which will be tested and validated in a multi-scale approach for integrated regional assessment through a number of relevant pilot sites; and (3) implementation of a Spatial Data Infrastructure (SDI), following the INSPIRE Directive, to organize and standardize spatial data to support information sharing on an interactive visor, to make it available to the ICZM Platform, and to disseminate all results of the project to the end users and interested parties. While there is no specific mention of climate variability and change in the project's description, its focus on ICZM makes it an especially valuable project that needs to be fully considered and good linkages established in further implementation of the Project.

Website: <http://www.pegasoproject.eu/>

3.1.5 WACDEP

Water and Climate for Development Programme (WACDEP) is coordinated by the Global Water Partnership (GWP) and the African Ministerial Council on Water (AMCOW). It started in 2012 and is expected to last until 2016. It aims at supporting the integration of water security and climate change adaptation into development planning processes and the design of financing and investment strategies in Africa. The coastal zone is among its areas of intervention. The North African Component of WACDEP is implemented by GWP-Med, with a current focus in Tunisia at national and local levels and in the North Western Sahara Aquifer; its expansion in more North African countries and the entire Mediterranean countries is on-going. Synergies between the Project and WACDEP will facilitate sharing of experiences, wide dissemination of results and co-financing.

Website: <http://www.gwp.org/WACDEP/>

3.1.6 MedSeA

The European Mediterranean Sea Acidification in a changing climate (MedSeA) is a project funded by the European Commission under Framework Program 7. It involves 22 institutions (including 6 associated partners) from 12 countries. MedSeA assesses uncertainties, risks and thresholds related to Mediterranean acidification at organismal, ecosystem and economical scales. It also emphasizes conveying the acquired scientific knowledge to a wider audience of reference users, while suggesting policy measures for adaptation and mitigation that will vary from one region to another.

Its objectives are to:

1. Identify where the impacts of acidification on Mediterranean waters will be more significant, taking into account the sequence of causes and effects, from ocean chemistry through marine biology to socio- economic costs.
2. Generate new observational and experimental data on Mediterranean organism and ecosystem responses to acidification and feed into existing fine-scale models of the Mediterranean Sea that are modified to better represent key processes, and then used to project future changes. The MedSeA focuses on a selected set of key ecosystem and socio-economic variables that are likely to be affected by both acidification and warming, studying the combination of both effects through ship-based observations, laboratory and mesocosm experiments, physical-biogeochemical-ecosystem modeling, and economical analyses.
3. Provide best estimates and related uncertainties of future changes in Mediterranean Sea pH, CaCO₃ saturation states, and other biogeochemical-ecosystem variables, assessing the changes in habitat suitability of relevant ecological and economically-important species.

Website: <http://medsea-project.eu/>

3.1.7 PROVIA

The Programme of Research on Climate Change Vulnerability, Impacts and Adaptation (PROVIA) is a global initiative which aims to provide direction and coherence at the international level for research on vulnerability, impacts and adaptation.

To this end, PROVIA will act as a new and growing network of scientists, practitioners and decision-makers working towards identifying research gaps and meeting policy needs in climate change vulnerability, impact and adaptation research.

The overall aim of PROVIA is to help provide international direction and improve the coherence of research on climate change vulnerability, impacts and adaptation. Its vision is to create a new and vitally important interface between the scientific community and decision-makers involved in vulnerability, impact and adaptation issues, and improve the availability and accessibility of such knowledge to the people that need it most.

The overarching objectives of the project are:

1. To advance policy-relevant research on vulnerability, impacts, and adaptation related to climate change.
2. To coordinate and facilitate the dissemination and practical application of this research for the benefit and value of society.

Website: <http://www.unep.org/provia/>

3.1.8 Clima South

The Clima South project (Support for Climate Change Mitigation and Adaptation in the ENPI South region) started in 2013 and will end in 2016. The countries participating in the project are Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Occupied Palestinian Territory, Syria and Tunisia.

The project seeks to enhance regional cooperation between the EU and its southern Mediterranean neighbors and among the partner countries themselves (South–South) on climate change mitigation and adaptation, mainly through capacity development and information sharing. The overarching goal is to support the transition of ENP South countries towards low carbon development and climate resilience.

To this effect, the project will assist partner countries in formulating and implementing mitigation and adaptation policies and tools such as national adaptation strategies; low emission development strategies; National Appropriate Mitigation Actions (NAMAs); and Measurement, Reporting and Verification (MRV), in particular by developing greenhouse-gas inventories.

It also aims to improve the access of decision-makers, officials, experts and civil society in ENP South countries to best practices and legislation in the EU, ENP South countries and other regions of the world, in the field of climate change.

3.1.9 CLIMATE-ADAPT

The European Climate Adaptation Platform (CLIMATE-ADAPT) is a partnership between the European Commission (DG CLIMA, DG Joint Research Centre and other

DGs) and the European Environment Agency. It helps users to access and share data and information on:

- Expected climate change in Europe
- Current and future vulnerability of regions and sectors
- EU, national and transnational adaptation strategies and actions
- Adaptation case studies and potential adaptation options
- Tools that support adaptation planning

CLIMATE-ADAPT organises information under the following main entry points:

- Adaptation information (Observations and scenarios, Vulnerabilities and risks, Adaptation measures, National adaptation strategies, Research projects)
- EU sector policies (Agriculture and forestry, Biodiversity, Coastal areas, Disaster risk reduction, Financial, Health, Infrastructure, Marine and fisheries, Water management)
- Transnational regions, Countries and Urban areas
- Tools (Adaptation Support Tool, Case Study Search Tool, Map Viewer)

Website: <http://climate-adapt.eea.europa.eu/>

3.2 Initiatives of international institutions

3.2.1 Union for the Mediterranean (UfM) – The Mediterranean Climate Change Initiative

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.

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.

3.2.2 The Arab Climate Resilience Initiative (ACRI)

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

3.2.3 World Bank - MENA Regional Business Strategy to Address Climate Change

The World Bank has adopted this strategy in 2008 with the overall objective 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.

3.2.4 World Bank – Sustainable MED Program

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

3.3 Projects mentioned in National Reports

3.3.1 Albania

The main program working in the country is the UNDP climate change program that is implemented by the UNDP in collaboration with the MEFWAFWA. In this context the Climate Change Unit has been established which tries to coordinate the activities with the government institutions in this field.

- The project “Identification and implementation of adaptation measures for the Drini-Mati deltas” is supported by UNDP and GEF. The project aims to develop and implement strategies to moderate, cope with, and make the most of the impacts of climate change, by increasing the adaptive capacity and resilience of ecosystems and local communities. A supporting objective aimed to integrate the management of climate change into local development policies.

The Integrated Coastal Zone Management for the Southern coast of Albania (a WB project) was another attempt to include the climate change effect in the coastal zone development issues. But the project did have some serious problem in the implementation and did not reach it expected results.

3.3.2 Algeria

- “Climate change enabling activity” (UNEP/GEF): This project focuses on three key areas: technology transfer to address climate change, systematic observation systems, and emission factors. The workshops and activities intended to address these areas are not simply forums for exchange, but working groups make up of specialists and experts.
- CIRCE coastal case studies: Gulf of Oran: Key research issues related to climate change include accelerated coastal zone degradation and marine system modification, and the availability and quality of water resources.

3.3.3 Croatia

The UNDP 2008 Human Development Report for Croatia accounts for and quantifies the damages in several sectors of the Croatian economy over the past several years as a result of climate variability. It demonstrates that climate is already a critical factor in development in Croatia, and climate change may have profound impacts on the country.

3.3.4 Egypt

- Adaptation to the Impacts of Sea Level Rise in the Nile Delta Coastal Zone (Egypt): a 3 year project funded by IRDC, in the framework of CCAA. The project aims to advance the science and technology that underpin preparations for and responses to climate-related events; contribute to information systems that guide policies for public protection; and possibly support the implementation of adaptation measures in the regional context.
- Adaptation of the Nile Delta to climate change through integrated coastal zone management (UNDP-GEF): Despite the measures implemented by the government, there are still many constraints to the effective implementation of integrated coastal zone management and adaptation to the rise of sea level. The project aims to improve Egypt’s resilience and reduce its vulnerability to climate change by integrating the management of risks associated with rising sea levels into the development policies of the Nile Delta.
- Climate Change Risk Management in Egypt: The aim of the proposed joint programme is to help Egypt align its climate risk management and human development efforts in pursuing the achievement of MDGs in the face of climate change and the predicted serious threats to the country. In this context, the project

will serve to reduce poverty and mitigate risk by combining mitigation and adaptation under one integrated climate risk management banner.

3.3.5 Montenegro

- ADRIatic sea integrated COastal areaS and river basin Management system (“Adricosm-Star”) The project aims to the initiation and improvement of an integrated coastal zone and river basin management using methodologies, regulations and techniques of monitoring, modelling, forecasting, and reporting. Climate change impacts on the water quality and sediment transport in the Bojana river and in the Montenegrin coastal area are done using IPCC climate change scenario for the next decades.

- “The Economic Impacts of Climate Change in Montenegro: A First Look”: this study has been funded by UNDP to identify the data and state-of-the-art models and methods needed to estimate the economic impacts of climate change and the benefits and costs of adaptation in agriculture and forests, tourism, water resources and human health in Montenegro, and to use existing data, models and methods available in Montenegro to make some highly preliminary estimates of the economic value of the physical impacts that were identified in the First National Communication.

3.3.6 Morocco

- The Adaptation to Climate Change in Morocco (ACCMA) Project focuses on adaptation to rising sea levels and extreme weather events in the eastern Mediterranean coast. It is funded by the Centre for Research and International Development Research Centre (IDRC) and covers a period of three years (2007-2010). Its aim is to improve the knowledge and awareness on climate change and strengthen vulnerability assessment capabilities.

- Impact Assessment of Climate Change on the Agricultural Sector in Morocco. (World Bank & FAO, 2008-2010). The objective is to determine the economic and political options for adapting Moroccan agriculture to climate change to ensure that the country is not taken aback by any crisis. This study was organized operationally into 5 phases : (1) future climate projections across the country, (2) impacts on crop yields, (3) impacts on water resources, (4) economic impact, (5) adaptation to climate change policy options.

- Study of vulnerability to climate change and natural disasters in coastal cities of North Africa (2010-ongoing). This project is part of the intervention of the World Bank support to the Governments of the Middle East and North Africa (MENA) to face the challenges resulting from climate change and natural disasters and to integrate adaptation strategies into their development plans. The study shows the increasing

environmental threat that Alexandria, Casablanca and Tunis face, such as flooding, storm surges and coastal erosion. Morocco's Bouregreg Valley- an area slated for rapid development - could face major risks unless decision-makers employ climate-smart planning. Particularly, as they develop housing and commercial structures in low-lying, vulnerable areas.

- UNDP Project: Adapting to climate change in Morocco for resilient Oasis (October 2009 - December 2011). The project aims to establish dynamic mechanisms and tools for long-term planning to manage the risks of climate change, strengthen the institutional frameworks for integrated climate risk management, establish policies and measures to provide people and ecosystems the resilience necessary to cope with anticipated changes.

- Nature Conservation and Combating Desertification. This project was launched in the framework of bilateral cooperation between the Kingdom of Morocco and the Federal Republic of Germany. It is run by the High Commission for Water, Forests and Desertification Control (HCEFLCD) with technical support from GTZ. The overall objective is the management of protected areas and the fight against desertification in a sustainable way.

3.3.7 Palestine

- In 2009, the Environment Quality Authority (EQA), spearheaded the effort to generate a climate change risk and vulnerability assessment report/adaptation strategy for Palestine, entitled "Climate Change Adaptation Strategy for the Occupied Palestinian Territory" and funded by the United Nations Development Program's (UNDP) Program of Assistance to the Palestinian People (PAPP). It addresses the short-term adjustments, as well as the long-term adaptation strategies, while exploring three of the most vulnerable areas of Palestinian society – the Bedouin communities around Hebron, Jordan Valley villages and residents of the Gaza Strip – as case studies.

- "Climate Induced Changes on the Hydrology of Mediterranean Basins (CLIMB) – Reducing Uncertainty and Quantifying Risk through an Integrated Monitoring and Modeling System". This project is funded by the European Commission through the Seventh Framework Program. The project started in January 2010 and would be ended by the end of 2013. The main objective of this project is to analysis the climate change impacts on available water resources. Seven sites of the Mediterranean countries were selected as study sites which are; Sardinia, Northern Italy, Southern France, Tunisia, Egypt and the Palestine.

- The Climate change, hydro-conflicts and human security (CLICO) project is a collaborative project funded under the EU Framework 7 Program which will explore the ways in which different hydro-climatic, climate change, water conflict and human security as well as climate change and its social dimensions.

3.3.8 Syria

Currently, the German Development Bank (KfW), in cooperation with the Ministry of Housing and Construction and the Damascus Water and Wastewater Authority, has commissioned a comprehensive climate study in order to assess the basic data and analyze the existing information in Syria in order to reach conclusions on the possible effects of climate change on the Barada and Awaj hydrologic basin and the Fiegh water spring. The analysis includes the development of different scenarios based on regionalized global climate models processing data on precipitation, temperature, and evapotranspiration.

3.4 *Other projects*

Recent projects relating to climate change in the Mediterranean are presented in the following table:

Title	Countries involved	Time frame	Geographical focus / case studies	Funding	Main Objectives
PESETA - Projections of Economic Impacts of Climate Change in Sectors of Europe Based on Bottom-up Analysis http://peseta.jrc.ec.europa.eu/index.html	Croatia	2006-2007		EC's Joint Research Centre (JRC)	The objective of PESETA is to make a multi-sectoral assessment of the impacts of climate change in Europe for the 2011-2040 and 2071-2100 time horizons. The project focuses on the impacts of climate change on the following sectors: Coastal systems, Human health, Agriculture, Tourism, and Floods.
CIRCLE : Climate Impact Research Co-ordination for a Larger Europe http://www.circle-era.eu/np4/home.html		2005 - 2009	Regional	Commission of the European Union	CIRCLE-2 is a European Network committed to fund research and share knowledge on climate adaptation and the promotion of long-term cooperation among national and regional climate change programmes. It aims: to coordinate European transnational research funding on Climate Change Impacts, Vulnerability and Adaptation (CCIVA) and to facilitate the transfer of research outcomes that European and national decision makers need to design effective yet economically efficient Adaptation initiatives and strategies; to share experiences and lessons learnt on CCIVA research funding and management and to encourage international cooperation with non-European countries and organizations as well as the involvement of countries with less diverse CCIVA research programmes.
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.

SESAME: Southern European Seas Assessing and Modeling Ecosystems changes http://www.sesame-ip.eu/	Croatia Egypt Tunisia	2007-2011		Commission of the European Union	Objectives: to understand and to explain how climate will change in the Mediterranean area; to predict and to quantify physical impacts of CC in the Mediterranean area; to evaluate the consequences of CC for the society and the economy of the populations located in the Mediterranean area; to develop an integrated approach to understand combined effects of CC; to identify adaptation and mitigation strategies in collaboration with regional stakeholders.
MEDEX: Cyclones that produce high impact weather in the Mediterranean http://medex.aemet.uib.es/		2000-2005 and 2006-2010	Regional	WMO THORPEX	MEDEX is a Mediterranean project focused on cyclogenesis and high impact weather in and around the Mediterranean area. It aims to better understanding and improved forecast of Mediterranean severe storms, through better understanding and improved forecast of cyclones that produce severe storms; identification of the most sensitive areas in which an improvement of the observation leads more clearly to a better forecasting and the evaluation of the societal impact of the hazardous weather and the establishment of ways to translate the scientific achievements to the operational meteorological community.
HYMEX: Hydrological cycle in the Mediterranean Experiment http://www.hymex.org/		2008-2020	Regional	not yet determined	HYMEX aims at a better understanding and quantification of the hydrological cycle and related processes in the Mediterranean, with emphasis on high-impact weather events, inter-annual to decadal variability of the Mediterranean coupled system, and associated trends in the context of global change.
CLIMBIOMEDNET: Climate change influence on biodiversity, goods and services of Mediterranean lagoons	Albania and Tunisia	2008-2010	Coastal Lagoons	MEEDDM CII Galicia	Main objective: Scientific assessment of Climate Change effects on lagoons ecosystem in comparison with man-induced changes The project has three main aims: (1) to contribute to reinforce the theoretical background linking climate changes to community and ecosystem level responses in Mediterranean lagoons; (2) to test the expected relationships with already existing data; (3) to develop experimental protocols to evaluate the actual influence of climate changes on the Mediterranean lagoon ecology, in comparison with human activity induced changes.
CANTICO: Climate and local Anthropogenic	Tunisia	2008-2010	Coastal Zone Gulf of Gabes.		Aim: To develop a pilot study to establish a conceptual model tool to integrate the complex interaction of climate and anthropogenic impacts

drivers and impacts for the Tunisian coastal area					on vulnerable Mediterranean coastal areas; Downscaling for the Gulf of Gabes.
ACIDBIV: The integrated impacts of marine acidification, temperature and precipitation changes on bivalve coastal biodiversity and fisheries: how to adapt?	Adriatic and Gulf of Tunis coastal areas	2008-2010	Adriatic and Gulf of Tunis coastal areas		Objective: Scientific assessment of ocean acidification impacts on bivalves and Proposal of adaptation measures for bivalve's aquaculture.
CLIMWAT: Assessing and managing the impact of climate change on coastal groundwater resources and dependent ecosystems		2008-2010	Coastal aquifers		Objective: determine sustainable yields for groundwater use to prevent degradation of aquifers and dependent ecosystems; develop bioindicators to monitor the state of coastal wetlands.
INTERMED: The impact of climate change on Mediterranean intertidal communities: losses in coastal ecosystem integrity and services	Croatia	2008-2010	Coastal Ecosystems	IMEP IMELS	Objective: scientific assessment of impacts of Climate Change on coastal ecosystem and socio-economic consequences.
AQUIMED: Participatory design of adaptive groundwater management strategies	Morocco	2008-2010	Coastal water resources and livelihoods	FCT MEEDDM	Objective: develop capacity building methods for water users to define and discuss possible strategies of adaptation to future changes including climate change; support definition of ground water management strategies and practices through improved participation of irrigation

and instruments in Mediterranean coastal water scarce areas as a response to climate change					farmers.
MEDCODYN: Climate change impacts in transitional water systems in the Mediterranean	Morocco	2008-2010	Coastal Ecosystems	MEEDDM IMELS	Objective: scientific assessment of coastal ecosystems vulnerability to climate and anthropogenic modifications; explore adaptation measures.
RAB: Building capacity in the Maghreb to respond to the challenges and opportunities created by national response to the FCCC	Algeria Morocco Tunisia	1995-2003	Sub Regional Maghreb Region	UNDP - GEF Medium size project <750k	Objective: To build and reinforce capacity within the Maghreb countries, to advance regional interest related to CC and to enhance capability to implement adaptation strategies in the Maghreb region through institutional capacity strengthening, development of national adaptation plans, project portfolio and pilot project development and the deepening of public awareness of the risks of climate change.
BEACHMED 3 : Strategic Resources for the Adaptations of Mediterranean littorals to climate change					To be proposed
ClimateCost: the Full Costs of Climate Change http://www.climatecost.cc/		2008-2011	European	Commission of the European Union	The objective of the project is to advance knowledge in three areas: -Long-term targets and mitigation policies. -Costs of inaction (the economic effects of climate change). -Costs and benefits of adaptation.
Climate Water: Bridging the gap		2008-2011	European	Commission of the European	The overall objective is to study European and international adaptation measures and strategies related to climate change impacts and how these

between adaptation strategies of climate change impacts and European water policies http://www.climatewater.org				Union	are taken into account in water policies. The project will bring together scientific and policy experiences on the existing and/or missing links between climate change and water management and will help to identify research needs on climate change impacts on water cycle and resources; develop and apply methodologies for adaptation measures to climate change, and develop scenarios of water demand and to potential implementation on water policies.
A Climate for Change: Human Development Report for Croatia	Croatia	2008	Multiple sectors with reference to coastal zone and sea level rise	UNDP	The basic options available for coping with sea-level rise are to protect vulnerable areas or to retreat from them. A mixture of near- and long-term strategies involving both protection and retreat measures could be the best approach. The role of the national and local governments in adapting to sea-level rise is currently unclear and needs to be defined. The three step strategy for Croatia to take in this area is proposed.
ClimDev Africa: Climate for Development in Africa http://www.wmo.int/pages/prog/gcos/index.php?name=ClimDevAfrica					The Climate for Development in Africa Programme is an integrated, multi-partner programme addressing climate observations, climate services, climate risk management, and climate policy needs in Africa. The user-driven programme will support efforts to achieve the Millennium Development Goals. In addition to GCOS, principal partners are the UN Economic Commission for Africa, the African Union, the African Development Bank, the World Meteorological Organization, and potential donors including the UK Department for International Development.
The ACQWA Project (Assessing Climate impacts on the Quantity and quality of WAter) http://www.acqwa.ch/		2008-2012	Regional	Commission of the European Union (FP7)	The goal of the project is to use advanced modeling 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.
DESURVEY : A Surveillance System for Assessing and Monitoring of		2005-2010	Regional	Commission of the European Union (FP6)	The ambition of the DeSurvey consortium is to deliver a compact set of integrated procedures of desertification assessment and forecasting, with application and tutorial examples at the EU and national scales. The performance of DeSurvey in other desertification threatened areas of

Desertification http://www.desurvey.net/					UNCCD regional Annexes will be also tested against other expertise and available procedures CRU are developing much of the observational datasets for the assessments across Europe.
ENSEMBLES http://www.ensembles-eu.org/		2004 - 2009	European	Commission of the European Union (FP6)	This EU integrated project on ENSEMBLE based predictions of climate changes and their impacts uses the collective expertise of 66 institutes to develop a reliable quantitative risk assessment of climate change and its impacts on timeframes ranging from seasonal to decadal and longer, at global, regional, and local spatial scales. Research themes encompassed data analysis, downscaling, extreme events, impacts, communication and dissemination activities and treatment of uncertainty. An ENSEMBLES web portal provides briefing material for developers and users of regional climate information, together with links to relevant datasets and tools, including the ENSEMBLES downscaling portal.
Adaptation of the Nile Delta to climate change through integrated coastal zone management	Egypt	Sept 2009 - June 2014	Coastal areas, all sectors	UNDP-GEF	The main objective is to integrate the management of sea level 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 http://www.ccalb.org/	Albania	May 2008 - May 2012	Drini - Mati River Deltas	UNDP-GEF	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.
ADRICOSM-STAR ADRIatic sea integrated COastalareaS and river basin Management system: Montenegro coaSTalARea and Bojana river catchment http://gnoo.bo.ingv.it/adricosm-star/	Montenegro, and Albania	2007-2010	Montenegro coastal area and Bojana river catchment	The Italian Ministry of Environment, Territory and Sea and the Italian Ministry of Foreign Affairs.	The project aims at the development and partial implementation of an integrated coastal area and river and urban waters management system that considers both observational and modeling components. The project develops innovative components such as studies of climate change impacts on the water resources and sediment transport.

ADRICOSM-EXT http://gnoo.bo.ingv.it/adricosm-ext/	Croatia, Albania, Bosnia-Herzegovina and Serbia-Montenegro		Sub-Regional/ Adriatic	The Italian Ministry of Foreign Affairs and implemented by IOC-UNESCO	The main objectives are: To activate the participation of Bosnia-Herzegovina, Serbia-Montenegro and Albania in the activities of ADRICOSM; To continue and further enhance of the ADRICOSM observational network with the active participation of the new entering countries; To expand and implement a data management system for real time exchange and historical data archiving; and Activate training courses and workshops on different aspects of real time monitoring and forecasting.
CLIWASSEC: Climate Induced Changes in Water and Security http://www.cliwasec.eu/home/home.php	Tunisia Egypt	2010-2013		Commission of the European Union (FP7)	In order to better assess the manifold consequences and uncertainties in climate impact on man-environment systems, a coordinated topic has been programmed between Theme 6 ('Environment (incl. climate change)') and Theme 8 ('Socio- Economic Sciences and Humanities') in the 3rd FP7 call for proposals (2009). CLICO (SSH) with WASSERMed (ENV) and CLIMB (ENV), all started in early 2010, are now establishing a research cluster for scientific synergy and improved policy outreach.
CLIMB Project: "Climate Induced Changes on the Hydrology of Mediterranean Basins- Reducing Uncertainty and Quantifying Risk through an Integrated Monitoring and Modeling System" http://www.climb-fp7.eu/home/home.php	Tunisia Egypt Palestine	2010-2013	Chiba Watershed in Cap-Bon (Tunisia) and Gaza Strip (Palestine)	Commission of the European Union (FP7)	The strategy of CLIMB is aiming to employ and integrate advanced field monitoring techniques, remote sensing analyses and retrievals, climate models auditing and integrated hydrologic modeling and socioeconomic factor assessment in a new conceptual framework to significantly reduce existing uncertainties in climate change impact analysis. It will create an integrated risk assessment tool for adaptive water resources management and best agricultural practice under climate change conditions. Case studies : Chiba Watershed in Cap-Bon (Tunisia) and Gaza Strip (Palestine)
CLICO Project: Climate Change, Hydro-Conflicts and Human Security	Egypt Morocco	2010-2012	Alexandria, Egypt Morocco- Andalusia	Commission of the European Union (FP7)	A large dataset – the first of its kind – of domestic hydro-conflicts in the Mediterranean, Middle East and Sahel will be regressed against climatic, hydrological and socio-economic variables. The resilience of international treaties in the region to deal with climatic variability will be addressed

http://www.cluco.org/			Biosphere:		and national and international policies will be evaluated, the aim being the development of a suitable international institutional framework for dealing with the human security implications of hydro-climatic hazards.
WASSERMed project “Climate Induced Change on Water and Security” http://www.wassermmed.eu/	Tunisia Egypt	2010-2012	Merguellil catchment (Tunisia) The Rosetta area, Nile Delta (Egypt)	Commission of the European Union (FP7)	The project analyses, in a multi-disciplinary way, ongoing and future climate induced changes in hydrological budgets and extremes in southern Europe, North Africa and the Middle East under the frame of threats to national and human security including the assessment of changes in mean flows, frequency and magnitude of extreme precipitation (intensity and duration), surface run-off, stream flows ground water balance, as well as social and economic factors.
Project on Climate Change Impacts and Adaptation Assessment in the coastal areas of Morocco	Morocco	2004-2005	Coastal zones of Saïdia and Tangiers Bay	UNEP-GEF AIACC	Assess the biogeophysical and socioeconomic impact of climate change and rising sea level on the coastal zones of Morocco Assess the Vulnerability and Adaptation options to the adverse effects of climate change Strengthen the scientific and technical capacities of the country in modeling and analysis of climate change impacts.
Climate Change Adaptation and Natural Disasters Preparedness in the Coastal Cities of North Africa	Egypt Morocco Tunisia	2008-2010	Coastal Cities Alexandria Casablanca BouRegreg Valley	World Bank and other partners	This project aims to: assess the climate change and natural disaster vulnerabilities of 4 urban areas in North Africa: Alexandria (Egypt), Tunis (Tunisia), Casablanca and Bouregreg Valley (Morocco), and formulate related action plans to improve their adaptation to climate change and preparedness for natural disasters.
MY OCEAN: Ocean Monitoring and Forecasting http://www.myocean.eu.org	Morocco	2009-2012	Euro-Mediterranean	Commission of the European Union	MyOcean aims at providing a sustainable service for Ocean Monitoring and Forecasting validated and commissioned by users. The MyOcean information includes observations, analysis, reanalysis and forecasts describing the physical state of the ocean and its primary biogeochemical parameters. It also contributes to research on climate by providing long time-series of reanalyzed parameters

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