

THE IMPACTS OF CLIMATE CHANGE ON WATER RESOURCES AND WETLANDS IN MOROCCO

SUMMARY

Not only are water resources in Morocco particularly limited but they are also subject to extreme cyclic variations (i.e. a succession of acute drought cycles).

Rising demands brought about by both the rapid increase in population figures, improvements in standards of living, industrial development and the extension of agricultural land under irrigation are all bringing constant pressure to bear on this already scant resource. Such pressures on water resources go hand in hand with a growing, and increasingly serious, decline in water quality.

Pollution, soil erosion and soil transport are the main constraints hampering the rational management and sustainable development of water resources in Morocco.

National wetlands are under intense man-induced pressures as a result of their accessibility, their inherent significance for local populations and their enormous biological wealth. Wetland degradation is mainly caused by:

- ✍ Drying out, loss and transformation of habitats,
- ✍ The loss of functions, ecological qualities and biodiversity,
- ✍ Impacts related to natural drought.

Seven general circulation models (GCM), based on the average IGPPC (IS92a), with an average climate sensitivity and the SCENGEN network, have been examined for climate simulations for the 2020 horizon. The results of the forecasts for the country as a whole point to:

- ✍ A net trend towards warming by between 0.7°C and 1°C,
- ✍ A trend towards drops in annual rainfall averaging 4%,
- ✍ An increase in both frequency and intensity of droughts in the south and east of the country,
- ✍ A disruption in seasonal rainfall.

The already critical status of country's water resources may even eventually become a barrier curbing any form of development. The climate change forecast for Morocco would have disastrous consequences, both direct and indirect, on water resource potential not only in terms of quantity and quality but also of water needs and efficient use of the resource for different purposes. Ecosystems will have to cope with temperatures and rainfall patterns that are very different from those recorded today. Future changes in national climate conditions combined with future increases in sea level will also alter water availability and will exert a strong influence on the nature and function of certain Moroccan wetlands, including the plant and animal species it hosts. Such changes are likely to affect water birdlife whose habitat is currently provided by the country's wetlands (classified as important world sites by the Ramsar Convention).

On an institutional scale, management for the water sector is shared by the Ministry for Public Works & Development, responsible for water resource distribution, management and planning, by the Ministry of Agriculture, who is the main user and manager of wetlands, and by the Department for the Environment, responsible for drawing up laws and regulations on waste. Indeed, the lack of co-ordination between the various ministerial Departments involved is posing a major constraint on the implementation of development plans. Through adjustments in the institutional framework, the Government should ensure the enforcement of legal provisions on water and encourage inter-

departmental co-ordination as well as active involvement in the planning and implementation of programmes. Such inter-ministerial co-ordination should be entrusted to the Department for the Environment.

Morocco has always respected and complied with the fundamental rules governing international co-operation. As a result, Morocco ratified the three conventions stemming from the Rio Summit Process in 1995. These address topics linked to climate change such as biodiversity and the fight against desertification (the Department for the Environment is the national body responsible for these conventions). Morocco also ratified the International Ramsar Convention in 1980 where the Ministry of Agriculture is the core national body.

Both the ratification of these conventions and all the efforts made to comply with their provisions reflect the country's good will to make an effective contribution to world efforts towards environmental protection and sustainable development. To date, however, as Morocco has been unable to harness the synergy that their implementation in common may generate, but is now determined to set up appropriate structures capable of implementing decisions arising from negotiations on these conventions.

The partial survey on vulnerability and adaptations to the impacts of Climate Change, conducted within the framework of preparations for Morocco's maiden speech at the UNFCCC, puts forward the forecasts for 2020 for certain determining variables, i.e. in terms of quality for the environment sector and the socio-economic context; and in terms of quantity for the water and agricultural sectors. This initial diagnosis has given rise to a dozen projects for adaptation in the water and agricultural sectors as well as a further seven linked projects (see table n° 5, Annexes). Relief from the impacts of climate change on the country's water resources and wetlands can only be achieved if adaptation programmes are set underway as soon as possible. Morocco has set high hopes on the provisions to be adopted by the international community on the issue of adaptation to climate change. Morocco is determined to contribute actively towards the implementation of a suitable funding mechanism for adaptation projects in Non-annexe 1 countries.

In itself, the process that has led Morocco to draw up its first speech thanks to GEF projects, has also entailed a process of strengthening Moroccan capabilities on climate change. Significant progress has been made. Now, in pursuance to the 7th COP hosted by the country, it is up to Morocco to contribute towards implementation of the Convention, in line with the principle of joint, but clearly differentiated responsibility. It also means that Morocco must now prepare in particular for adaptation to potential impacts of climate change on the environment and on the different social and economic sectors.

Morocco must secure the availability of certain management skills to ensure that the problems involved in climate change are built into sustainable development policies, such as:

- ✍ Capabilities for the analysis and formulation of response policies,
- ✍ Capability to select from alternatives under conditions of extreme uncertainty,
- ✍ Capability to recommend certain measures and to match them with the country's socio-economic and political reality.

Technological and financial means must be made available to enforce any policies issued in response. This is why Morocco has drawn particular attention to strengthening capabilities and technology transfer as pivotal measures to ensure the implementation of United National Conventions and Protocols.

Such strengthening of capabilities and technology transfer can only be achieved through strong regional co-operation and partnership.

Contents

Page

FOREWORD.....	¡ERROR! MARCADOR NO DEFINIDO.
SUMMARY	1
 PART A : THE CONTEXT IN THE COUNTRY . ¡ERROR! MARCADOR NO DEFINIDO.	
1. CURRENT SITUATION OF WATER RESOURCES AND WETLANDS IN THE COUNTRY.....	¡ERROR! MARCADOR NO DEFINIDO.
MARCADOR NO DEFINIDO.	
1.2 Water resources.....	¡Error! Marcador no definido.
1.2 Wetlands.....	¡Error! Marcador no definido.
2. PROSPECTIVE CLIMATE VARIABILITIES AND CHANGES FOR THE COUNTRY	¡ERROR! MARCADOR NO DEFINIDO.
MARCADOR NO DEFINIDO.	
2.1 Likely changes in sea level.....	¡Error! Marcador no definido.
2.2 Likely changes in average temperatures.....	¡Error! Marcador no definido.
2.3 Likely changes in rainfall	¡Error! Marcador no definido.
3. USAGE OF WATER AND COMPONENTS OF THE HYDROLOGICAL AND ECOLOGICAL SYSTEM IN CLIMATE-CHANGE VULNERABLE COUNTRIES.....	¡ERROR! MARCADOR NO DEFINIDO.
3.1 Usage of water	¡Error! Marcador no definido.
3.2 Ecosystems.....	¡Error! Marcador no definido.
 PART B : INSTITUTIONS, PROCESSES AND NETWORKS WORKING ON WATER, WETLANDS AND CLIMATE CHANGE ISSUES. ¡ERROR! MARCADOR NO DEFINIDO.	
1. INSTITUTIONS, PROCESSES AND NETWORKS DIRECTLY INVOLVED IN THE ASSESSMENT OF CLIMATE CHANGE IMPACT, VULNERABILITY AND ADAPATION, DEFINING POLICY.....	¡ERROR! MARCADOR NO DEFINIDO.
MARCADOR NO DEFINIDO.	
2. VULNERABILITY AND ADAPTATION.....	¡ERROR! MARCADOR NO DEFINIDO.
3. DEGREE OF CO-ORDINATION BETWEEN INSTITUTIONS RESPONSIBLE FOR MANAGEMENT OF WATER RESOURCES AND WETLANDS	¡ERROR! MARCADOR NO DEFINIDO.
 PART C : BUILDING CLIMATE CHANGE ISSUES INTO POLICY AND PRACTICES FOR THE MANAGEMENT OF WATER RESOURCES AND WETLANDS..... ¡ERROR! MARCADOR NO DEFINIDO.	
1. POLICIES FOR THE MANAGEMENT OF WATER RESOURCES AND WETLANDS	¡ERROR! MARCADOR NO DEFINIDO.
MARCADOR NO DEFINIDO.	
2. PLANNING SYSTEMS AND INSTRUMENTS REQUIRED.....	¡ERROR! MARCADOR NO DEFINIDO.
3. OPTIONS AND MEASURES CONSIDERED	¡ERROR! MARCADOR NO DEFINIDO.
4. FLEXIBILITY IN INSTITUTIONAL AND PARTICIPATORY ARRANGEMENTS....	¡ERROR! MARCADOR NO DEFINIDO.
NO DEFINIDO.	
4.1 Institutional framework.....	¡Error! Marcador no definido.
4.2 Structures.....	¡Error! Marcador no definido.
5. INFLUENCES AND ADVANTAGES OF REGIONAL CO-OPERATION AND PARTNERSHIP	¡ERROR! MARCADOR NO DEFINIDO.
MARCADOR NO DEFINIDO.	
5.1 The need to strengthen capabilities	¡Error! Marcador no definido.
5.2 Funding requirements.....	¡Error! Marcador no definido.
6. ADAPTATION AND AVAILABILITY OF RESEARCH, DATA AND INFORMATION SYSTEMS ..	¡ERROR! MARCADOR NO DEFINIDO.
MARCADOR NO DEFINIDO.	

- 6.1 Scientific research ¡Error! Marcador no definido.
- 6.2 Systematic observation and data banks ¡Error! Marcador no definido.

**PART D : TOWARDS ADAPTATION STRATEGIES – ITEMS FOR DISCUSSION
AT THE REGIONAL ROUND TABLE ¡Error! Marcador no definido.**

- 1. WATER RESOURCES..... ¡Error! Marcador no definido.
 - 1.1 Continuation and speeding up of efforts for conventional water distribution;¡Error! Marcador no definido.
 - 1.2 Maintenance and preservation of existing water infrastructure¡Error! Marcador no definido.
 - 1.3 Wastewater treatment ¡Error! Marcador no definido.
 - 1.4 Protection of water resources against pollution ¡Error! Marcador no definido.
 - 1.5 Unconventional usage of water resources..... ¡Error! Marcador no definido.
 - 1.6 Water economy in all major consumer sectors ¡Error! Marcador no definido.
 - 1.7 Integrated management of water resources..... ¡Error! Marcador no definido.
 - 1.8 Strengthening the regulatory framework ¡Error! Marcador no definido.
- 2. WETLANDS ¡Error! Marcador no definido.
 - 2.1 Protection and management of human activities ¡Error! Marcador no definido.
 - 2.2 Restoration and rehabilitation ¡Error! Marcador no definido.
 - 2.3 Preventive measures ¡Error! Marcador no definido.
 - 2.4 Research and data bases ¡Error! Marcador no definido.
 - 2.5 Training, information and raising awareness ¡Error! Marcador no definido.
 - 2.6 Institutional and financial frameworks ¡Error! Marcador no definido.

SOURCES OF DOCUMENTATION AND BIBLIOGRAPHY ¡Error! Marcador no definido.

ANNEXES ¡Error! Marcador no definido.