



KINGDOM OF MOROCCO

COST OF WATER RESOURCE DEGRADATION OF THE OUM ER-RBIA BASIN

POLICY NOTE¹ -- DECEMBER 2012

Morocco has adopted a new policy in the field of water management based on demand, user participation and pollution remediation at the watershed level. Demand management, unlike supply management, can ensure operational and economic effectiveness and efficiency water resource management. To be implemented, this approach seeks an integrated management which includes the institutional, legal, economic, social and techniques to change the behavior of users and achieve a sustainable balance between the limited supply of water and its growing demand. The cost of water resource degradation in the watershed pilot of Oum Er-Rbia (OER) is part of the regional study of the cost of degradation of water resources at the basin level and is supported by the project SWIM-SM. The main objective is to value the cost of degradation of water resources at the OER watershed level to help decision makers at the national and local levels to identify and prioritize concrete actions to improve the management of the basin through the funding of potential projects that will reap environmental benefits and reduce externalities.

The costs of degradation of the OER were calculated by considering 2 base years, 2007 and 2010, which are illustrated in Table 1 and Figure 1. It should be noted that 2007 is characterized as being a dry season while 2010 is characterized as being a wet season. In addition, the valuation of poor waste management was included in the analysis because of its impact on water resources. However, urban and agricultural centres supplied through transfers from the OER basin are not included in the analysis.

In 2007, the cost of degradation of the OER amounted to Moroccan Dirham (MD) 6.2 billion with a range from MD 4.6 to 7.2 billion. These costs represent 9.3% of the GDP of the OER, 1% of Morocco's GDP in current terms but 1.1% of Morocco's GDP in constant terms (in 2000 prices). **In 2010**, the cost of degradation of the OER amounted to MD 6.3 billion with a range from MD 4.7 to 7.4 billion. These costs represent 7.9% of the GDP of OER, 0.8% of Morocco's GDP in current term but 1.0% of Morocco's GDP in constant terms (in 2000 prices).

Table 1: Cost of Degradation of the Oum Er-Rbia, 2007 and 2010

Category	Cost of degradation of the Oum Er-Rbia			
	2007 MD million	%	2010 MD millions	%
Water	5,121.7	82.5%	5,033.1	79.3%
Solid Waste	985.4	15.9%	1,031.5	16.2%
Biodiversity	7.6	0.1%	8.3	0.1%
Natural Disaster and Global Environment	97.2	1.6%	278.0	4.4%
Total	6,211.7	100%	6,350.9	100%
% current GDP of the Oum Er-Rbia	9.3%		7.9%	
% current GDP of Morocco	1.0%		0.8%	

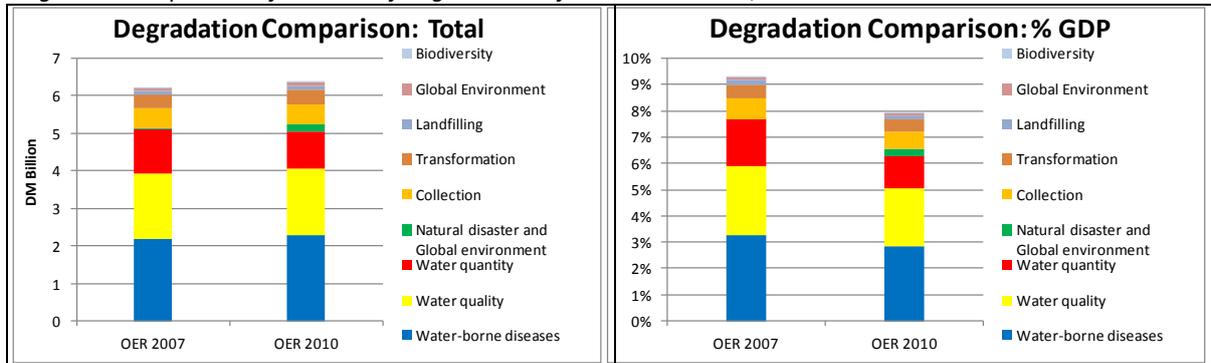
Broken down by the *Water Category* (MD 5.1 and 5.2 billion in 2007 and 2010 respectively), *waterborne diseases* (MD 2.19 and 2.27 billion) represent the majority of the costs of OER followed by *water quality* (MD 1.7 and 1.8 billion), *water quantity* (MD 1.2 and 1 billion) and finally the global environment by including

¹ This Note was prepared by Sherif Arif and Fadi Doumani, and is based on the report : *Royaume du Maroc, Coût de la Dégradation des Ressources en Eau du Bassin de l'Oum Er-Rbia*, prepared under SWIM-SM.



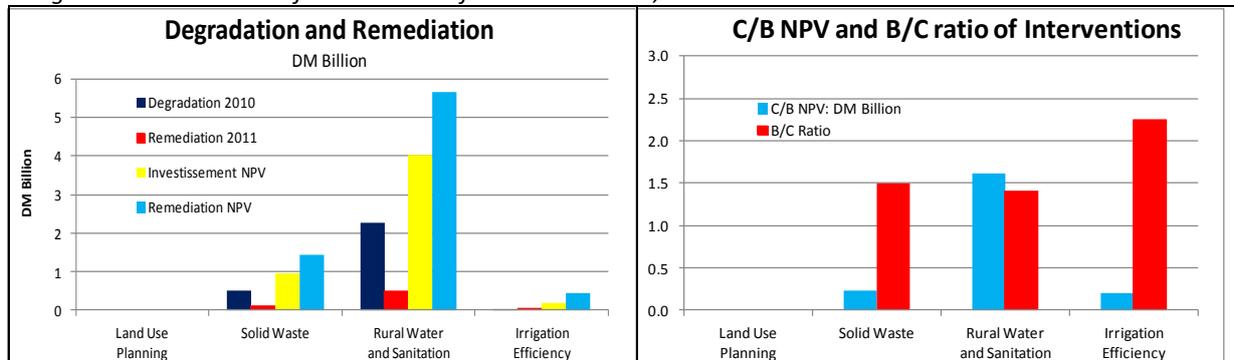
natural disasters and greenhouse gas emissions (MD 3 and 203 million). Broken down by the Waste Category (MD 1.1 billion in 2007 and 2010 respectively), the collection represents the majority of the costs of OER (MD 515 and 528 million) followed by waste transformation (MD 353 and 383 million), landfilling (MD 117 and 121 million) and finally the global environment (MD 65 to 75 million). Biodiversity represents only 0.1% of the degradation equivalent to MD 7.6 and 8.3 million respectively - natural disasters and greenhouse gas emissions are included in the above mentioned categories.

Figure 1: Comparison of the cost of degradation of the Oum Er-Rbia, 2007 and 2010



Moreover, the comparison of degradation costs in 2007 (dry season) and 2010 (wet season) reveals a significant difference in terms of GDP ranging from 1% in 2007 to 0.8% in 2010 compared to the GDP of Morocco. But this difference is even more significant when the OER GDP is considered: the difference is 1.4%. However, this difference is not entirely due to the difference in seasons but in part to the GDP growth in current terms over the period (4.2% per year on average) which is associated with a lower increase in pollution.

Figure 2: Selected cost of remediation of the Oum Er-Rbia, 2010 and in MD billion



Four intervention scenarios were considered but only three were calculated. Only the categories irrigation efficiency, drinking water, and sanitation in rural areas and solid waste management were valued (Figure 2). The profitability of large-scale irrigation effectiveness makes no doubts and could have a positive return on investment after only 5 years. Regarding water and sanitation in rural areas, all scenarios are profitable. For waste, the recycling center is not profitable and only the landfilling in cells and electricity generation alternative is profitable. Segregation and recycling alternatives are not because they are too expensive. Thus, to overcome this shortcoming, a multi-criteria analysis could be considered for decision making where the weights are assigned not only to analyze C/B but also for employment creation, poverty reduction, etc. In addition, interventions related to land use and to reduce erosion and siltation of dams were not considered due to lack of studies to establish a causal link between interventions and the reduction of siltation to conduct an economic valuation.

Six intervention areas are proposed for the integrated and sustainable management of water resources of the OER underlying the recommendations of this study:

- a) Focusing primarily on efficient investment for domestic pollution control in rural and peri-urban areas which have been neglected in the past. The priority would be that:





- i. The Moroccan Government investment first in the extension of drinking water and sanitation in rural areas of the basin where poverty is predominant by using appropriate technologies. There is an institutional vacuum regarding the planning and implementation responsibility of water and sanitation in rural areas in the OER basin. This should be addressed by the Ministry of the Interior in the development of the sanitation strategy that will be associated with access to drinking water, but based on strong economic and environmental elements, and provided with monitoring indicators such as the reduction of the cost of degradation of water resources.
 - ii. A similar strategy to the PNDM for waste management in suburban and rural area as well as the closure of dumps is strongly advised. However, the institutional aspects (role of municipality operators and control facilities available) and the limited financial capacity of the municipalities of the OER, particularly the small and medium-sized of them constitute a major constraint for waste management in rural and peri-urban areas and should be analyzed in the proposed strategy.
- b) **Considering opportunities to increase agricultural productivity by reducing the impact of salinity.** The following opportunities can be considered such as improving the efficiency of irrigation systems, the use of micro-irrigation such as drip, and consideration of other crops that are tolerant to salinity (wheat, sugar beet and citrus) instead of vegetable crops and the land where salinity levels are very high.
- c) **Gradually shifting the policy of intensifying the exploitation of natural resources,** including through the mobilization of surface water and groundwater that are exploited in the OER basin. This shift can be made on the basis of criteria that explicitly include economic performance and degradation and resource scarcity in the basin. This should allow a better water resource value-added on the one hand and integrate "soil and water" heritage conservation concern, and improving productivity on the other hand.
- d) **Planning upstream interventions that reduce siltation of dams needing to derive the determinants of siltation** and assess the exact impact of erosion control for the control and mobilization of surface water and adaptation of erosion control techniques for their effective use by the stakeholders.
- e) **Setting up an information network for decentralized monitoring, monitoring of the environment and natural resources of the basin of OER.** This network should be reoriented in partnership with the institutions of the water, ABHOER and the environment. This network will aim to:
 - i. define and validate protocols for continuous exchange and cooperation with other information sources and database;
 - ii. undertake the measurement of the state of soil and water in order to reflect the understanding and assessment of the environment and its impact on health and the degradation of natural capital hence contributing to decision-making based on accurate and regular data; and
 - iii. provide all users, all information and data on the nature and quality of water and soil as well as the constraints and incentives.
- f) **Considering a horizontal action for an overall and integrated management of water in the watershed of the OER is highly recommended.** Effective and efficient investments are not sufficient to ensure multi-sectoral and cooperation between ministries, ABHOER, local institutions and beneficiaries. The Provincial Water Commission of the OER can be a transversal study group composed of representatives of the ministries (Water and Environment, Interior, Agriculture and Health), their tutelage institutions such as ONEP and ABHOER and user representatives, will be mandated in the first place to:
 - i. develop expertise in the assessment of benefits and damages and water conservation, and advice in the ways and means of integrating these aspects into the programs and sectoral development strategies, and
 - ii. implement a system of monitoring and evaluation for investments and activities in the basin.