

# SWIM and Horizon 2020 Support Mechanism

Working for a Sustainable Mediterranean, Caring for our Future

## SWIM-H2020 SM Regional Activities

### Training on Cost of Environmental Degradation

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**Water pollution in Tunisia**

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# Content of the presentation

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# Background

- Tunisia is a water-stressed country with approx. 400 m<sup>3</sup>/capita/year
- The limited water supply is unevenly distributed across the country.
- High demand for water resources has intensified their use, creating serious challenges such as increasing degradation and risk of depletion.
- In 2004, 83 percent of the total water demand was used for agriculture, the rest for drinking water and industry

# Drivers

- Scarcity. Steadily increasing demand will lead to greater reliance on unconventional resources such as desalination and wastewater treatment.
- Salinity. Over 50% of mobilized resources have salinity higher than 1.5 grams per liter
- Chemical and bacteriological contamination. This type of degradation affects both inland and coastal marine waters. Bacteriological contamination affects the networks supplying drinking water in rural areas
- Dam sedimentation. Silting reached more than 25% percent of the initial dam capacity

# Impacts

- Deteriorating water quality. Whether caused by chemical or bacteriological contamination or by increased salinity due to intrusion of coastal and chott waters, water degradation can affect all uses. For example, poor water quality for irrigation may reduce agricultural productivity in irrigated areas.
- Reducing water quantity. This occurs when the quantity of water extraction exceeds the sustainable level of exploitation. For example, the overexploitation of groundwater reduces the groundwater level, which deepens the water table and may induce groundwater salination.

# Impacts and valuation

- Impact on agriculture: Change in productivity (salinity, insufficiently treated wastewater) / Replacement costs (new dam, improvement wastewater treatment)
- Impact on fishery: Change in productivity
- Impact on health (Diarrhea, typhoid fever, hepatitis): DALYs, treatment costs, lost opportunity costs
- Impact on tourism: Additional travel costs / lost opportunity
- Impact on biodiversity: Contingent valuation method / annual costs of wetland restoration
- Cost of overexploiting groundwater: Increased pumping costs / replacement costs of wells

# Some results - 1

Irrigated agriculture (salinity and water logging): It is estimated that current irrigation practices cause an annual loss equivalent to about 1 percent of irrigated agricultural production. Eighty percent of this loss is short-term, and 20 percent is permanent. In an irrigated area of about 375,000 hectares, this corresponds to an equivalent annual loss of 3,000 hectares and an irreversible loss of 750 hectares. Considering that the value added of irrigated agriculture is US\$2,160 per hectare (Ministry of Agriculture), the short-term losses are estimated at about US\$6.5 million, and the present value of permanent losses at US\$25.3 million. Consequently, the total impact of salinity and waterlogging on irrigated agriculture is estimated at US\$31.8 million.

Irrigated agriculture (improper treated wastewater): In 2004, 7,440 hectares were irrigated with treated wastewater, of which 6,066 hectares used insufficiently treated wastewater. The loss of agricultural production due to lack of drainage, poor agricultural practices and poor-quality treated wastewater was in several studies estimated to be on average US\$890 per hectare, representing US\$ 5.4 million. If 30 % of these losses were caused by poor-quality treated wastewater, the total losses are around US\$ 1.6 million.

## Some results - 2

Dam sedimentation, causing loss of agricultural productivity: It is projected that the storage capacity of 26 operating dams would gradually diminish from 800 million cubic meters in 2002 to 450 million cubic meters in 2020, corresponding to an annual loss of 19.4 million cubic meters of dam storage capacity. Replacement costs (anti-erosive measures, dam heightening, dredging and eventually building new dams are estimated at US\$ 13 million USD per year. If dams are not replaced, 4,000 ha irrigated land would be replaced by non-irrigated land, with an estimated loss of US\$ 1,520 per ha, resulting in a loss of US\$ 6 million per year. Assuming that this cost would only occur during dry years, the present value over a period of 25 years was calculated at US\$ 29 million. As not all dams can be enhance/replaced, the real costs are somewhere between US\$ 13 and 29 million.

Hence, the total costs of water pollution and sedimentation on agriculture are estimated at US\$ 46-62 million.



## Some results - 3

Fishery: Sfax and Gabès areas are the most affected by pollution. Here, fish production remained at 8 tons per boat; in the rest of the country it increased from 7.5 to 12 tons per boat (10 years). With 3,900 boats in the area and a price of US\$ 2,480 per ton, it is calculated that total losses were US\$ 46 million. It is estimated that 20-30 % of these losses can be attributed to pollution, the rest to other factors like fishing practices, investments, etc. This brings total annual costs to US\$ 9-14 million.

Health impacts: using DALYs and risk factors from literature it is estimated that the costs are between 6 and 42 million USD/year.

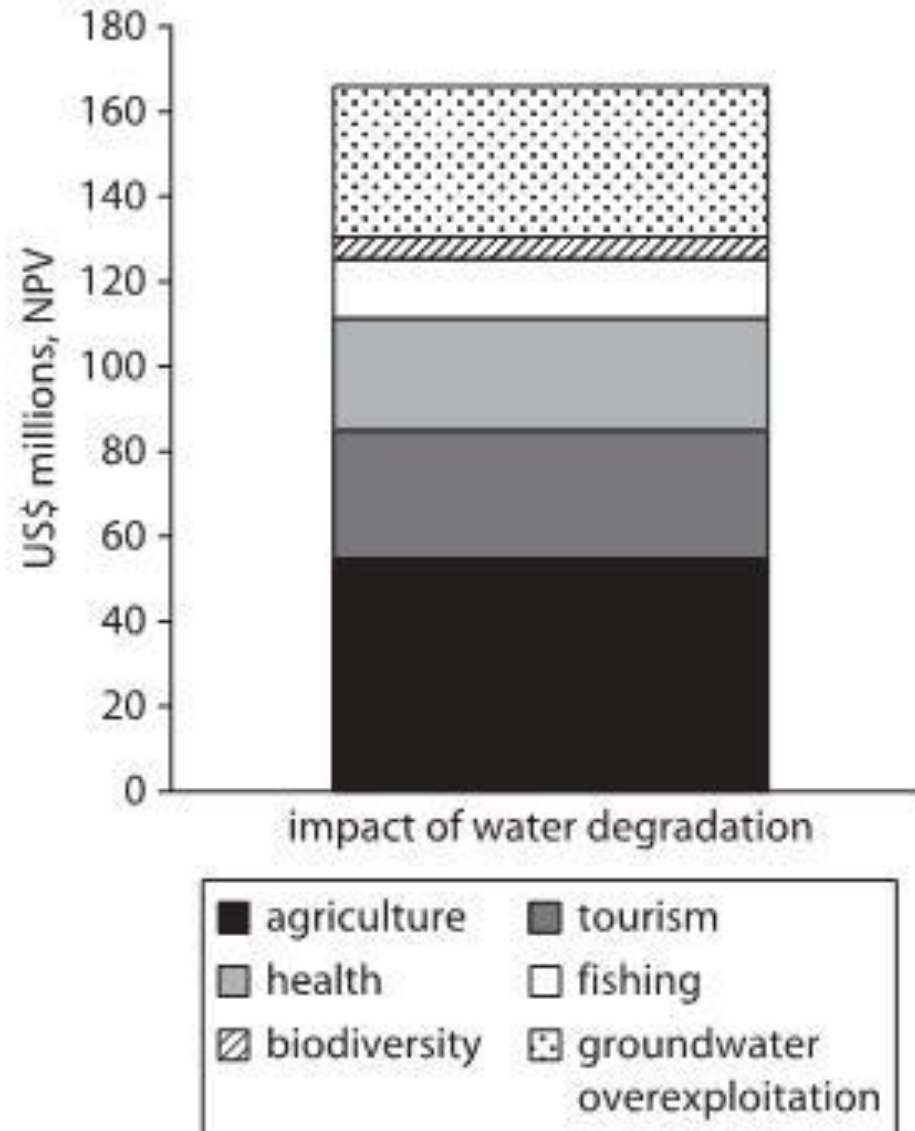
Tourism: statistics on departure rates (due to seawater pollution?) and travel to other destinations: Costs:14-22 million USD/year

Wetlands: 6 million USD/year

Groundwater: extra pumping costs: 1.5 million USD/year - replacement of wells: 12.4 million USD/year.

More information can be found in the provided reports (COED MENA region, 2010). The total annual costs of water degradation varies between US\$ 75 and 160 million.

# Total costs for water resources degradation in Tunisia



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Thank you for your attention.

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