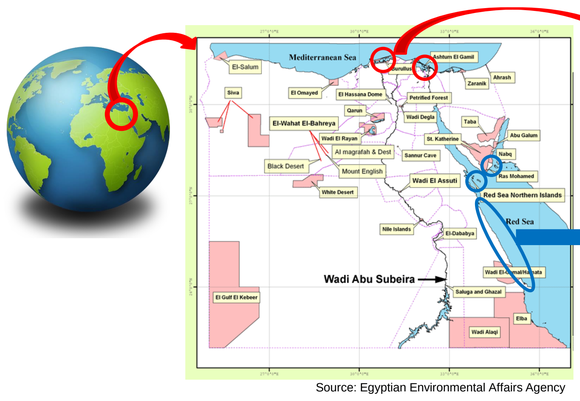
United Nations Educational, Scientific and Cultural Organization

UNESCO Chair in Heritage Studies
University of Cottbus-Senftenberg, Germany

Climate Change: Challenges and Response for Natural Heritage in Developing Countries
Vulnerability Assessment of Coastal Natural Heritage in Egypt

Objectives

Increase resilience of Coastal Natural heritage to climate change by reducing climate change and human-induced pressure



Source: Egyptian Environmental Affairs Agency

Fig1: Case Study location


Source: EEAA Source: Egyptian Environmental Affairs Agency Source: kafrelsheikh.gov.eg/

Fig2: Biodiversity in Northern lakes, Egypt


Source: freewallpaperfullhd.com/ Source: vacationandtravelphotos.com/ Source: southsinai.gov.eg/

Fig3: Biodiversity in Red Sea, Egypt

Methods

-**Assessment Vulnerability indicators of coastal protected areas in Egypt (exposure, sensitivity, adaptive capacity)**

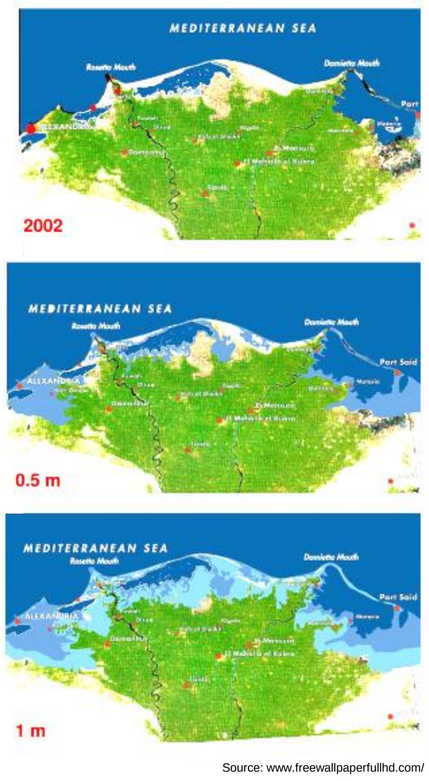
- **Develop a package of proposals for conservation**

Results

1. Vulnerability Assessment; Exposure

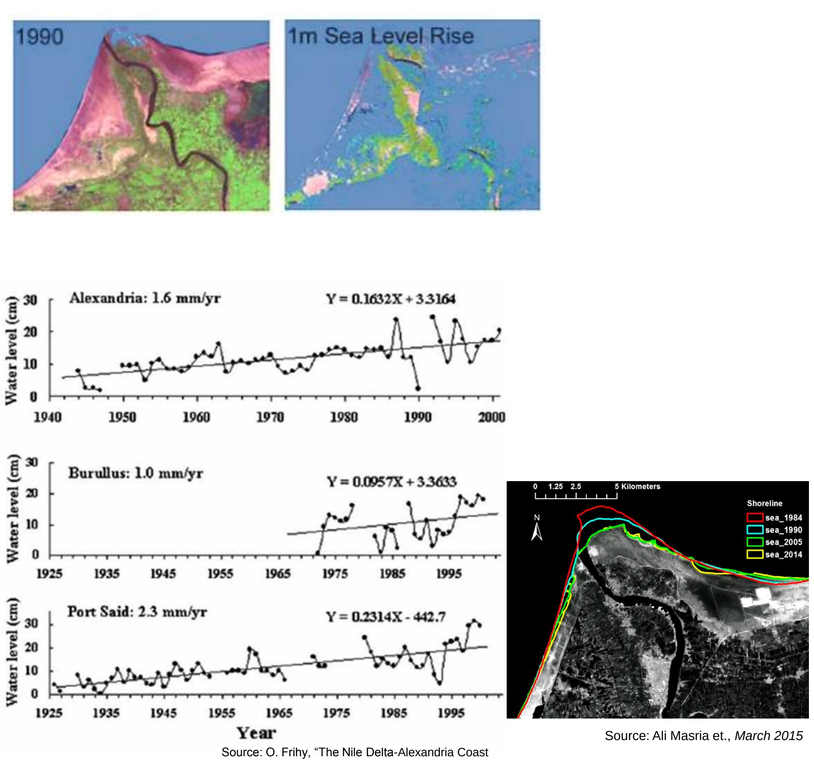
Northern coastal Natural Protectorates

- **Sea level rise and costal erosion**
- **Current Trends:**1.6 mm/yr at Alexandria, 1.0 mm/yr at Burullus and 2.3 mm/yr at Port Said
- **Future Scenarios:** Loss of land:2025→ 153 km2, 2050→ 256 km2, 2075→ 450 km2, 2100→ 761km2



Source: www.freewallpaperfullhd.com/

Fig4: Sea level rise scenarios



Source: O. Frihy, "The Nile Delta-Alexandria Coast

Fig5: Sea level rise rates

Source: Ali Masria et., *March 2015*

Fig6: Erosion rates

Eastern coastal Natural Protectorates

- **Water warming and acidification**
- **Current Trends:** decrease of coral reefs by 37% between 1987-2000 and by 46% between 2000-2010, deterioration of mangroves
- **Future Scenarios:** 80% increase in coral reef bleaching by 2060

www.alamy.com - E1BKCW

Fig7: Deterioration of mangroves

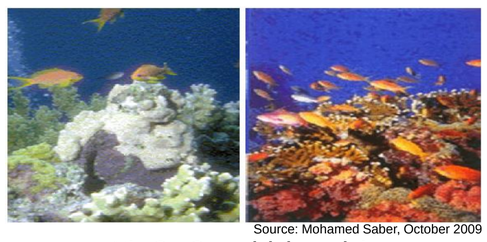
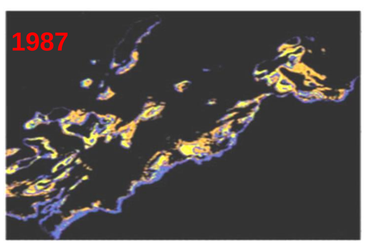
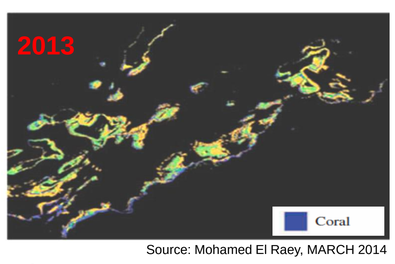

Source: Mohamed Saber, October 2009

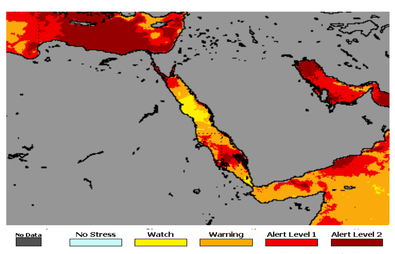
Fig8: Coral bleaching





Source: Mohamed El Raey, MARCH 2014

Fig9: Coral bleaching between 1987-2013



Source: NOAA Coral Reef Watch

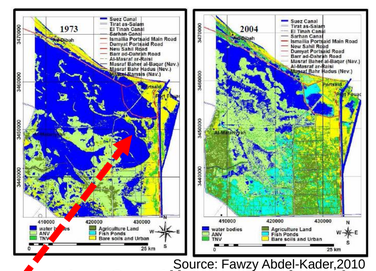
Fig10: Coral stress map

1. Vulnerability Assessment; Sensitivity

Fig11: Nile's roses

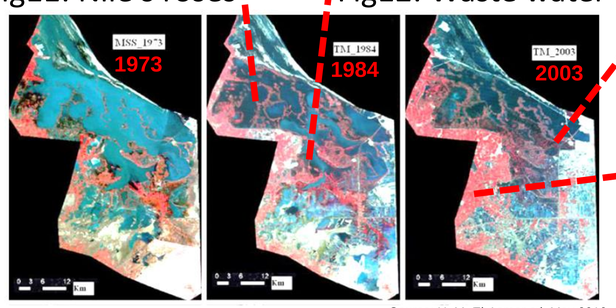

Source: GAFRD

Fig12: Waste water



Source: Fawzy Abdel-Kader,2010

Fig13: Filling wetlands



Source: H. M. El-Asmar etl. May 2010

Fig15: Human induced pressure on one of Northern lakes

Fig14: Informal settlement

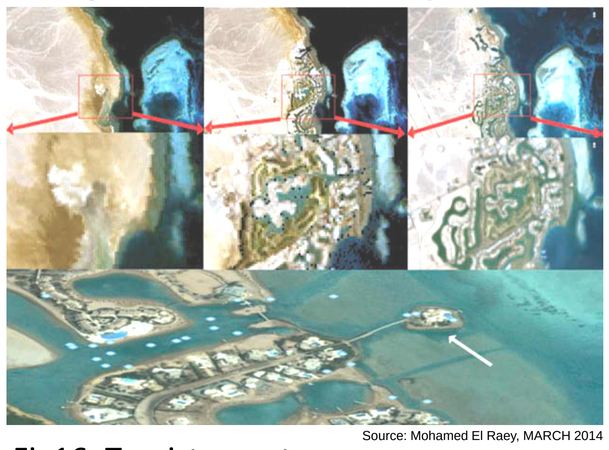

Source: Mohamed El Raey, MARCH 2014

Fig16: Tourist resorts
(Filling wetlands–dump wastes)


Source: http://www.coralgardening.org/

Fig17: Destructive fishing

Source: H. M. El-Asmar etl. May 2010

Fig18: oil spills and wastes of ships

Fig19: Human-induced pressure on Red sea

1. Vulnerability Assessment; Adaptive Capacity

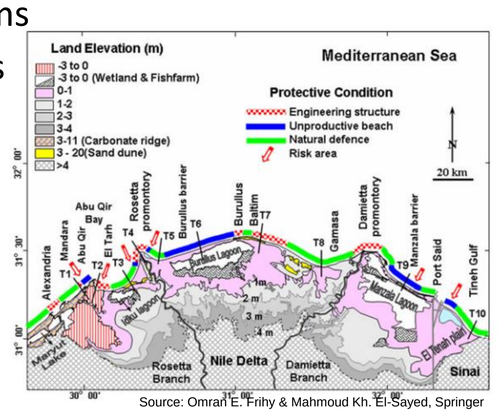
Table 1: Adaptive capacity of Coastal Governorate that contain case studies

	Population with secondary education or higher	Population density	Unemployment rate		Poverty rate	Labour force	Healthy populations	NGOs	illiteracy rate	Adaptive Capacity Rating
	%	People /m2	%	%	%	%	%	Number	%	Number
Area	Total	Total	Total 15-24 yr	Total	Total	Total	Total	Total	Total	Out of 10
Alexandria	36.5	2025.7	41.6	10.3	11.8	41.9	99.5	983	19.5	Northern lakes
Port Said	45.4	481.0	54.9	11.0	18.8	46.6	99	267	16.4	6.3
Damietta	27.6	1411.6	29.1	7.5	9.9	47.8	99.3	200	22.4	
Red sea	24.8	2.8	61.9	5.9	2.4	60.7	99.6	199	12.7	6.8

Source: Based on Database of Central Agency for Public Mobilization and Statistics

2. Adaptation and Mitigation Measures

-Integrated environmental management systems
-Mapping vulnerability of natural protectorates
-Conservation biological diversity
-Nourishment natural sand dunes
-Expand Mohamed Ali seawall
-Develop the environmental protection laws
-Create a buffer around Natural Protectorates
-Relocate or renovation informal settlement
-Recycling of solid waste and reuse wastewater
-Put restrictions on fish farming and fishery techniques



Source: Omran E. Frihy & Mahmoud Kh. El-Sayed, Springer

Fig20: Engineering measures in Northern Egypt

Discussion

-Human-induced pressure increase vulnerability to climate change
-Adaptive capacity: Strengths; NGOs and Healthy population weaknesses; Illiteracy, poverty and unemployment
-Measures mitigate climate change and human-induced pressure also support sustainability
-solving-conflicts strategies ensure access to good plan and avoid obstacles during implementation

Table 2: Involvement of stakeholder framework

stages of stakeholder involvement
•Information: assessment stage •Consultation: Propose solutions and recommendation •Shared policy: shared management and planning process.
Suggested Tools
•Improve information, communication(meetings, leaflets, local media) •Improved participation of a broad range of stakeholders •flexibility of solution to be compatible with their business •Financial incentives and compensatory measures.
Expected results
• reduce human-induced pressure on Natural protectorates • Increase of social acceptance (owners and NGOs) • Sharing of knowledge in order to ensure the best solutions

Outlook

- How can urban development be one of conflict solving strategies to increase resilience to climate change?

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