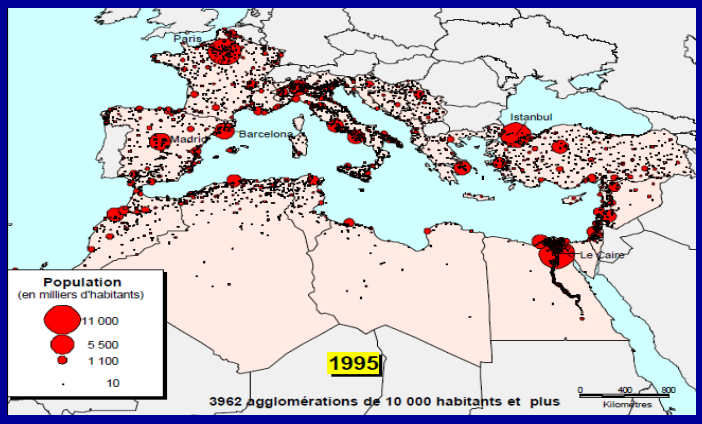
Vulnerability to climate change and natural disasters of coastal cities of North Africa



Anthony G. Bigio, The World Bank, September 2010

Main urban and climate issues

- MENA coastal cities home to over 60m, 100m by 2030, or 1/3 of all urban pop.
- Region is second most affected by SLR, with high water stress already present
- Increasing temperatures (2C), decreasing precipitation and runoff expected by 2030
- Coastal cities are among the largest and most vulnerable urban agglomerations

Alexandria, Casablanca, Tunis

- **3-year** study to a) assess vulnerability to climate change and natural disasters; and b) prepare adaptation action plans for greater urban resilience

- **$1.2m** effort directed by the World Bank, with financial support from NTF-PSI, TFESSD, GFDRR, WB-administered technical and funding windows

Milestones

- June 2008: Project WB approval, funding
- June 2009: start of technical consultancy
- June 2010: vulnerability assessments completed
- Dec. 2010: action plans to be completed
- June 2011: Final WB report to be published

Stakeholders

- Central and local Governments
- Meteo institutes, utility companies, others
- Egis BCEOM consulting consortium
- Arab Academy
- CMI Marseille
- European Space Agency

Climate change impacts

- Statistic and dynamic down-scaling to 2030
- SLR, storm surges and inundation analysis
- Flood modeling
- Digital Elevation Models
- GIS mapping of urban vulnerable assets
- Urbanization trends analysis to 2030

Natural hazards and risks

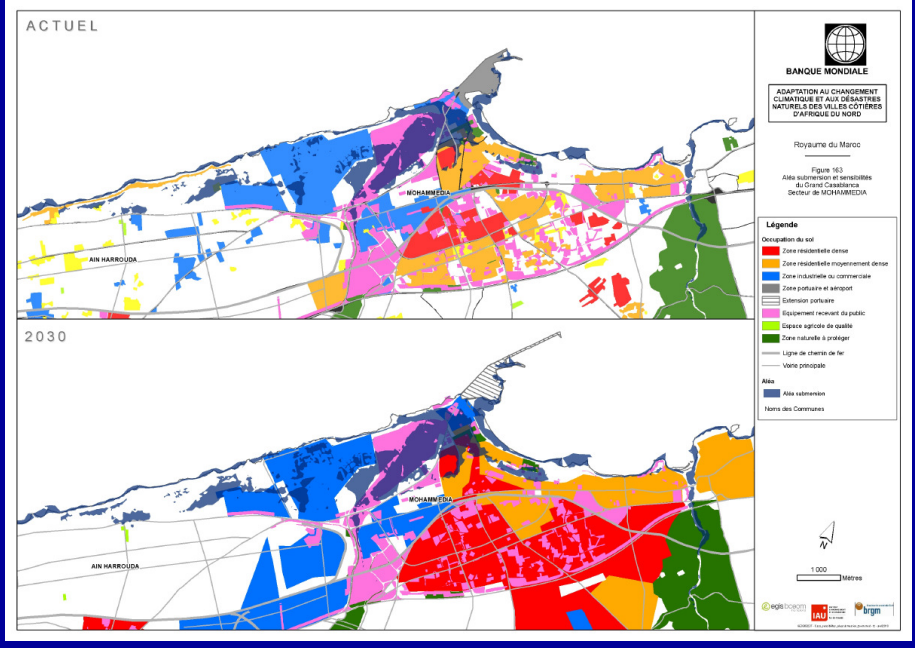
- Probabilistic assessment of seismic, tsunami risks
- Land subsidence measurements via satellite data
- Institutional analysis of urban response capabilities
- Economic valuation of natural hazard and CC impacts to 2030

Summary of urban risks

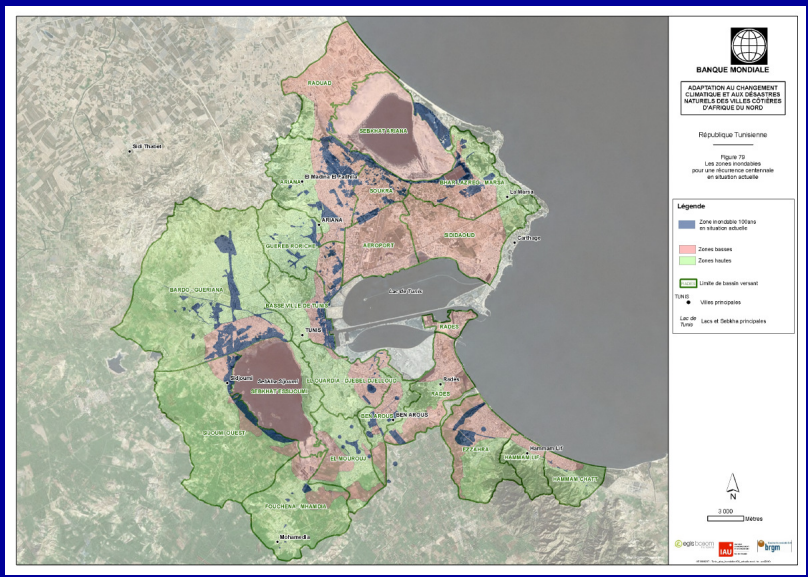
URBAN RISKS BY 2030	ALEXANDRIA	CASABLANCA	TUNIS
Coastal erosion			
Marine submersion			
Flooding			
Water scarcity			
Heat waves			
Earthquakes			
Tsunamis			
Land subsidence		N/A	

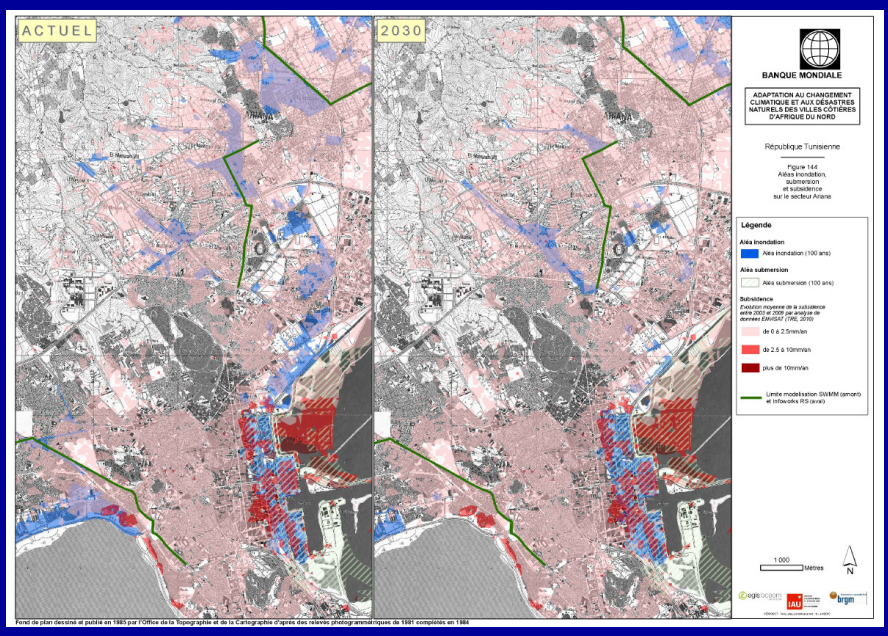
High	*Medium*	*Low*	*Negligible*

Marine submersion risks

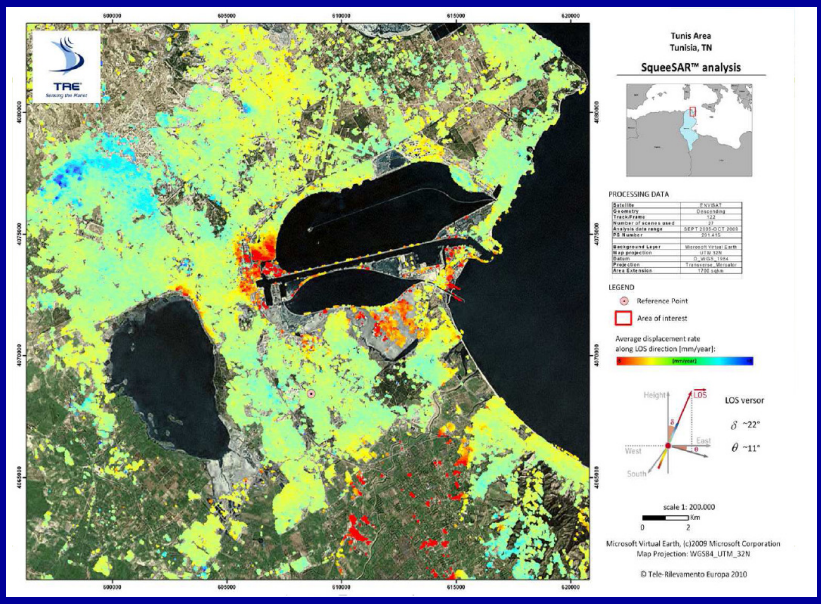


Flooding risks





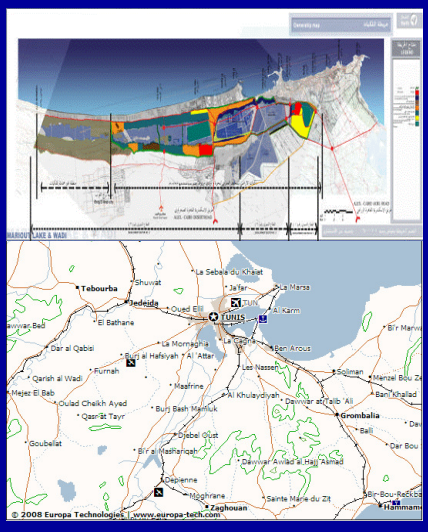
Land subsidence risks



Multi-risk mapping

Adaptation 1: Urban Planning

- All urban populations to expand by 2030:
  * Alexandria by 50%
  * Casablanca by 55%
  * Tunis by 35%
- Areas at future risk to be identified, protected
- Adaptation actions to be implemented for areas currently at risk

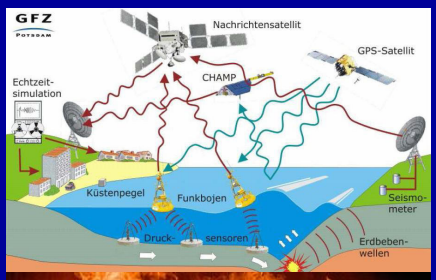


Adaptation 2: Infrastructure

- Coastal marine defenses and measures
- Harbor structures and logistics platforms
- Waste water treatment, power plants protection
- Drainage systems and pumping stations
- Built environment retrofitting

Adaptation 3: Preparedness

- Early warning systems
- Civil protection readiness
- Emergency response and evacuation plans
- Public information and awareness
- Institutional coordination
- Spatial data management



Early responses: Alexandria

- Construction of coastal corniche (25 km) has worsened problems
- Maritime defenses being built with little scientific understanding
- Pressure to build over urban lakes and fragile wetlands below sea-level

Early responses: Casablanca

- Urban drainage systems upgrades planned upstream and within city
- Significant investments in reducing water leakages, equivalent to 800.000 people demand
- Lack of CZM plans, protections, institutional capacity still limited

Early responses: Tunis

- Maritime defenses being built, but still insufficient
- Urban drainage systems being upgraded
- Unsustainable urban redevelopment plans for areas at risk
- Urban subsidence risks ignored so far

Lessons learned [so far]

1. These Coastal cities are already vulnerable, and climate change will increase their risks
2. There is a continuum between natural hazards and climate change impacts
3. Expected urban growth is very likely to worsen urban vulnerability, if unchecked
4. Urgency for action triggered by natural hazards, extreme weather events, not CC
5. Institutional capacity to adapt is critical