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Assessment of Climate Change Impacts on Water Resources and How to Adapt

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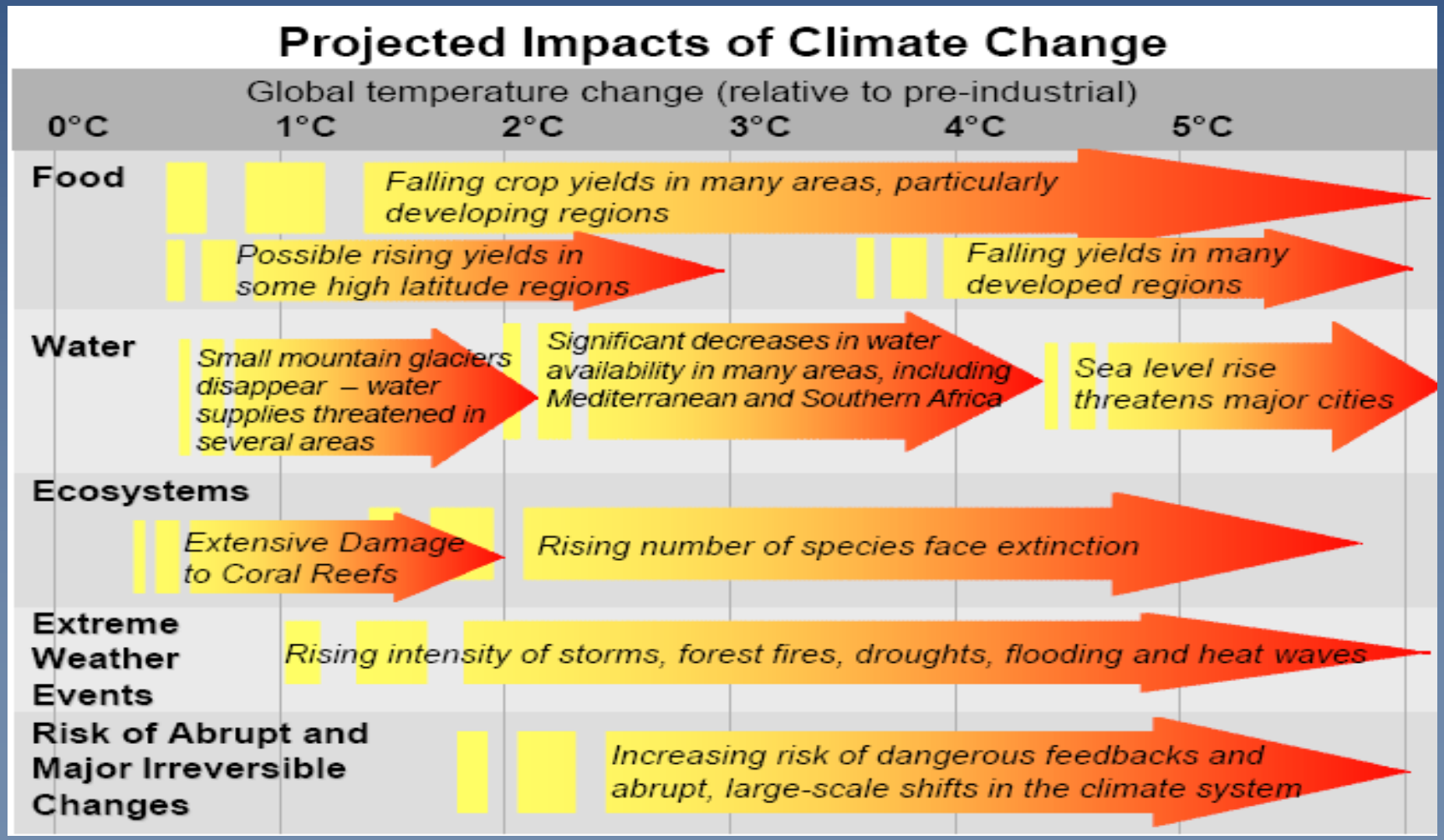
Climate change is effecting our environment, our societies and our cultures



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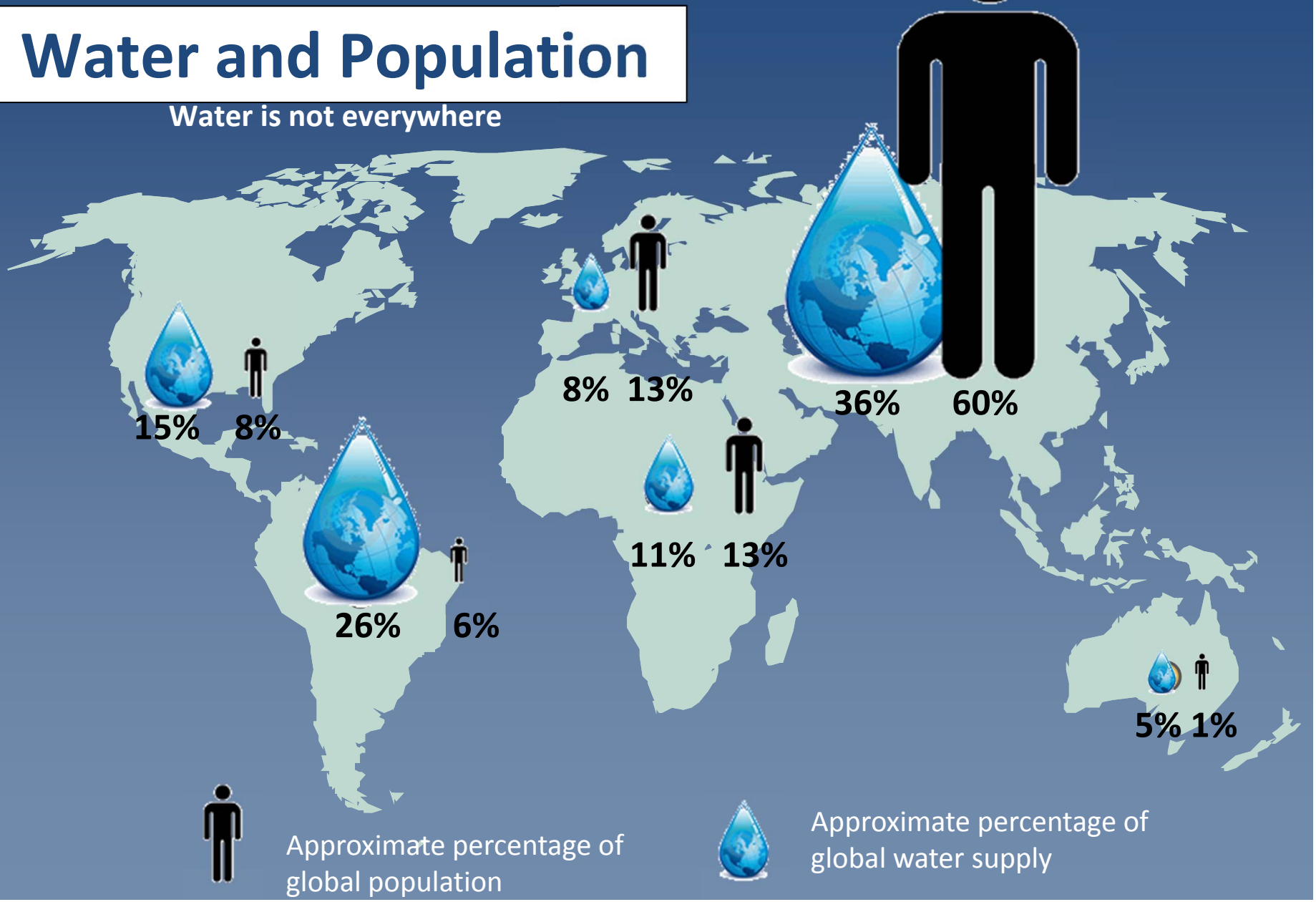
Water and Population

Water is not everywhere



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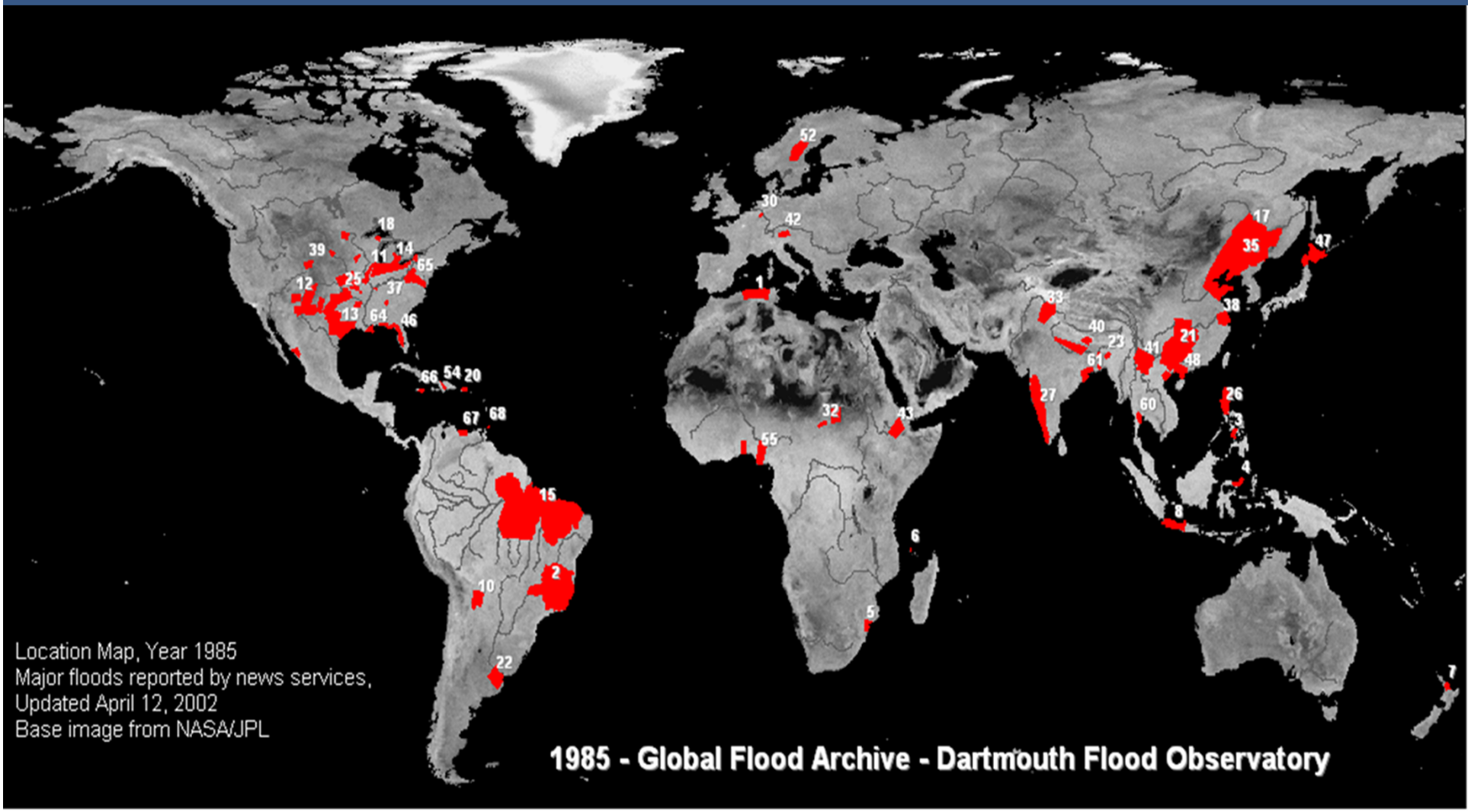
Major Floods 1985-2007



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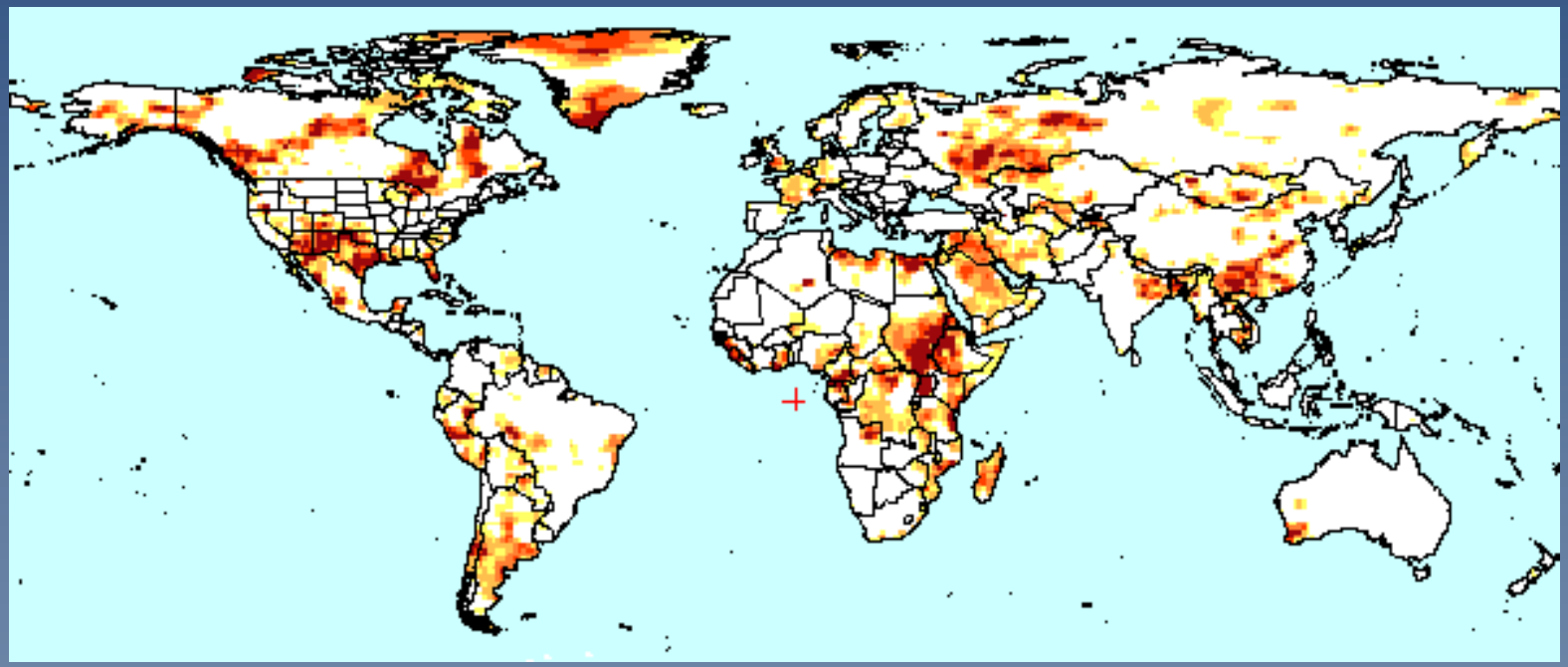
Droughts

36 months of drought conditions starting Sept 2011



302,800,000 People are under severe drought condition

Data from UCL global drought monitor. Based on 36 months standardized precipitation index

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Sedimentation problems are a matter of global concern

- The annual erosion of surface soil from global river basins amounts to 60 billion tons
- 5 to 7 million ha of farmland are annually ruined

- About 1% of the precious storage capacity of the world's reservoirs is annually lost to deposition
- Economic Loss over USD 6 billion/year

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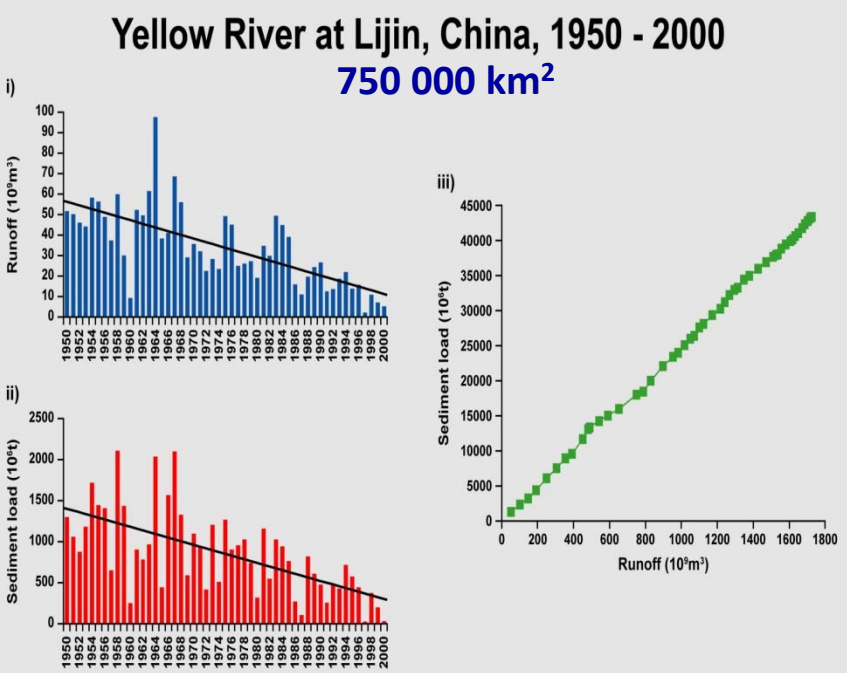
The Evidence



Yellow River

CAUSES OF REDUCED SEDIMENT LOAD

Wang et al. (2006)

Soil Erosion	40%
Climate Change	30%
Reservoir Trapping	30%

Des Walling, 2008

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Water pollution: Degradation of water quality

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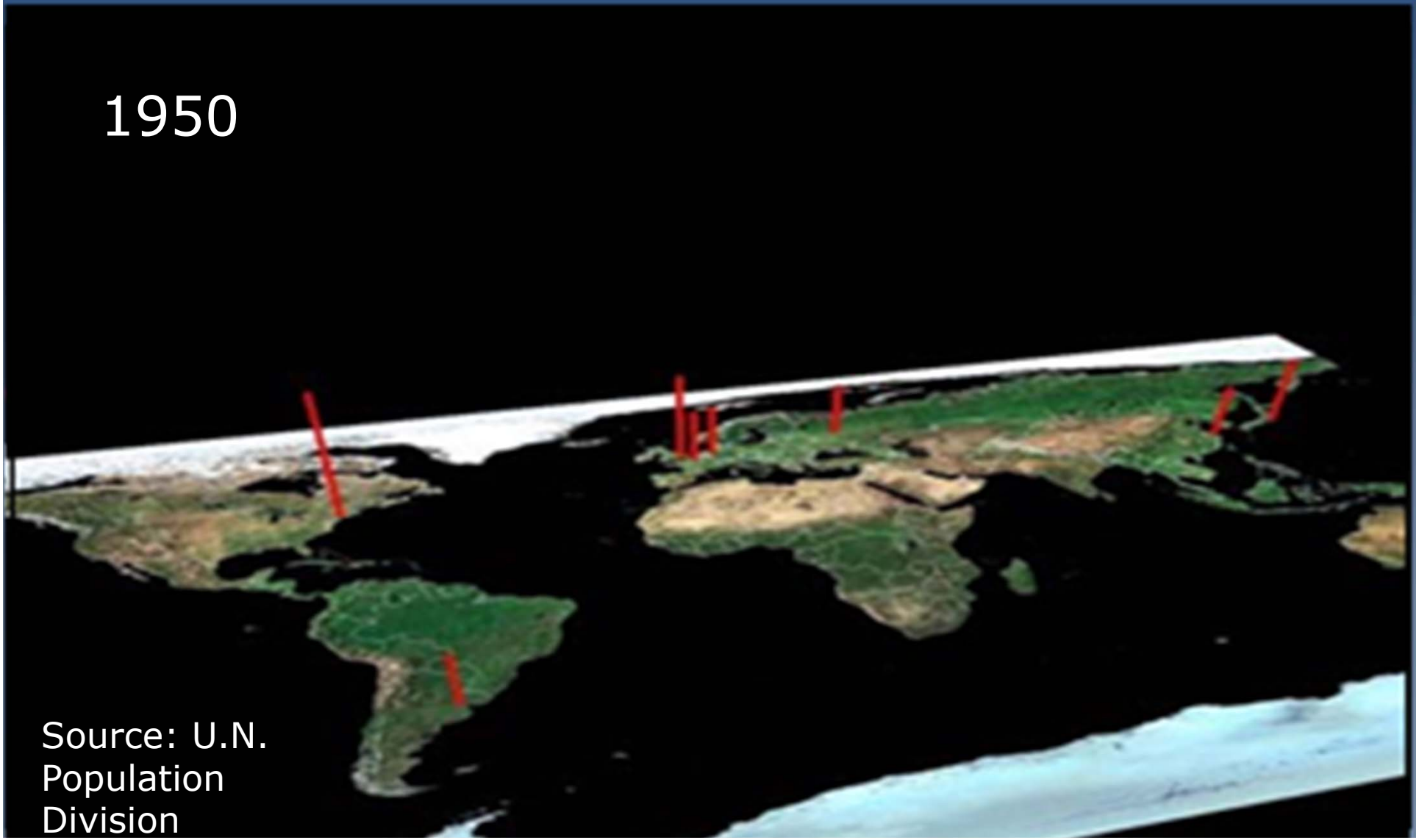
World Cities exceeding 5 million residents



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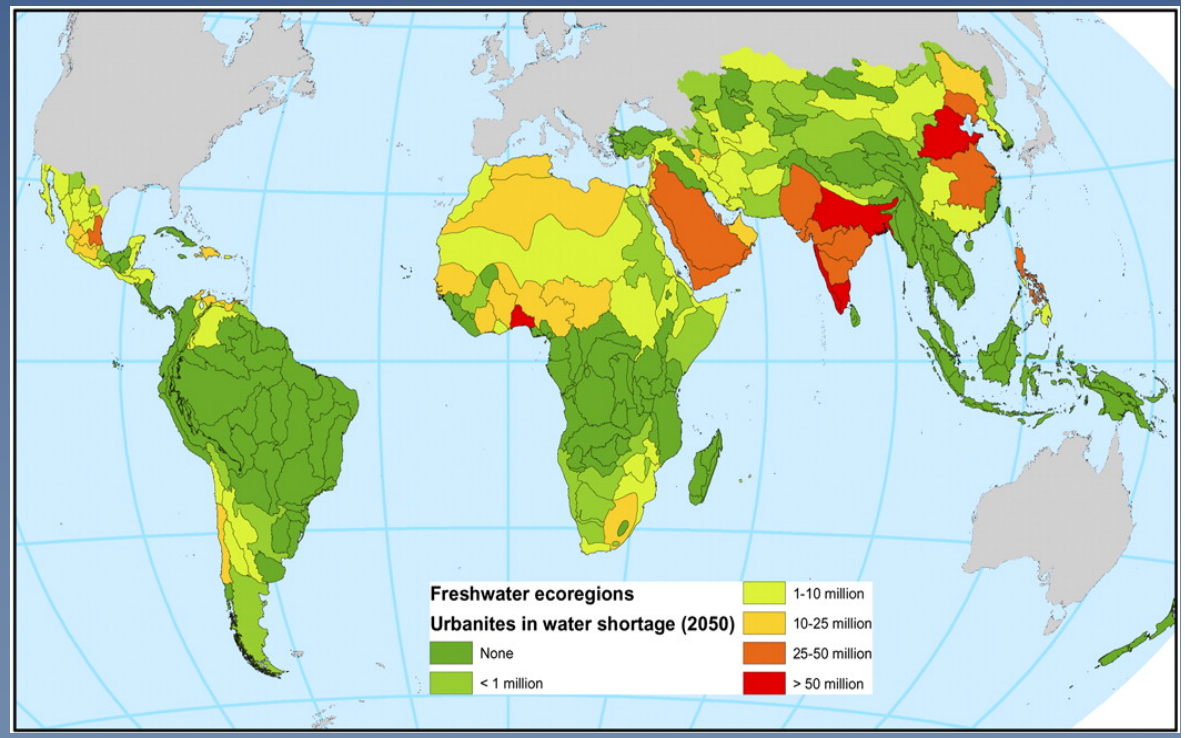
Impact on Urban Water Supplies & Systems

- Shortage in urban water supplies
- Damage to infrastructure caused by flooding
- Less reliable water resource base
- Increase in water temperature and pH
- Higher water purification costs



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Mountain Glaciers

IMPACTS

- Vulnerable and sensitive ecosystems
- Diverse ecosystems and habitats at all latitudes
- Important for livelihoods & ecosystem services
- Excellent sites to study and monitor global change and its impacts

ADAPTATION STRATEGIES

- Shifting away from hydroelectric power
- Hazard mapping to alert for landslides, avalanches, and floods

South Cascade Glacier

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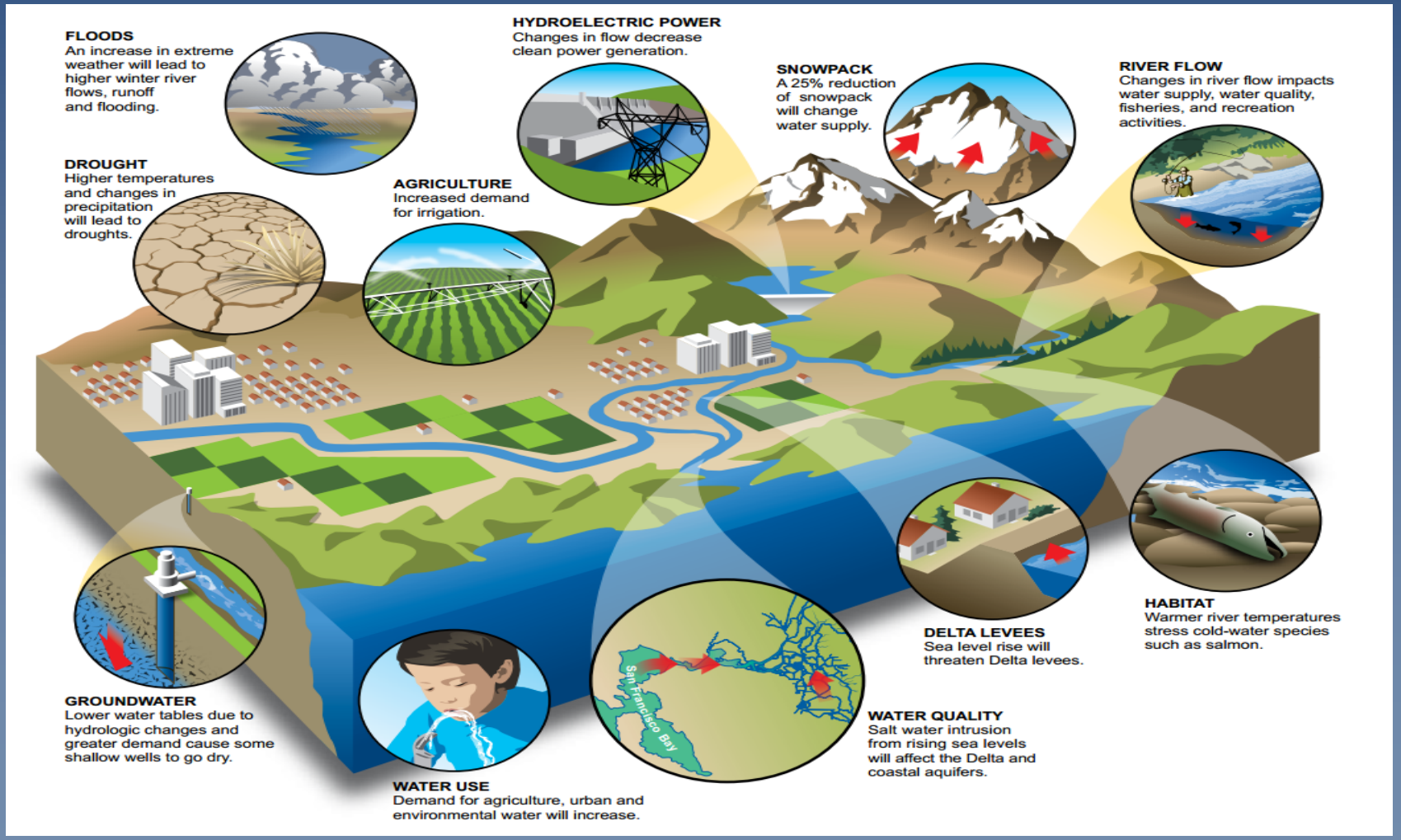
Climate change impact in a basin



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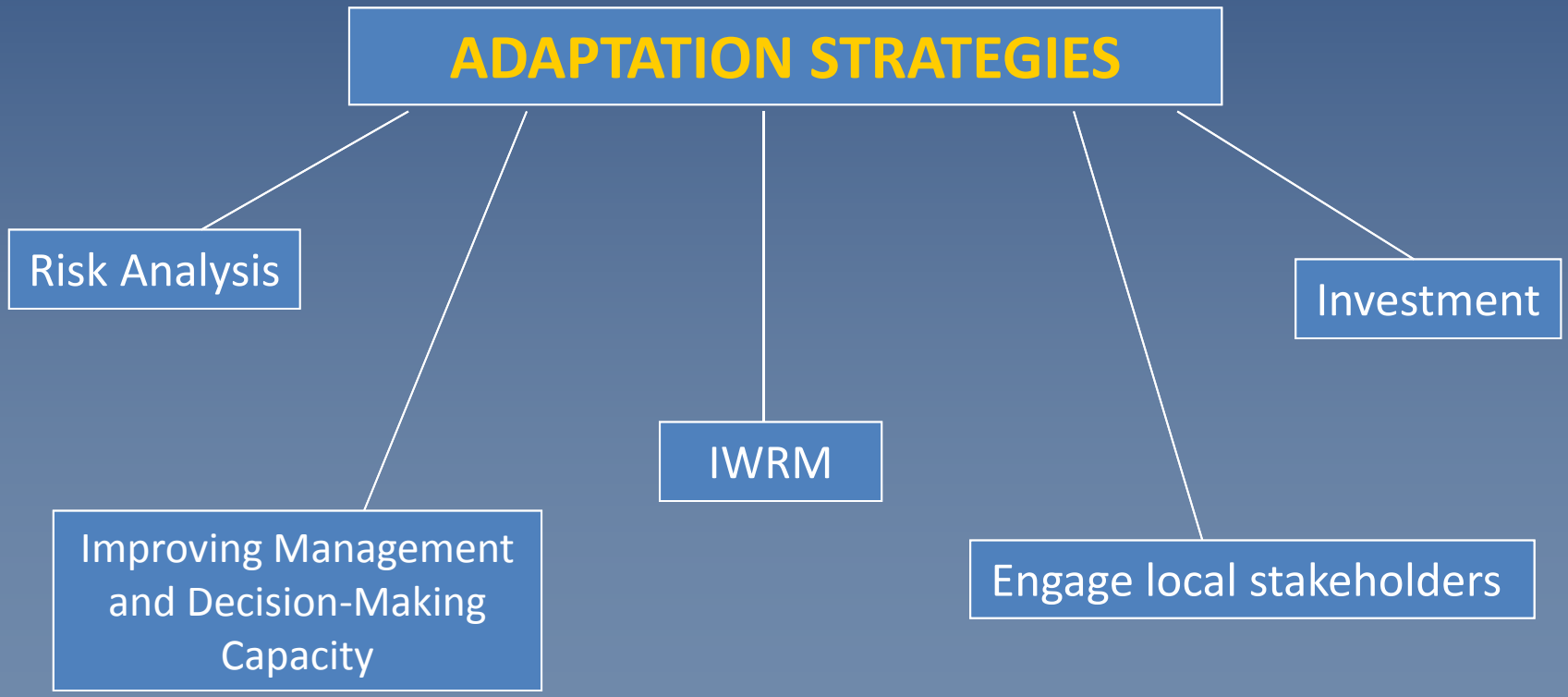
Adaptation Strategies - general plan of action for addressing the impacts of climate change, including climate variability and extremes. It will include a mix of policies and measures with the overarching objective of reducing the country's vulnerability



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IWRM Components

Principles

- Economic Efficiency
- Equity
- Environmental Sustainability

Structure

Management Instruments
- Assessment
- Information
- Allocation Instruments

Enabling Environment
- Policies
- Legislation

Institutional Framework
- Central - Local
- River Basin
- Public - Private

Balance "**water for livelihood**" and "**water as a resource**"

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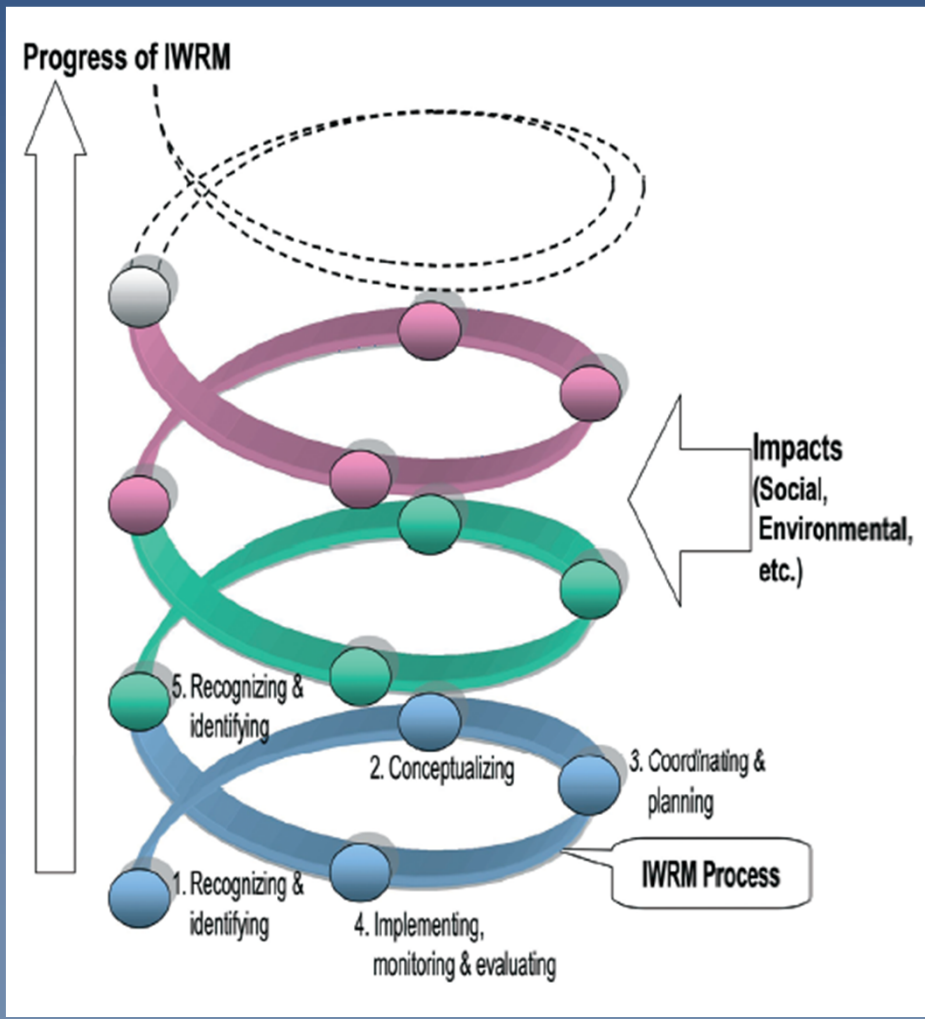
Integrated Water Resources Management (IWRM)

- IWRM - a process which promotes the coordinated development and the management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems

Processes

- Phase 1: Recognizing & Identifying (determine pressing issues or needs)
- Phase 2: Conceptualizing (delineate the problem and find possible solutions)
- Phase 3: Coordinating & detail planning (work with stakeholders to reach an agreement)
- Phase 4: Implementing, monitoring & evaluation (carry out the plan and study its outcome)



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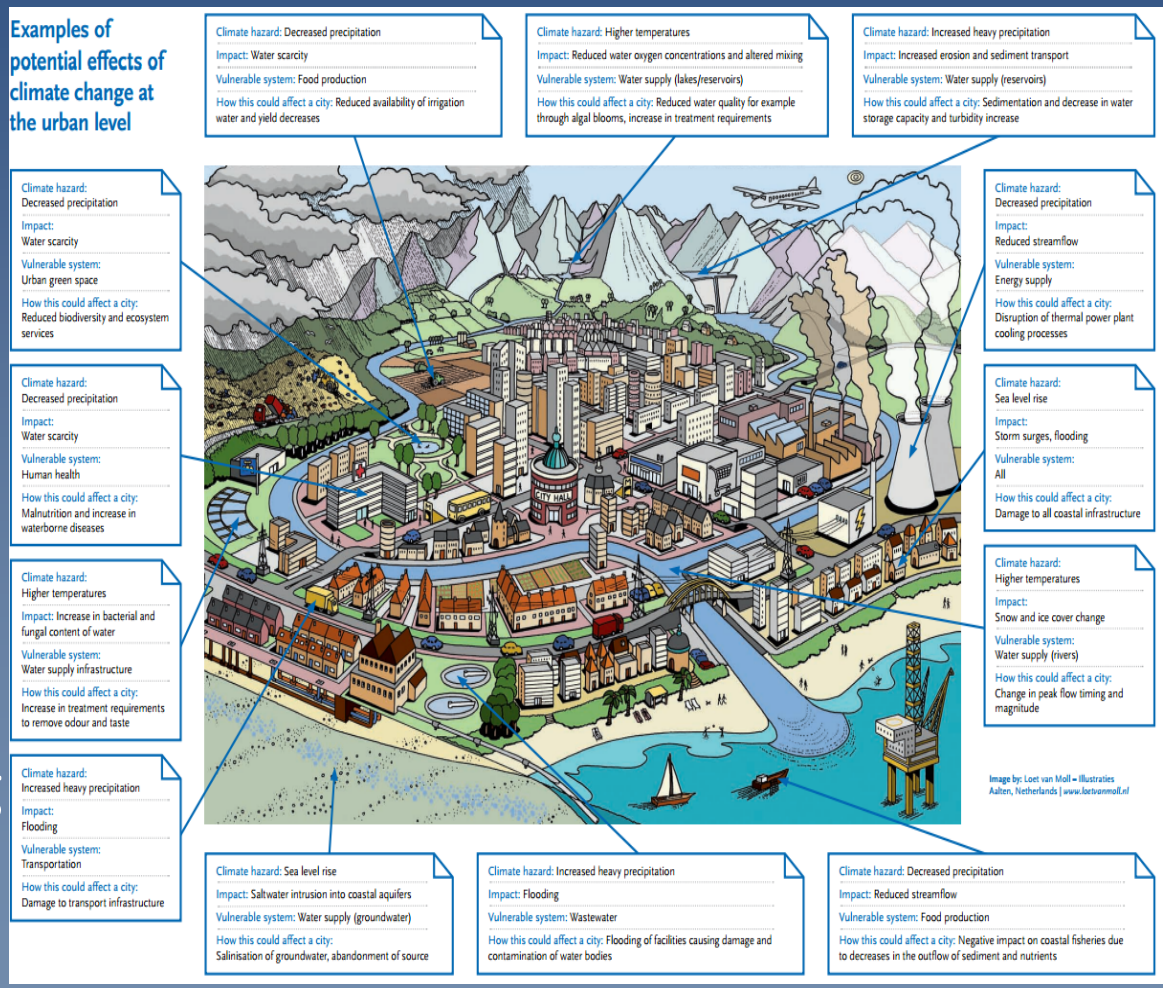
Urban Water Adaptation Strategies

- Need for long-term planning to deal with weather variability and uncertainty of water resources
- Need to adopt adaptation measures and adaptive management
- Improve operational performance of existing infrastructure
- Reduce water demand



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Conclusion

- Lack of data both quality and quantity for many rivers and aquifers is a major constrain in assessing changes
- Changes we face are due to various drivers e.g. population growth, land use change, migration, urbanisation and climate change
- It is important to address current problems with current variability
- Use regional approach – not global. Develop adaptation strategies at the local level
- Little understanding of the storage and renewable groundwater resources, which will play a key role in future food production