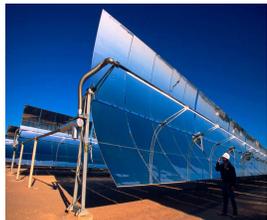




for a living planet

Increasing ecosystem resilience as a measure to adapt to climate change

Water and climate change: How to develop adaptation strategies in transboundary basins, Geneva, 11 May 2010



Climate adaptation – a new issue?

- People and nature have been adapting to changing climate conditions for millennia and beyond

What is different?

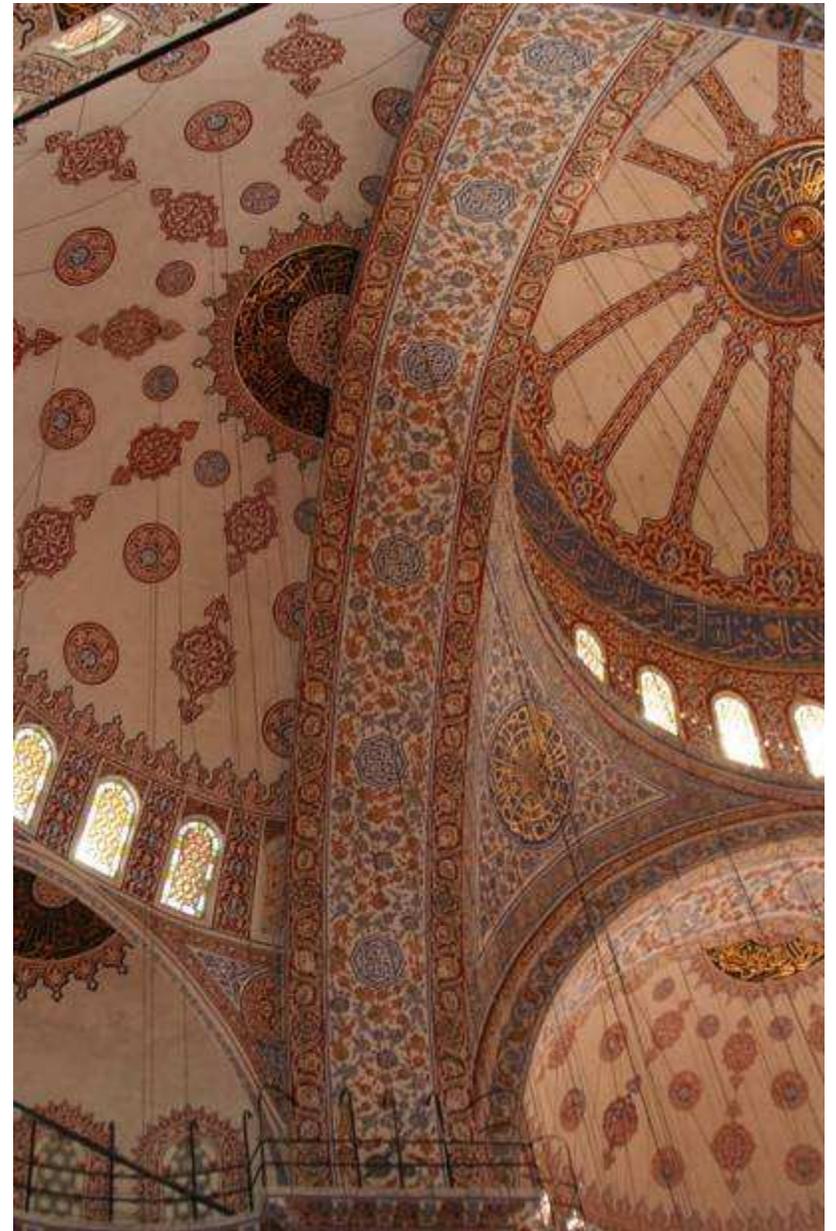
- Rate of change
- Type of change
- The world has changed!
 - Limited habitat
 - Limited connectivity
 - Limited (water) resources



Mongolian Gazelle, Daurian Steppe

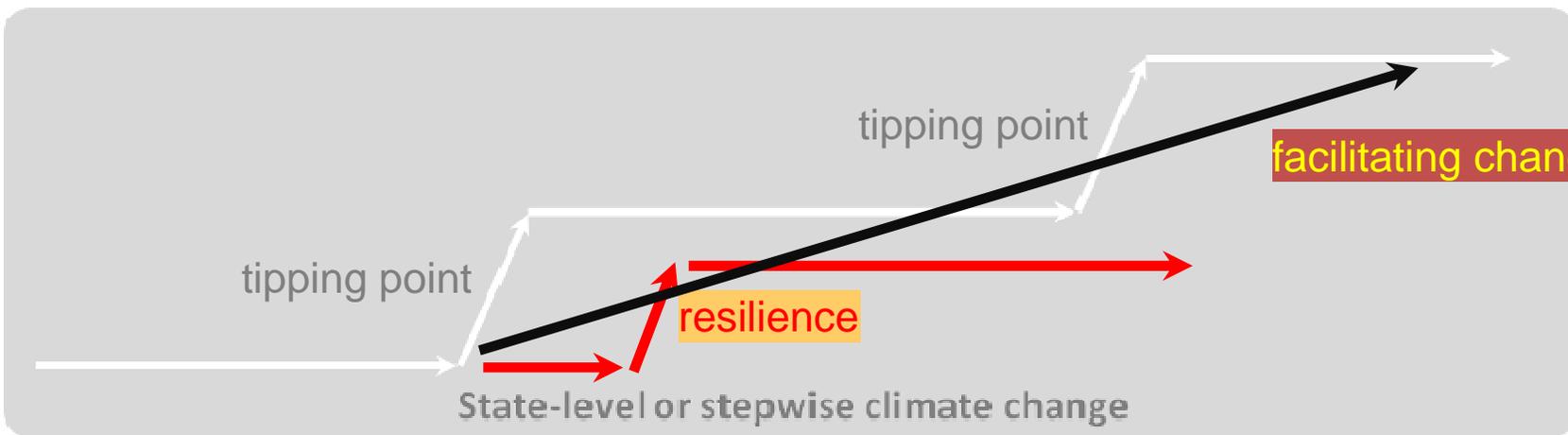
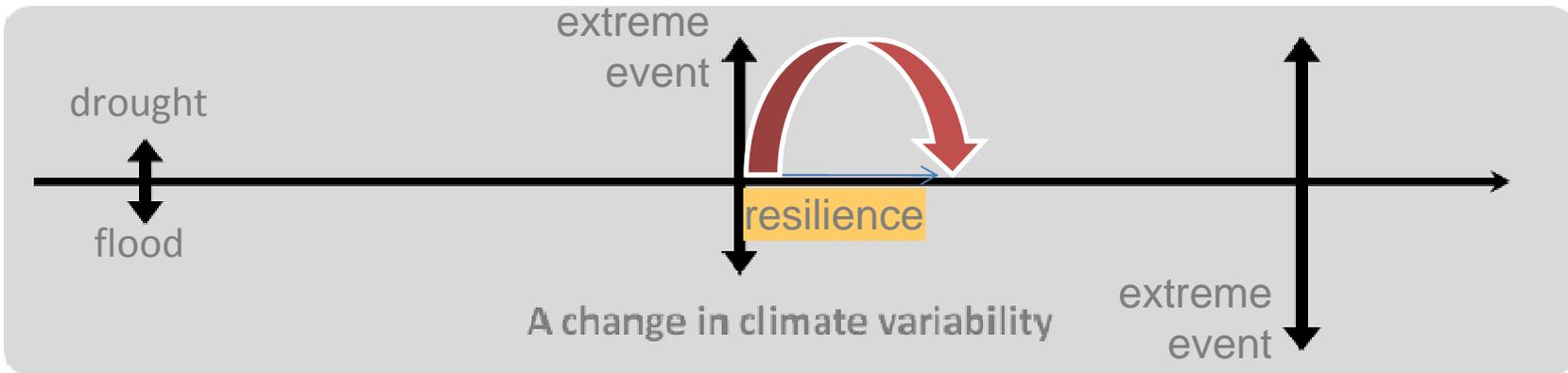
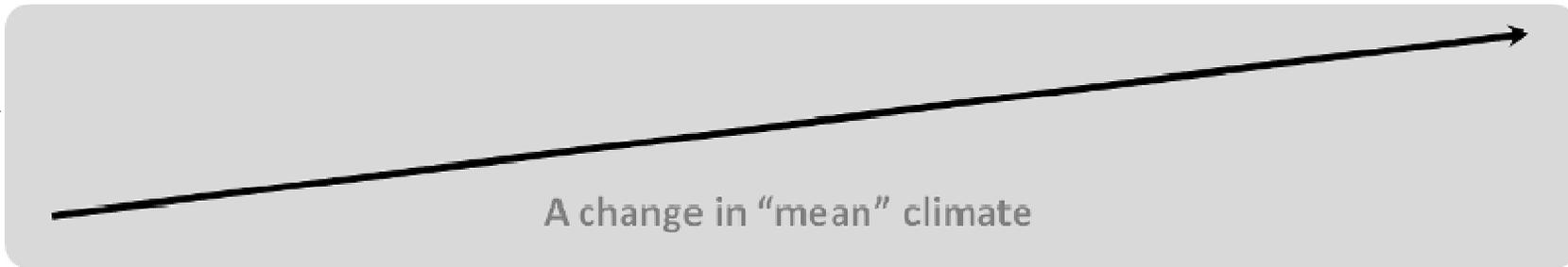
Adaptation is ultimately an *uncertainty* problem

- **Stationarity** — the assumption that the past is a good guide to the future (Milly et al., *Science*, 2008)
- Our policies, institutions, conservation, and even water infrastructure design and management largely assume *climate* stationarity
- We are not able to easily adjust to shifting or emerging climate conditions



Blue Mosque, Istanbul, Turkey

Change? What change?



Solutions

- Assess vulnerability & resilience
- Explore adaptation options
- Monitor

- 80% of the solution is in our hands
 - Conservation Agriculture
 - IRBM -> IRBM +?
 - Environmental flows
 - EIA/SEAs



Climate-adaptive people

Slow, occurs once,
quantitative, deterministic

Impacts thinking

“Current climate change adaptation practice places great faith in the ability of climate models to predict specific impacts.”

Quick & dirty, open ended,
continuous or iterative, semi-
quantitative, focused

Adaptation thinking

“Ecosystems are dynamic entities ... Adaptation thinking emphasizes the **shifting** relationship between institutions and ecosystems.”

vulnerability

adaptation

vulnerability

adaptation



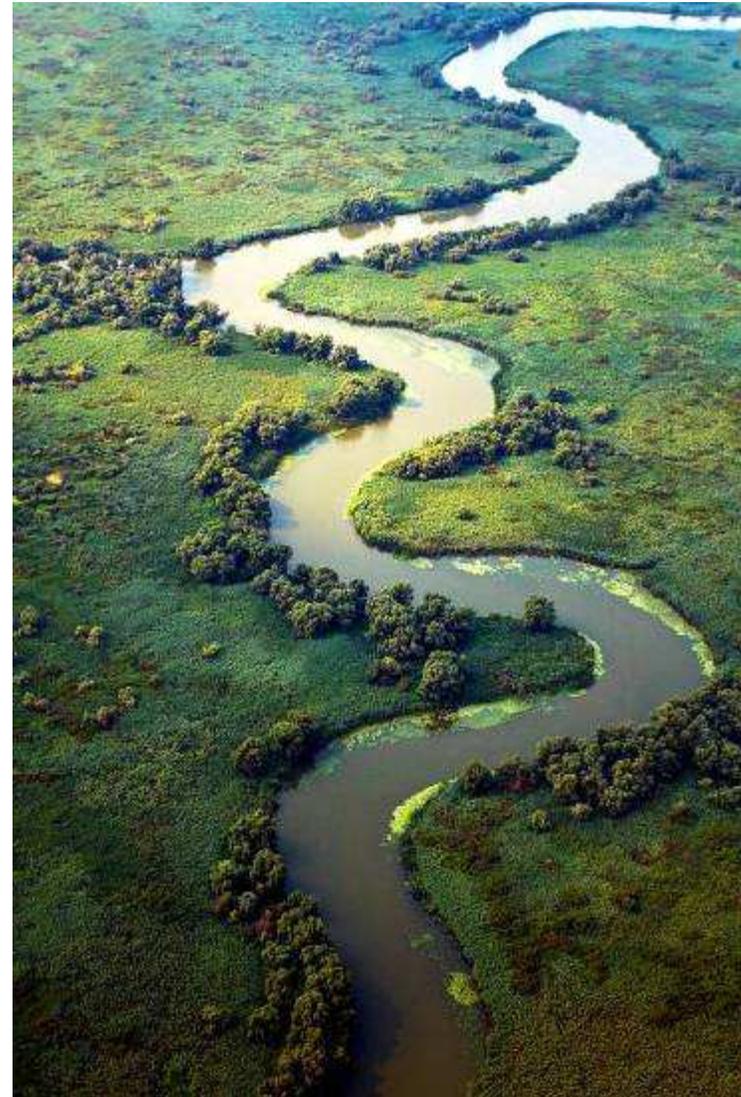
“Soft” is the new “hard” infrastructure

- Natural, wild freshwater ecosystems often have the ability to adapt to changing climate conditions by themselves
- They have high natural resilience, can resist extreme events, and transition into new ecological conditions
- “Hard” water infrastructure usually restricts or eliminates some of this natural resilience
- Soft or “green” infrastructure to manage water can help combine control of water resources, restore flow regimes, and rebuild natural climate resilience



Lower Danube River

- Extensive floodplain loss
- 2000 agreement for 9,000 km², 2,236 km² restoration
- Big floods in 2005 & 2006
- 469 km² floodplain restoration at 2008 (14.4%)
- E 500/ha/yr ecosystem services
- Full restoration cost = E 183 M vs E 396 M damages from 2005 flood and E 85.6 M in benefits per year

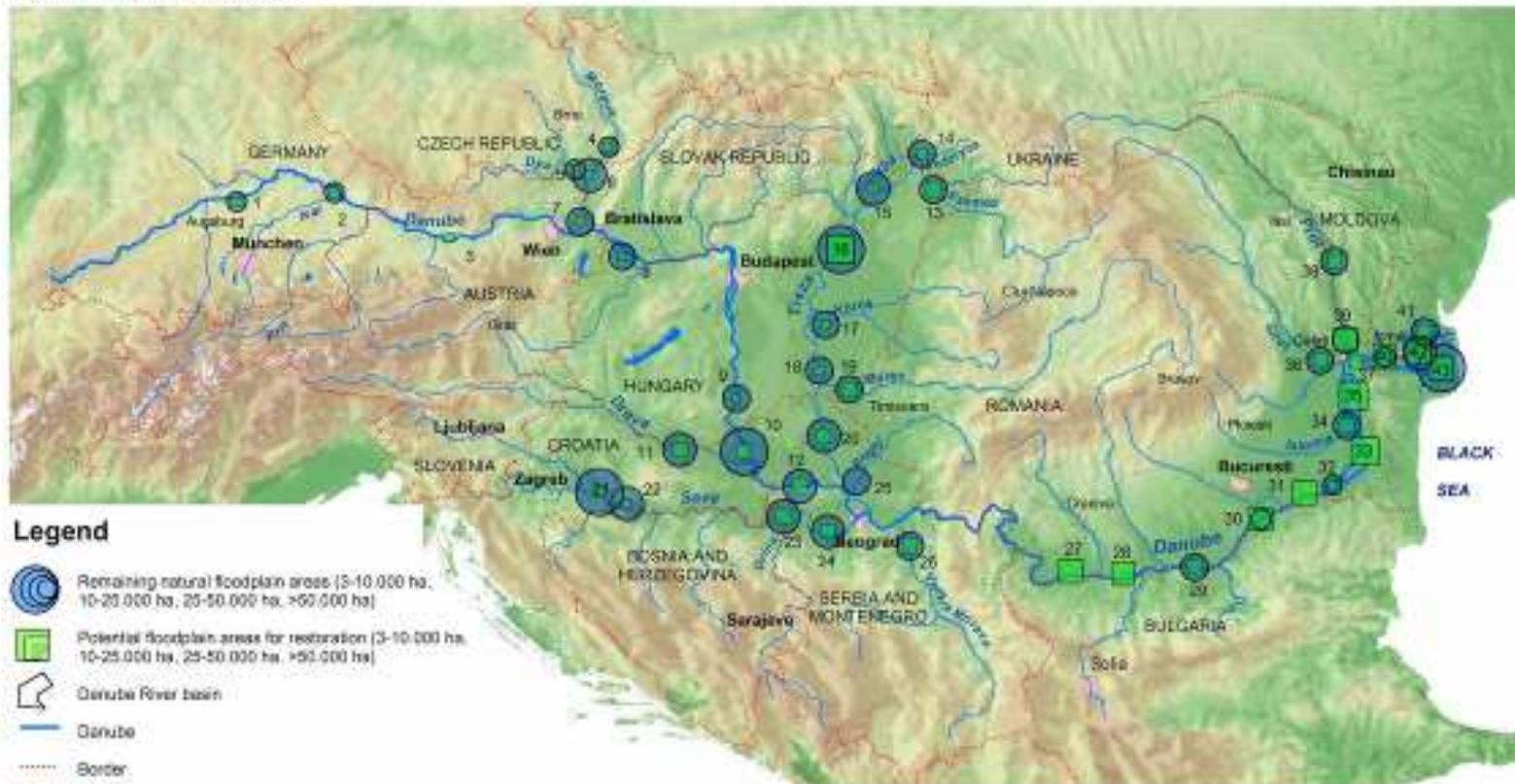


Lower Danube River



WWF for a living planet®

Large floodplain areas with high potential for flood risk mitigation and restoration for the Danube and selected tributaries



Legend

- Remaining natural floodplain areas (3-10,000 ha, 10-20,000 ha, 20-50,000 ha, >50,000 ha)
- Potential floodplain areas for restoration (3-10,000 ha, 10-20,000 ha, 20-50,000 ha, >50,000 ha)
- Danube River basin
- Danube
- Border
- Metropolis > 1 million inhabitants
- Other important cities

0 85 170 340 Kilometers

Prepared by FL/AM/US, Vienna, July 2006

- | | | | |
|--|--|-------------------------------------|-----------------------------|
| 1 Danube near Ingolstadt (DE) | 12 Middle Danube in Serbia at Beograd (CS) | 23 Dniepr mouth, Bosphorus (BA, CR) | 34 Small Braia island and |
| 2 Danube and far north (DE) | 13 Szamos, Upper Tisza (HU) | 24 Cebotari lake (CS) | Montia north (RO) |
| 3 Danube Marchfeld (AT) | 14 Latorca (UA, SK) | 25 Lower Dniepr (CS) | 55 Botta (Bosna) (RO) |
| 4 Meisva near Hódmező (CZ) | 15 Ródosz mouth (HU) | 26 Lower Vukta Morava (CS) | 36 Lower Siret |
| 5 Lower Dye (CZ) | 16 Middle course of Tisza (HU) | 27 Botta Helyu (RO) | 37 Drobeta complex (RO) |
| 6 Dye-Marava confluence (CZ, SK) | 17 Kőrös confluence and Tisza (HU) | 28 Botta Poni (RO) | 38 Lower Prut (MD, RO) |
| 7 Morava and Danube (PT, SK) | 18 Lower Tisza (HU) | 29 Balane island (BG) | 39 Prut mouth (MD, RO) |
| 8 Engelenő and Zsna sóton (HU, SK) | 19 Lower Maros/Mureş (HU, RO) | 30 Botta Crasna, Tulnik (RO, BG) | 40 Limes lake (UA) |
| 9 Drenov-Berka, Kolpovka (HU) | 20 Lower Tisza (CS) | 31 Botta Coloni (RO) | 41 Utr, part of the CD (UA) |
| 10 Kopački Rit, Gornje Podunavlje (HR, CS) | 21 Lónokó pölte (HR) | 32 Calarasi-Raul island (RO) | 42 Podgorje (RO) |
| 11 Lower Drava (HR, HU) | 22 Moko pölte (HR) | 33 Batta Isabella (RO) | 43 Danube Delta (RO) |

Graphics © WWF DCPO





Retaining ecological integrity

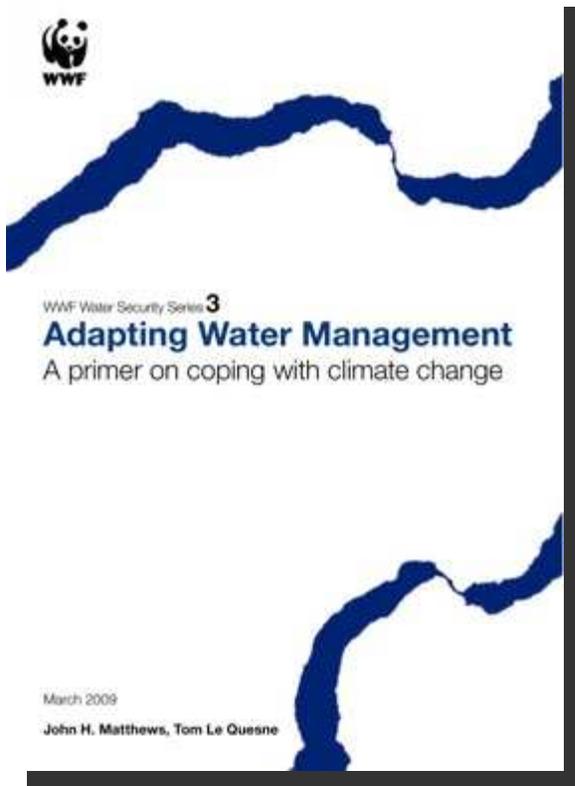
- Secure ecosystems as the ultimate stakeholder in a basin
- Develop multiple “water futures” based on a range of possible qualitatively defined eco-hydrological conditions; use as the basis for flexible, low/no-regrets planning
- Vulnerability assessments should focus on both climatic and non-climate elements and flow regime and should be conducted iteratively
- Use tactical, active monitoring to trigger ecosystems & livelihoods resilience management (droughts, floods)
- Strategic, regular reevaluation of usage, flow, and climate data to determine which water future is evolving (facilitate state-level change)
- Maintain maximum natural connectivity



Policy challenges

- Develop institutional capacity
- Create flexible allocation systems and agreements
- Reduce external non-climate pressures
- Help species, human communities and economies move their range
- Paradigm shift in infrastructure planning and management
- Promote mainstreaming of climate change adaptation into sectoral policies
- Institute sustainable flood risk policies
- Support climate aware planning
- Improve monitoring and responsiveness capacity

Adaptation guidance



ClimatePrep.org
AdaptationPortal.org
ClimateChangeWater.org