Ecosystem management for improving hydrological services

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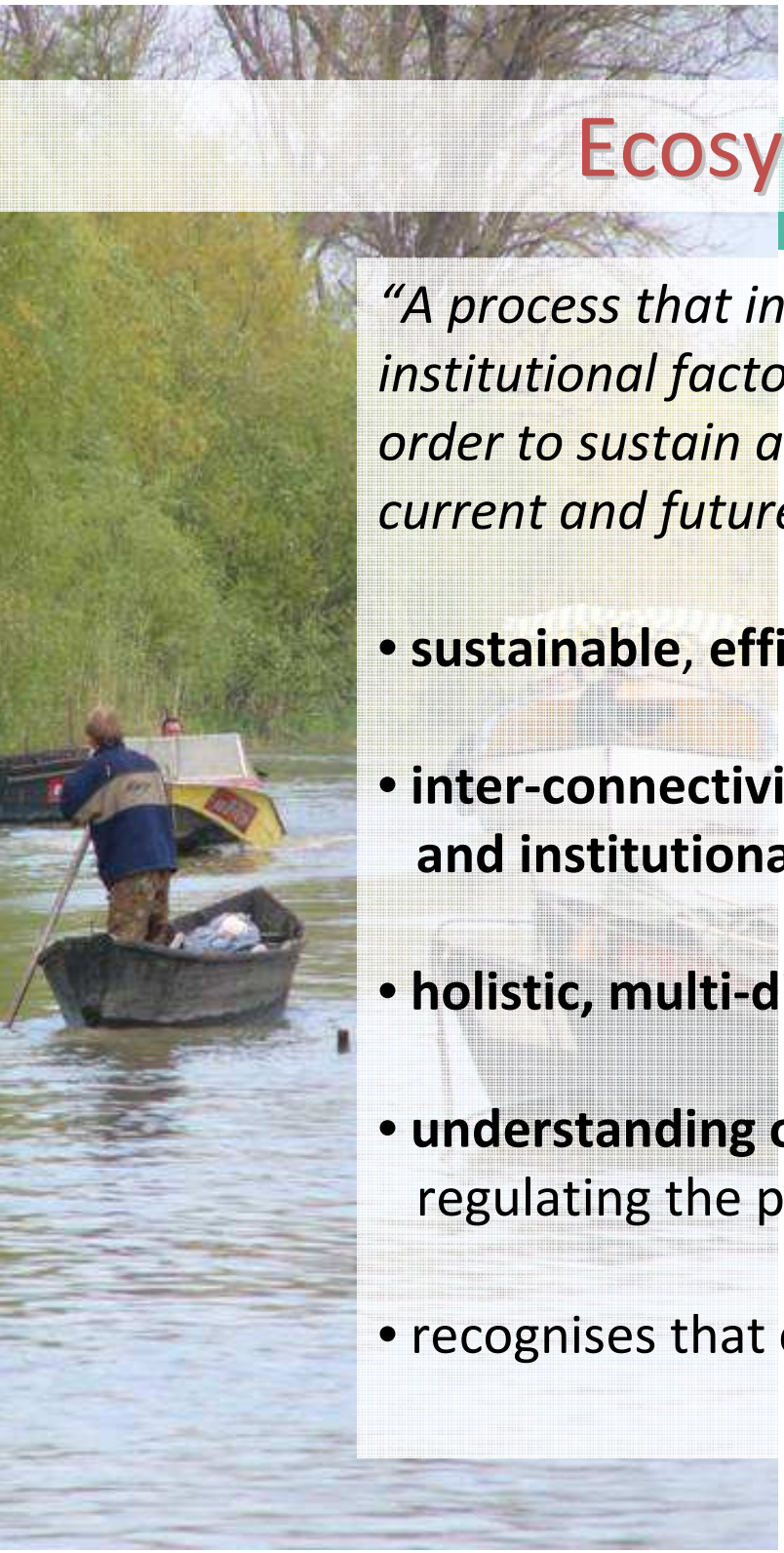


Ecosystem management

"A process that integrates ecological, socio-economic, and institutional factors into comprehensive analysis and action in order to sustain and enhance the quality of the ecosystem to meet current and future needs." (IUCN-CEM)

- **sustainable**, **efficient** and **equitable use** of natural resources
- **inter-connectivity of ecological, socio-cultural, economic and institutional systems**
- **holistic, multi-disciplinary and integrated approach**
- **understanding of the functions of ecosystems** in supporting and regulating the processes which underpin life on earth
- recognises that **ecosystems provide diverse goods and services**

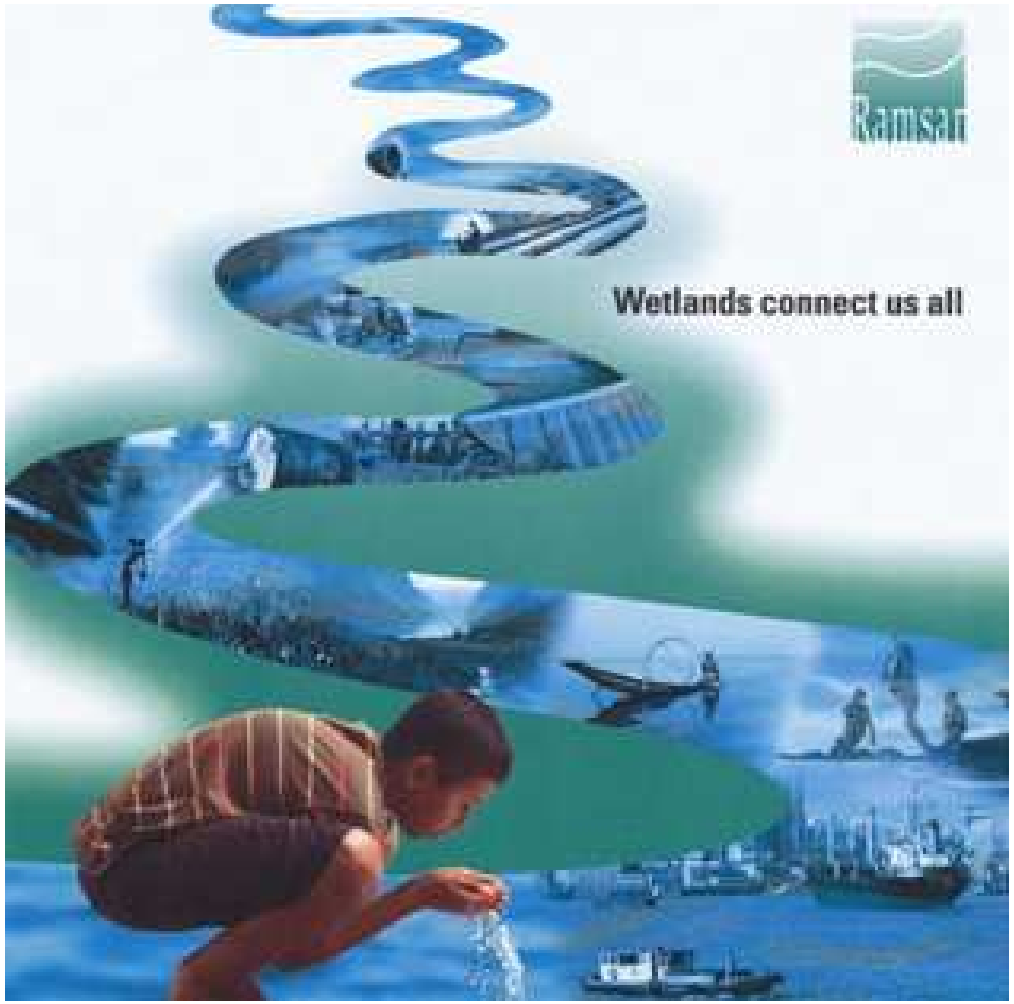
CEM 5: Ecosystem Approach, IUCN

Brauman et al., 2007

5 broad catagories of hydrological services

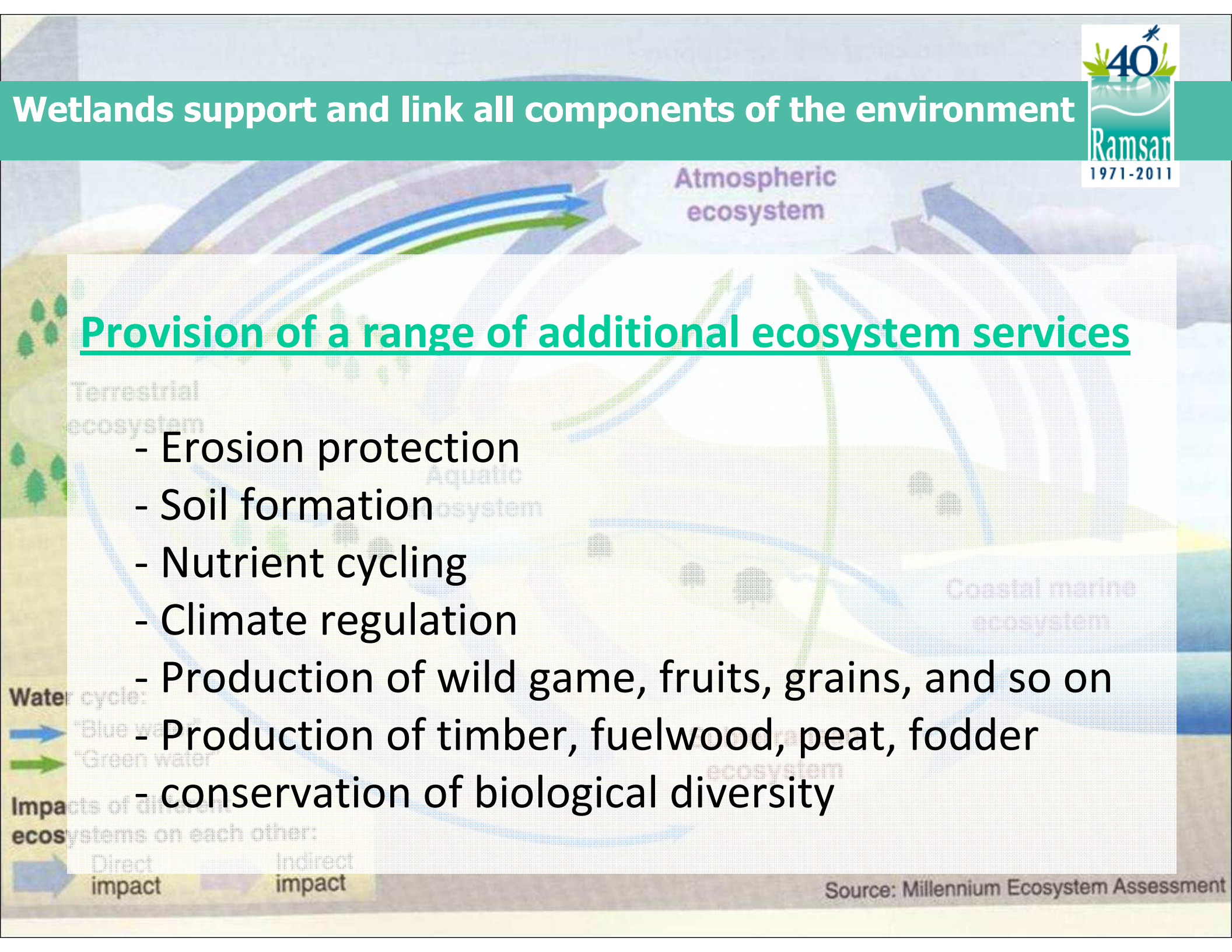
Category	Hydrological Services
1) Improvement of extractive water supply	Municipal, agricultural, commercial, industrial, thermoelectric power use
2) Improvement of in-stream water supply	- Hydropower generation - Water recreation - Transportation - Freshwater fish production
3) Water damage mitigation	Ecosystem mitigation of : - Flood damage - Sedimentation of water bodies - Saltwater intrusion into groundwater - Dryland salinization
4) Provision of water-related cultural services	- Spiritual uses - Aesthetic appreciation - Tourism
5) Water-associated supporting services	Wide-ranging, include: - Provision of water for plant growth - Creating habitats for aquatic organisms

Upstream - Downstream



Hydrological services are regional services: downstream users experience the effects of ecosystems throughout their watershed

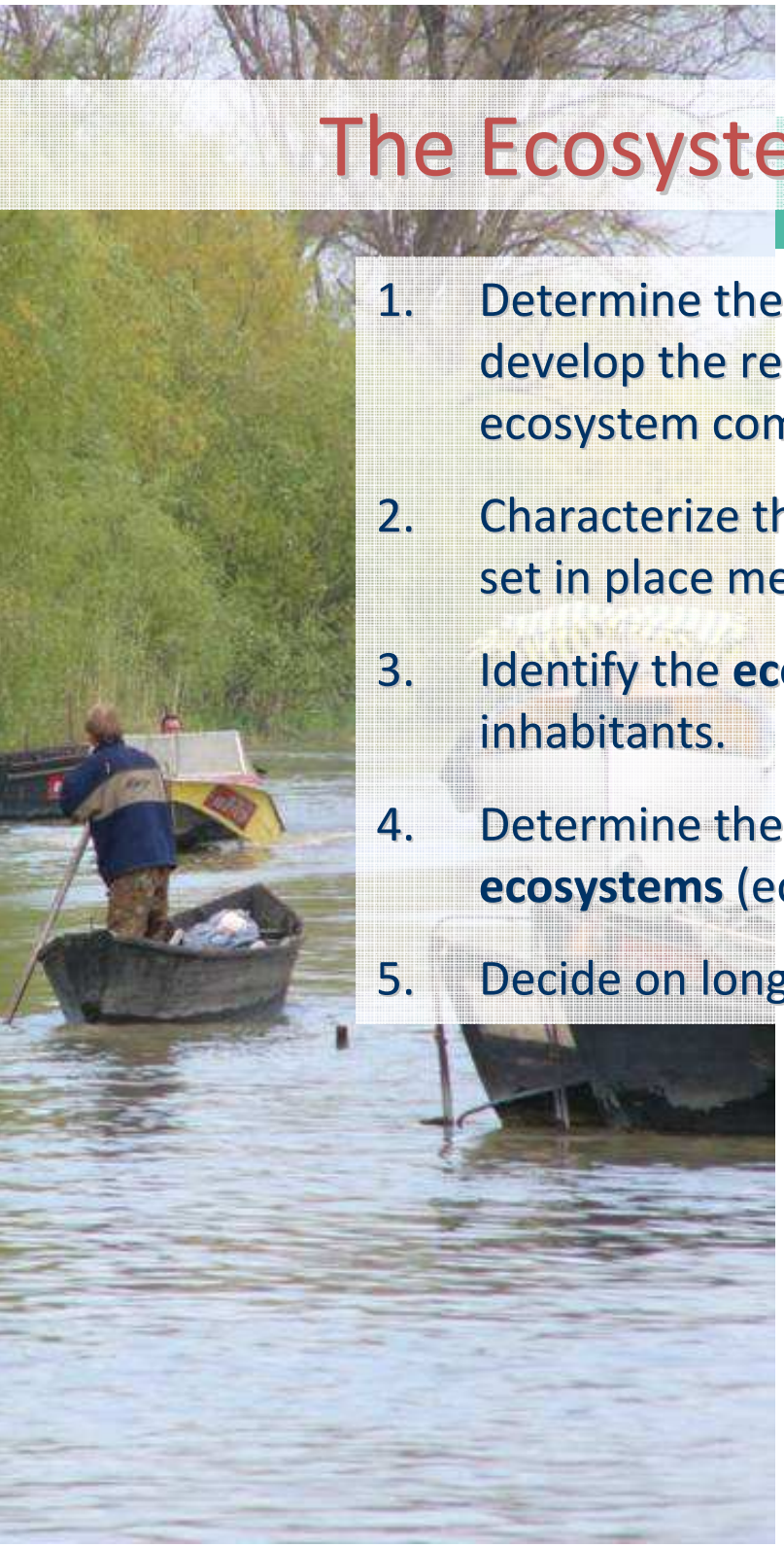
Wetlands support and link all components of the environment



Provision of a range of additional ecosystem services

- Erosion protection
- Soil formation
- Nutrient cycling
- Climate regulation
- Production of wild game, fruits, grains, and so on
- Production of timber, fuelwood, peat, fodder
- conservation of biological diversity

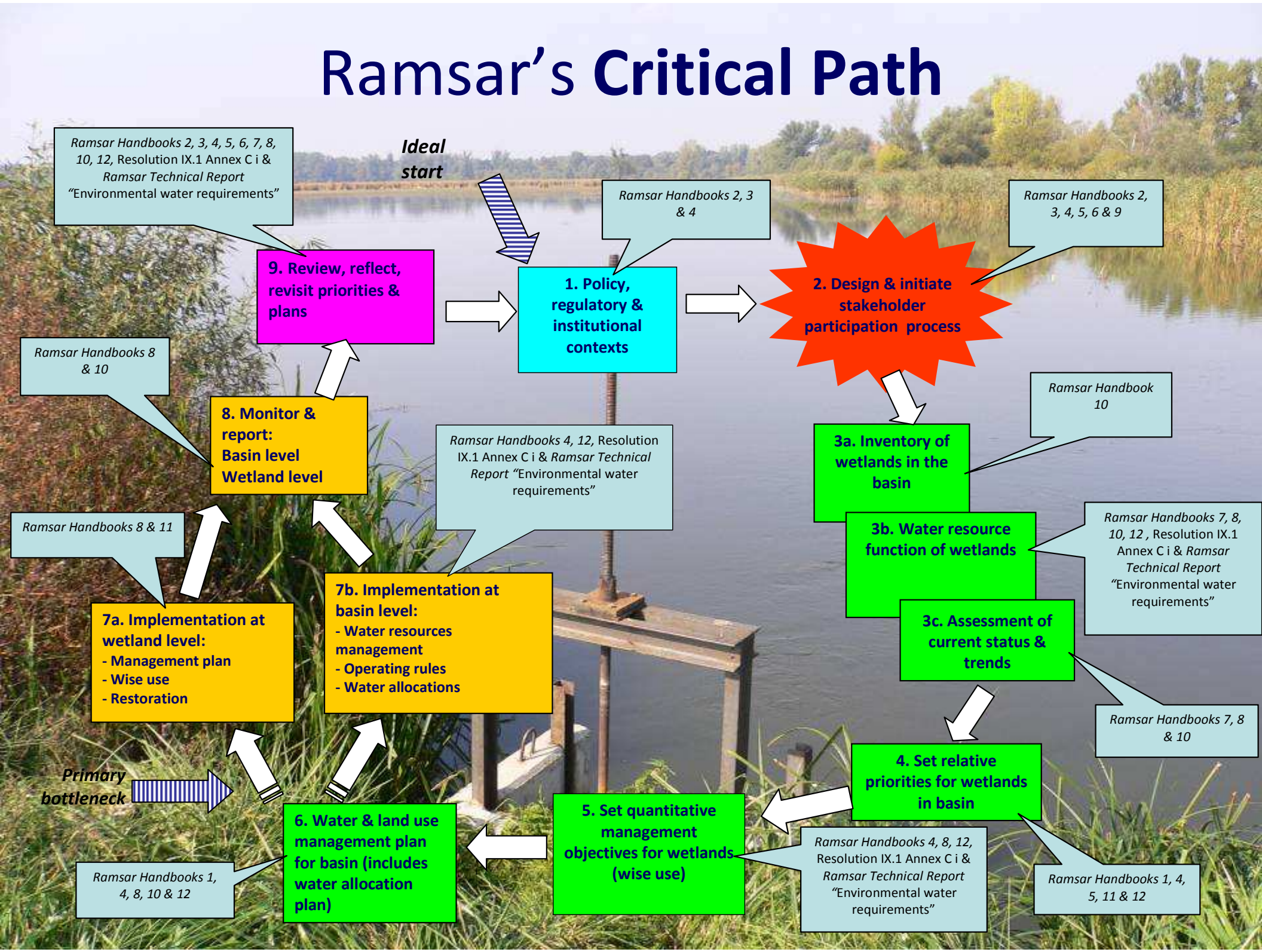
The Ecosystem Approach in Five Steps



1. Determine the **main stakeholders**, define the ecosystem area, and develop the relationship between them (human beings as ecosystem components).
2. Characterize the **structure and function of the ecosystem**, set in place mechanisms to manage and monitor it.
3. Identify the **economic issues** that will affect the ecosystem and its inhabitants.
4. Determine the likely **impact** of the ecosystem **on adjacent ecosystems** (ecosystems overlap and interact)
5. Decide on long-term goals, and **flexible** ways of reaching them.

Based on the 12 principles developed by the CBD

Ramsar's **Critical Path**



Ramsar Handbooks for the wise use of wetlands

Of special relevance are:

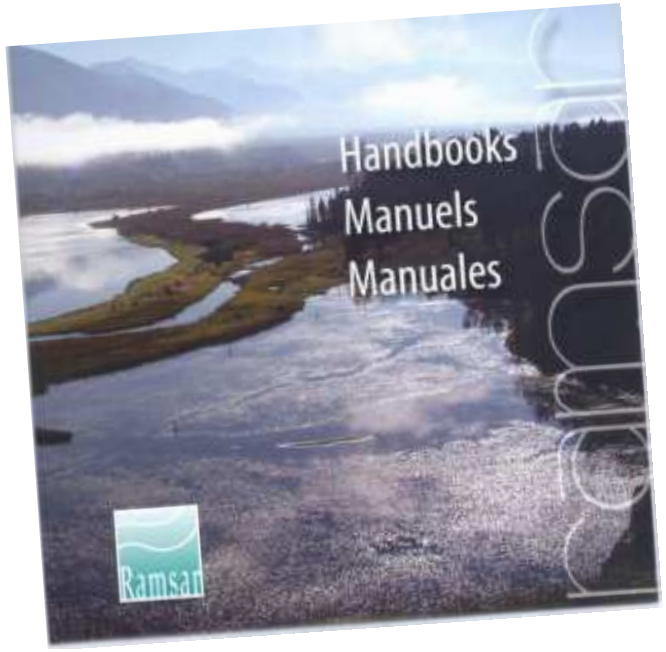
-Water-related guidance n. 6

-River basin management n. 7

- Water allocation and management n. 8

- Managing groundwater n. 9

- International cooperation n. 17



Ramsar COP10 Resolution X.19: **Consolidated Guidance for integrating wetland conservation and wise use into river basin management**

www.ramsar.org -> Publications -> Ramsar Wise Use Handbooks

European wetland ecosystems and their hydrological stress

eutrophication (agricultural runoffs and diffuse pollution)
drainage and land reclamation
water **abstraction**
artificial **channelizations**
decreasing **water levels**
sedimentation and siltations
dredging impacts
effects of **dams** and barrages
salt water intrusion
altered underground **flows**
agriculture and forestry effluent **pollutants**
household and urban **sewage** and waste waters
industrial and military effluents
persistent **drought**
lasting **desertification**

Examples of other stress:

Unsustainable use of natural resources (forestry practices, hunting, fishing, collecting plants and animals etc.)

Disturbance (from people, cattle, transport, military exercises etc.)

Habitats loss (mining, construction works etc.)

Invasive species

Air-born **pollution**

Climate change

River management in Europe

Now:

- Rivers cannot be managed in isolation of their floodplains

- Rivers and floodplains cannot be managed without balancing the demands put upon them by agriculture, industry, nature conservation, etc.

Belgium, Dijle valley

- Creation of …ys into the floodplain … stream
- Size of flo… …sultation

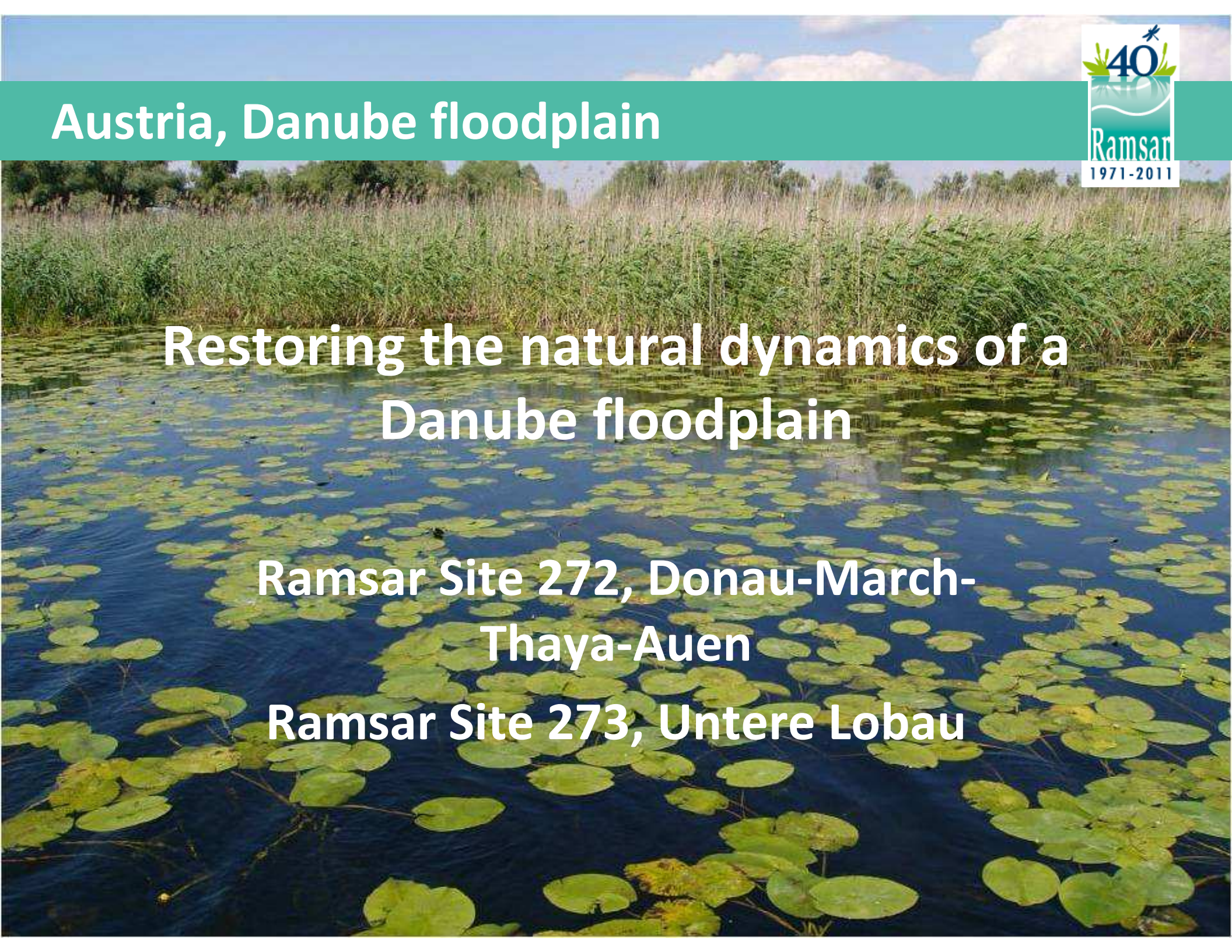
⇒ Too small … …uch mud & destroy v…

- Measures … …ops along the river (com…

⇒ Initial loca… …n no flooding events of …

⇒ Applicatio… …ermany

Initial stakeholder problems, but economical benefits convinced local residents (flood alleviation)



Austria, Danube floodplain

Restoring the natural dynamics of a Danube floodplain

Ramsar Site 272, Donau-March-Thaya-Auen

Ramsar Site 273, Untere Lobau

Danube River

- With 2,850 km the longest river in the EU
- Characterized by seasonal fast-flowing waters and regular flooding
- High population densities
- Important economic activities/ transportation
- Facilitating of navigation & flood alleviation changed physical and ecological characteristics of the waterway/ drying up of wetlands:

* Restriction of spillage into the floodplain

* Heavy modification of river banks

Objectives & Measures

Objectives	Measures
Reconnecting river branches	-Lowering of cut-off side channels relative to the main river -Exchanging weirs for bridges to allow outflow
Restoring gravel habitats	-Construction of gravel islands in the main channel - Reshaping of river banks
Regeneration of a natural river bank structure through natural erosion and accretion processes	-Removal of all artificial elements strengthening the banks (Removal of >50,000m3 of stones and boulders; dykes)
Public Awareness/Stakeholder dialogue	broad communication and media campaign
International cooperation	National and international (Ger, SK, HU, RO, BG) network for the promotion of side channel re-connection work

Achievements

- Dispersion of
  alleviation i
- ⇒ Integration
  objectives
- Increased fl
  dependent
- Gravel bank
  (Actitis hypo
- Reestablish
  availability
  side banks)
- Succesful st
  of increased
- One of the best LIFE projects 2007/08

=> Follow-on projects

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Economic considerations

Not in all parts of the river was a complete removal of river side banks possible as erosion processes would have hindered movements of ships (low water level) – removal in parts in those places

Austria: Aiding migration of endangered fish

- Danube Salmon (*Hucho Hucho*) is only found in the Danube and its tributaries
- Affected by:
  - Pollution
  - Overfishing
  - creation of dams and other obstacles to migration which also prevent exchange between subpopulations)
  - Watercourse regulation: loss of important spawning and feeding grounds

Measures to help migration

Crucial for the succes of this project:

Stakeholder Participation

Involvement of local landowners, holders of rights to use water, licensed anglers, NGO's, the Federal Environmental Ministry

Restoring one of the largest raised bog areas in the Netherlands

- Raised bogs are one of the rarest habitat types (fed by rainwater) and have an important role in groundwater recharge and sequestering CO^2

- Fochterloërveen: peat degraded after drainage for tree planting and farming

- result:monotonous *Molinia* grasses

- core area: intact peat with typical vegetation: peat moss: *Sphagnum*

⇒ restoration of the entire area from this core area
⇒ prevention of rainwater from flowing off the raised bog too quickly and to stimulate natural peat formation

Innovative approach:

⇒ Building of small compartments of peat-covered dykes and dams; subdividing the bog

⇒ Inundation of these compartments to stimulate *Shpagnum* growth to initiate peat production and to kill invasive molina grasses

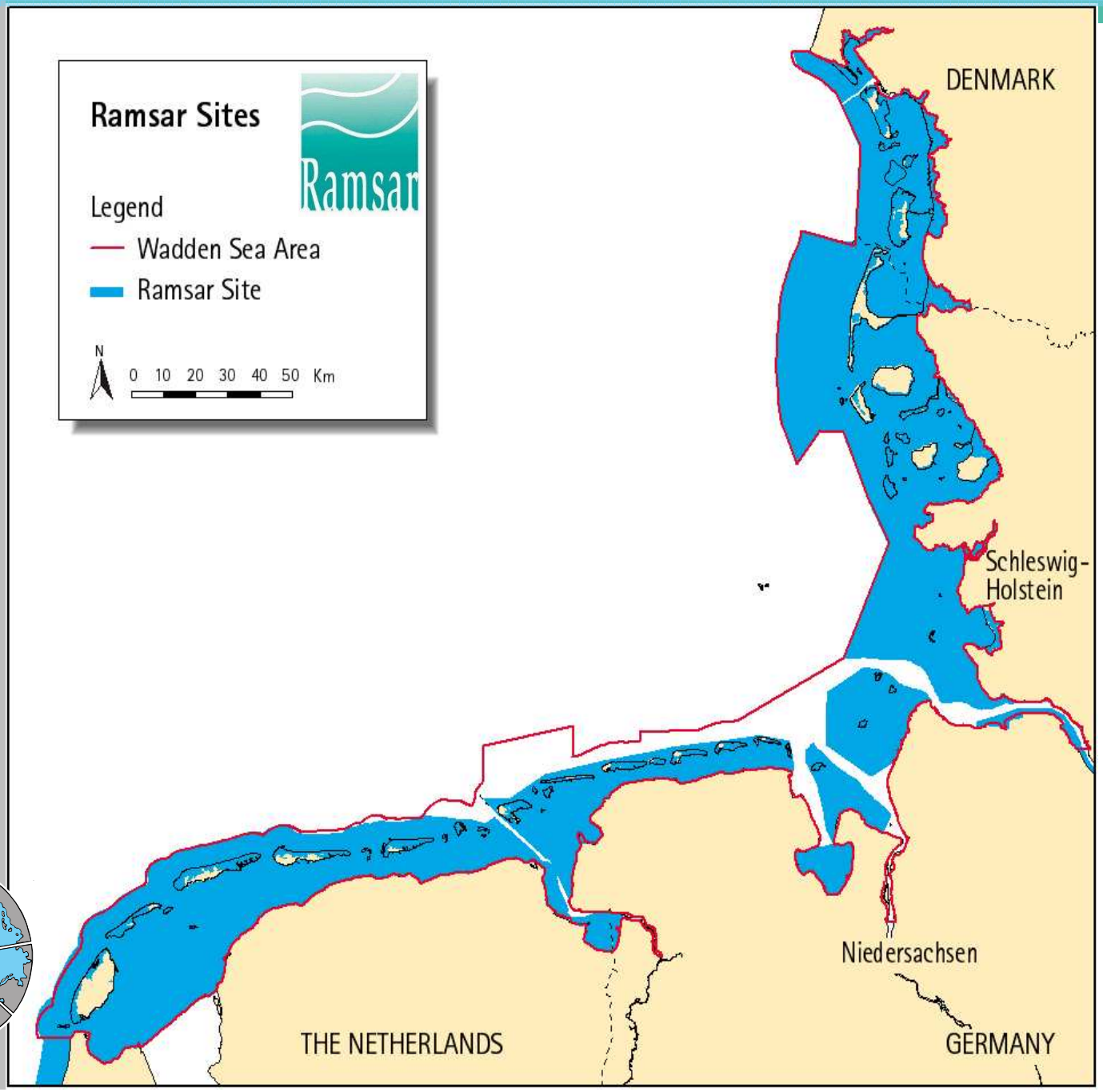
- Buffer zone of more than 400 ha
- Adaptation of local traffic infrastructure due to re-humidification => replacement of asphalt roads

⇒ Monitoring and control of water levels possible

⇒ Entire raised bog can be managed and peat formation initiated (instead of general drainage-ditch blocking)

- Isolated area: stakeholder participation: low importance

International Agreements - Ramsar



Ramsar Sites

Region (No.): Year

NL (2): 1984, 2000

Nds (3): 1976

HH (1): 1990

SH (1): 1991

DK (1): 1987

Trilateral Wadden Sea Cooperation

Guiding principle: *"to achieve, as far as possible, a natural and sustainable ecosystem in which natural processes proceed in an undisturbed way".*

1982/2010 Joint Declaration on the Protection of the Wadden Sea

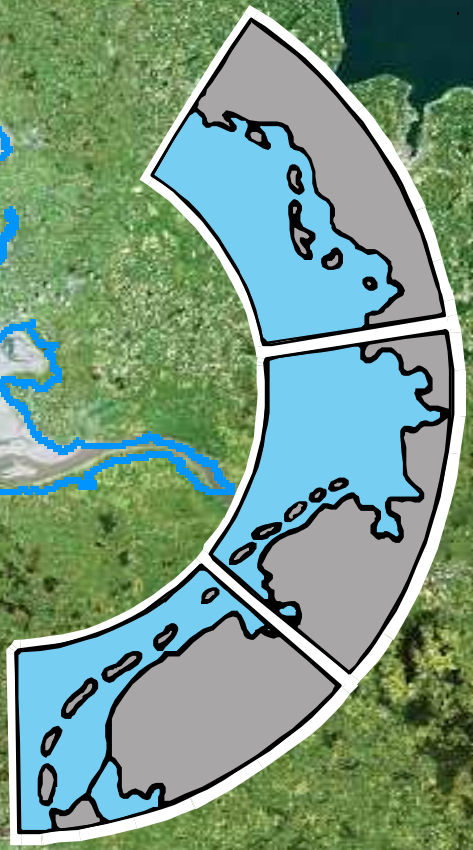
1987 Common Wadden Sea Secretariat

1993 Monitoring Programme TMAP

(Trilateral Monitoring and Assessment Program)

1997/2010 Wadden Sea Plan

2009 UNESCO World Heritage Site



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Trilateral Wadden Sea Plan

Targets:

- Landscape and Culture
- Water and Sediment
- Salt Marshes
- Tidal Area (tidal flats and subtidal gullies)
- Beaches and Dunes
- Estuaries
- Offshore Zone
- Birds
- Marine Mammals
- Fish

Regulations on :

- Agriculture
- Fishery
- Hunting
- Dredging and dumping
- Sand and clay extraction
- Tourism
- Shipping
- Energy (wind, gas, oil)
- others

TMAP Parameter

The trilateral cooperation is a great example of long-established international cooperation, detailed and joint monitoring and planning

Trilateral RS Floodplains of the Danube-Morava-Dyje Confluence
Austria & Czech Republic & Slovakia