The Economics of Ecosystems & Biodiversity

The Economics of Ecosystems and Biodiversity (TEEB): Water and Wetlands

What are the multiple values of Wetlands?

Patrick ten Brink
Senior Fellow and Head of Brussels Office
Institute for European Environmental Policy (IEEP)

Webinars: Transforming our approach to water and wetlands

12 December 2013,
11.00 - 12.15 and 16.00 -17.15 PM CET

The “nexus” between water, food and energy is one of the most fundamental relationships - and increasing challenges - for society.

Biodiversity and particularly wetland ecosystems are increasingly understood to be at the core of this nexus.

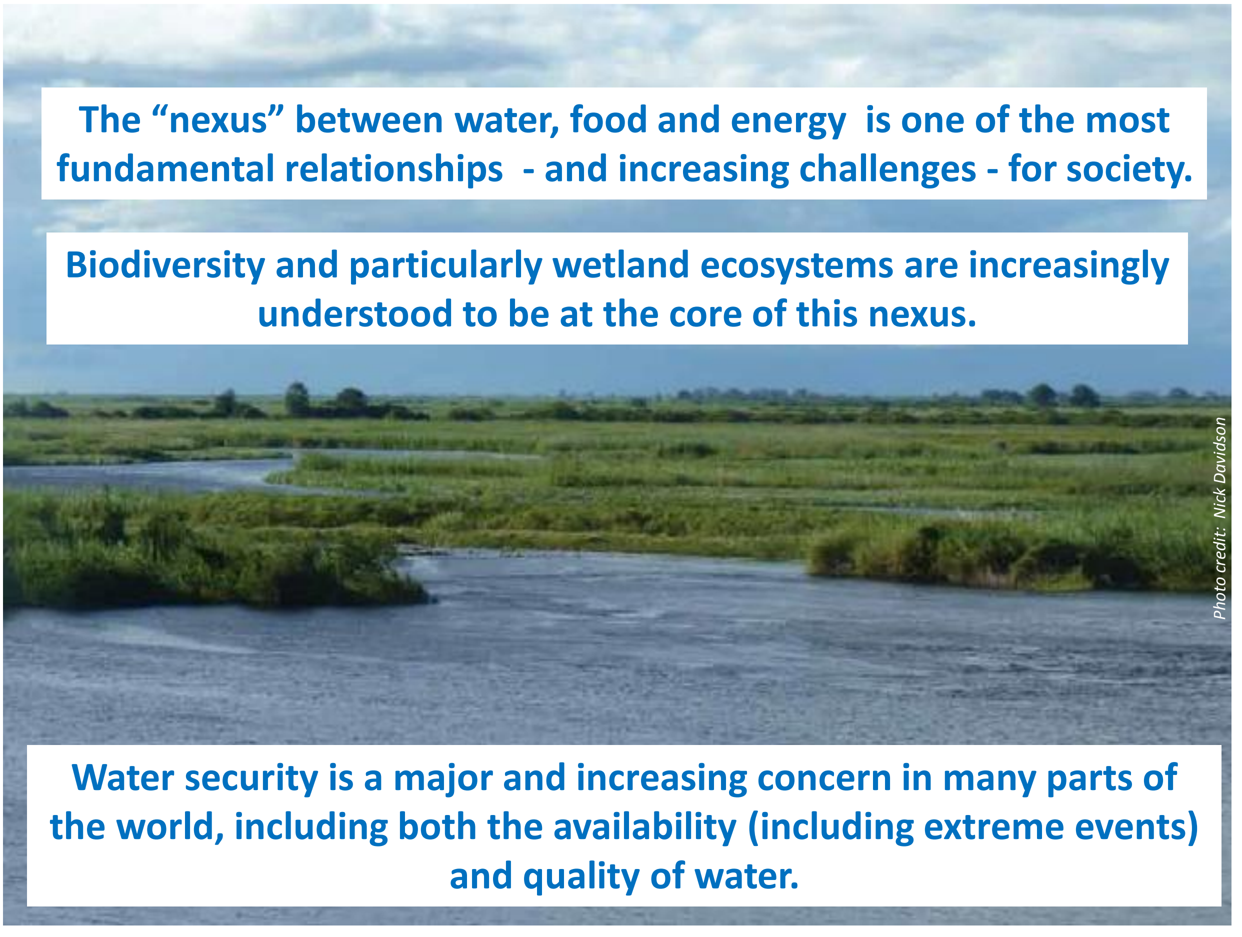
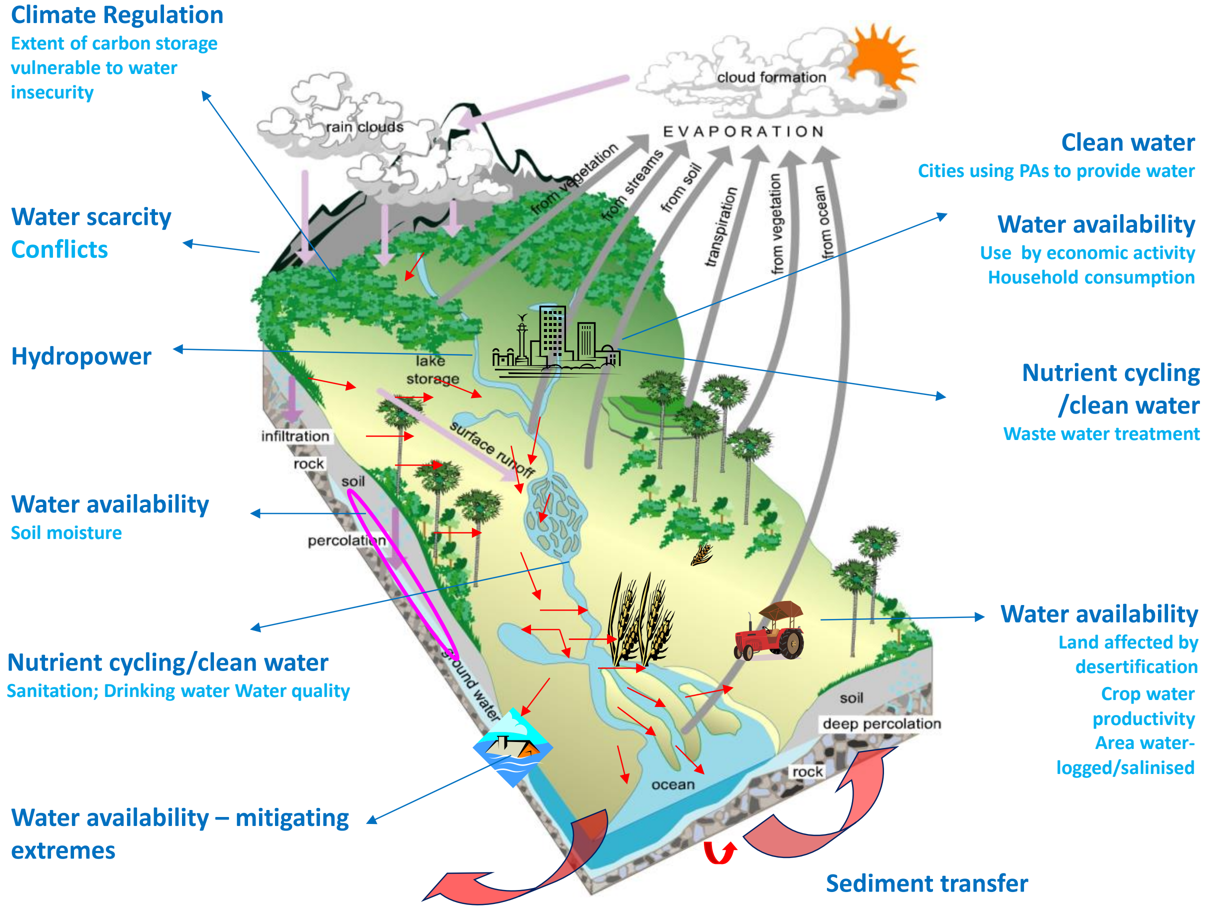


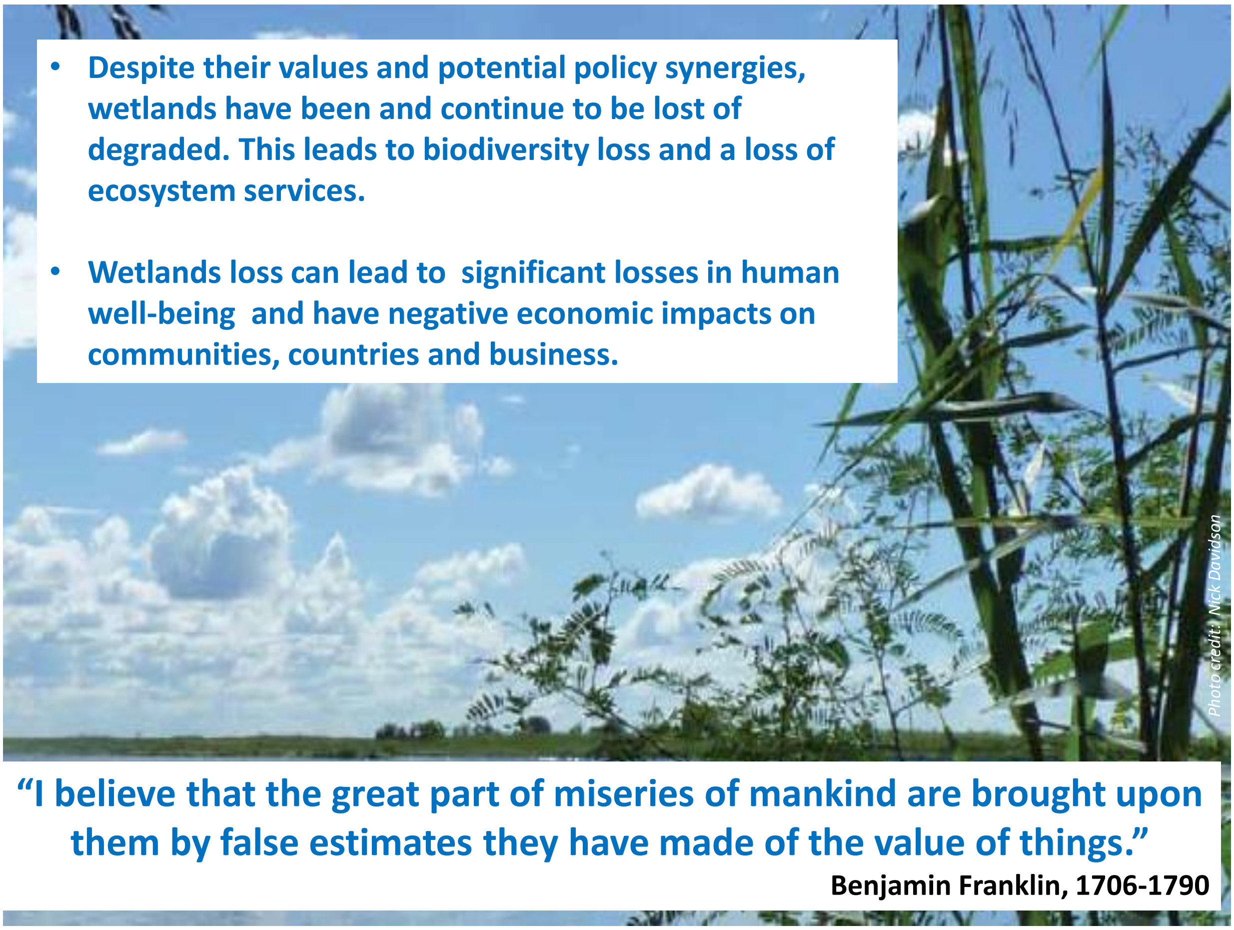
Photo credit: Nick Davidson

Water security is a major and increasing concern in many parts of the world, including both the availability (including extreme events) and quality of water.



Climate Regulation
Extent of carbon storage vulnerable to water insecurity
Water scarcity
Conflicts
Hydropower
Water availability
Soil moisture
Nutrient cycling/clean water
Sanitation; Drinking water Water quality
Water availability – mitigating extremes
Clean water
Cities using PAs to provide water
Water availability
Use by economic activity
Household consumption
Nutrient cycling /clean water
Waste water treatment
Water availability
Land affected by desertification
Crop water productivity
Area water-logged/salinised
Sediment transfer
rain clouds
cloud formation
EVAPORATION
from vegetation
from streams
from soil
transpiration
from vegetation
from ocean
lake storage
surface runoff
infiltration
rock
soil
percolation
ground water
soil
deep percolation
rock
ocean

- **Despite their values and potential policy synergies, wetlands have been and continue to be lost of degraded. This leads to biodiversity loss and a loss of ecosystem services.**
- **Wetlands loss can lead to significant losses in human well-being and have negative economic impacts on communities, countries and business.**



“I believe that the great part of miseries of mankind are brought upon them by false estimates they have made of the value of things.”

Benjamin Franklin, 1706-1790

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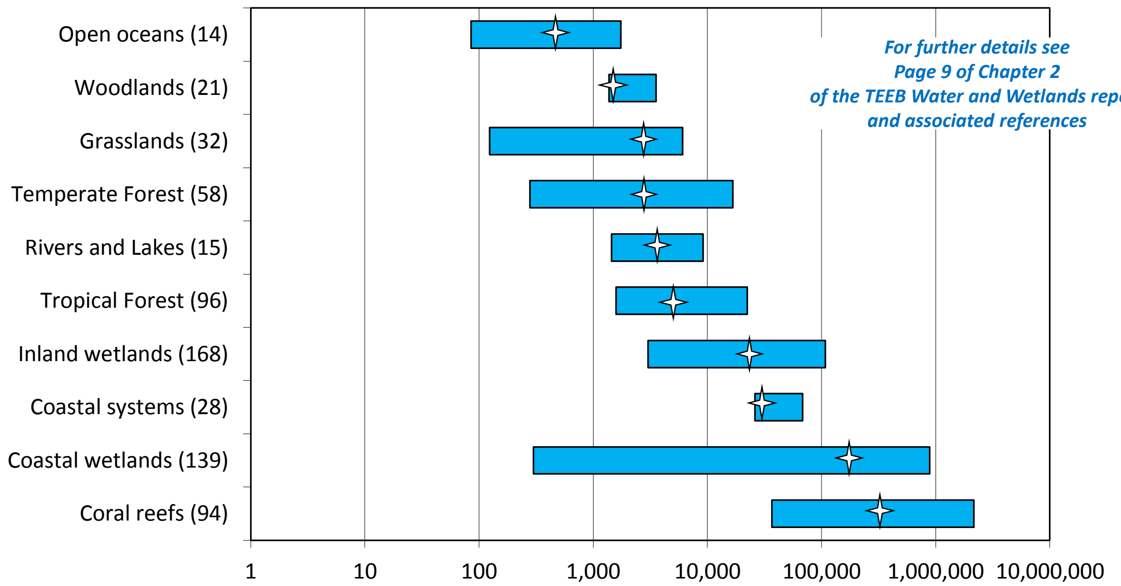
The evidence base: range of values of ecosystem services



Sources: de Groot et al 2012 building on TEEB 2010

Values of coastal & inland wetland ecosystem services can be high

Word of caution: Actual values are site specific

Knowledge base: what have studies focused on?
Types of wetlands and services

Table AII.6. The number of wetland ecosystem valuation studies for the four main categories of services for different types of wetland (data from TEEB, 2010). Colour-codes are: green >10% of studies; amber 5-10%; yellow <5%.

Ecosystem Services/ wetland type	Coral reefs	Mangroves & tidal marshes	Coastal systems (habitat complexes)	Inland wetlands	Freshwater lakes & rivers	TOTAL
Provisioning	34	35	20	37	6	132
Regulating	19	28	6	33	4	90
Habitat	8	38	3	9	1	59
Cultural	43	13	9	13	5	83
TOTAL	104	114	38	92	16	364

For further details see Annex II (page 62 to 71) of the TEEB Water and Wetlands report

Sources: TEEB (2010); de Groot et al. (2010)

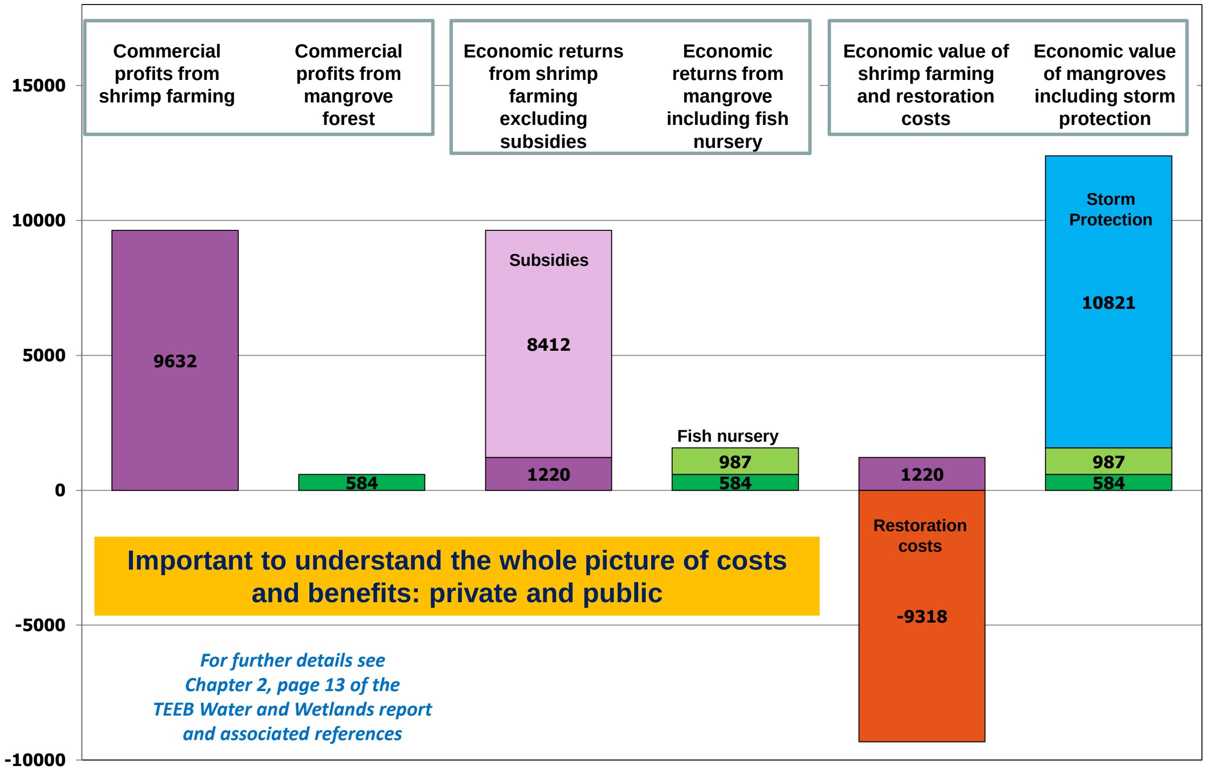
Need to improve the knowledge base for inland wetlands, particularly lakes and rivers

Ecosystem services	Coral reefs		Mangroves & tidal marshes		Coastal systems (habitat complexes e.g. shallow seas, rocky shores & estuaries)		Inland vegetated wetlands (floodplains, swamps/marshes and peatlands)		Freshwater lakes & rivers		TOTAL
	Relative ecosystem service importance	No. of valuation studies	Relative ecosystem service importance	No. of valuation studies	Relative ecosystem service importance	No. of valuation studies	Relative ecosystem service importance	No. of valuation studies	Relative ecosystem service importance	No. of valuation studies	
Provisioning											
Food	●	22 ☺	⬤	12 😐	●	14 ☺	⬤	16 ☺	⬤	3 ☹	67
(Fresh) water supply	n/a	n/a	•	3 😐	•	1 ☹	⬤	6 ☹	⬤	2 ☹	12
Raw materials	•	6 😐	⬤	18 ☺	●	5 😐	●	12 ☺	●	1 ☹	42
Genetic resources	•	1 ☹	•	0 ☹	•	0 ☹	•	1 ☹	•	0 ☹	2
Medicinal resources	•	0 ☹	•	2 😐	•	0 ☹	•	1 ☹	•	0 ☹	3
Ornamental resources	●	5 😐	•	0 ☹	•	0 ☹	•	1 ☹	•	0 ☹	6
Regulating											
Influence on air quality	•	0 ☹	•	1 ☹	•	0 ☹	•	0 ☹	•	0 ☹	1
Climate regulation	●	1 ☹	●	6 ☺	●	0 ☹	●	5 😐	●	1 ☹	13
Moderation of extreme events	⬤	13 ☺	⬤	13 ☺	●	1 ☹	⬤	7 ☹	⬤	0 ☹☹	34
Regulation of water flows	n/a	n/a	•	0 ☹	•	0 ☹	⬤	4 ☹	⬤	0 ☹☹	4
Waste treatment/ water purification	•	2 😐	⬤	4 ☹	●	0 ☹	●	9 😐	●	2 ☹	17
Erosion prevention	•	1 ☹	⬤	3 ☹	●	0 ☹	●	1 ☹	•	0 ☹	5
Nutrient cycling/ maintenance of soil fertility	●	0 ☹	⬤	1 ☹☹	●	4 😐	⬤	5 ☹	●	1 ☹☹	11
Pollination	n/a	n/a	•	0 ☹	•	0 ☹	•	1 ☹	•	0 ☹	1
Biological control	•	2 😐	⬤	0 ☹☹	●	1 ☹	●	1 ☹	●	0 ☹	4
Habitat											
Lifecycle maintenance (a.k.a. biodiversity)	●	0 ☹	●	33 ☺	●	2 ☹	⬤	2 ☹	⬤	0 ☹☹	37
Gene pool protection	?	8 😐	?	5 😐	?	1 ☹	?	7 😐	?	1 ☹	22
Cultural											
Aesthetic information	⬤	12 ☺	●	0 ☹	●	1 ☹	●	2 😐	●	0 ☹	15
Recreation/ tourism opportunities	⬤	31 ☺	●	13 ☺	●	7 😐	●	9 ☺	⬤	5 ☹	65
Inspiration for culture, art & design	⬤	0 ☹☹	●	0 ☹	●	0 ☹	⬤	2 ☹	⬤	0 ☹☹	2
Spiritual experience	⬤	0 ☹☹	●	0 ☹	●	0 ☹	⬤	0 ☹☹	⬤	0 ☹☹	0
Cognitive information (education & science)	•	0 ☹	•	0 ☹	•	1 ☹	⬤	0 ☹☹	⬤	0 ☹☹	1

Sources: TEEB (2010); de Groot et al. (2010); MA (2005b); Danone Fund for Nature (2010).

For further details see Annex II (page 62 to 71) of the TEEB Water and Wetlands report

Benefits provided by mangroves & shrimp farms: an economic illustration (in US$/ha NPV 9 years 10% discount rate)



Source: drawn from data from Barbier et al., 2007 and Hanley and Barbier. 2009

All values are NPV over 9 years and a 10% discount rate, given in 1996 US$.

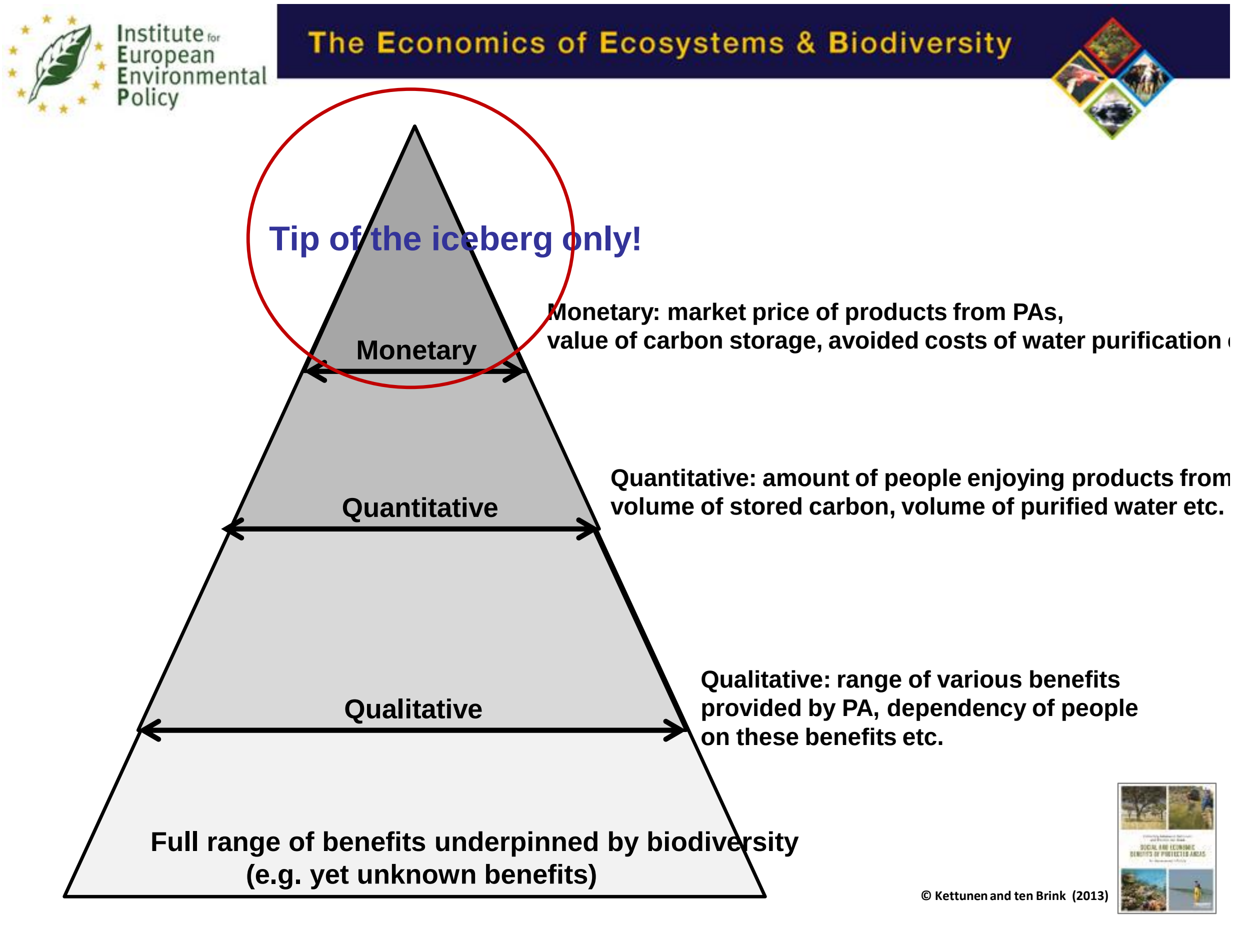
Evidence base - Assessing values and actions

Assessing the value of working with natural capital has helped determine where ecosystems can provide goods and services at lower cost than by man-made technological alternatives and where they can lead to significant savings

- **USA-NY**: Catskills-Delaware watershed for NY: PES/working with nature saves money (~5US$bn)
- **New Zealand**: Te Papanui Park - water supply to hydropower, Dunedin city, farmers (~$136m)
- **Mexico**: PSAH to forest owners, aquifer recharge, water quality, deforestation, poverty (~US$303m)
- **France :** Priv. Sector: Vittel (Mineral water) PES et al for water quality
- **Venezuela:** PA helps avoid potential replacement costs of hydro dams (~US$90-$134m over 30yr)
- **Vietnam** restoring/investing in Mangroves - cheaper than dyke maintenance (~US$: 1m to 7m/yr)
- **South Africa:** WfW public PES to address IAS, avoids costs and provides jobs (~20,000; 52%♀)

Critical to assess where working with nature saves money for public (city, region, national), private sector, communities and citizens & who can make it happen

Sources: various. Mainly in TEEB for National and International Policy Makers, TEEB for local and regional policy and TEEB cases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The Economics of Ecosystems & Biodiversity
Tip of the iceberg only!
Monetary
Monetary: market price of products from PAs,
value of carbon storage, avoided costs of water purification
Quantitative
Quantitative: amount of people enjoying products from
volume of stored carbon, volume of purified water etc.
Qualitative
Qualitative: range of various benefits
provided by PA, dependency of people
on these benefits etc.
Full range of benefits underpinned by biodiversity
(e.g. yet unknown benefits)
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Te Papanui Conservation Park, Dunedin, Otago Region, NZ

- 22,000 ha of protected land that is primarily used for recreation and provides ecosystem services to Dunedin City, mainly water
- Project objective to investigate the value of existing water in three uses: domestic, commercial, and industrial

Results

- The total value of Te Papanui water is estimated to be $136 million (NPV)
- The total value of Te Papanui water for irrigation is $12 million (NPV)
- The value of Te Papanui water for hydroelectricity is $25 million (NPV)
- Drinking water is valued at $93 million (NPV) based on avoided pumping and capital costs

Protected Areas benefit multiple stakeholders: nature based solution to clean water supply

Sources: New Zealand Department of Conservation, 2006; BPL, 2006

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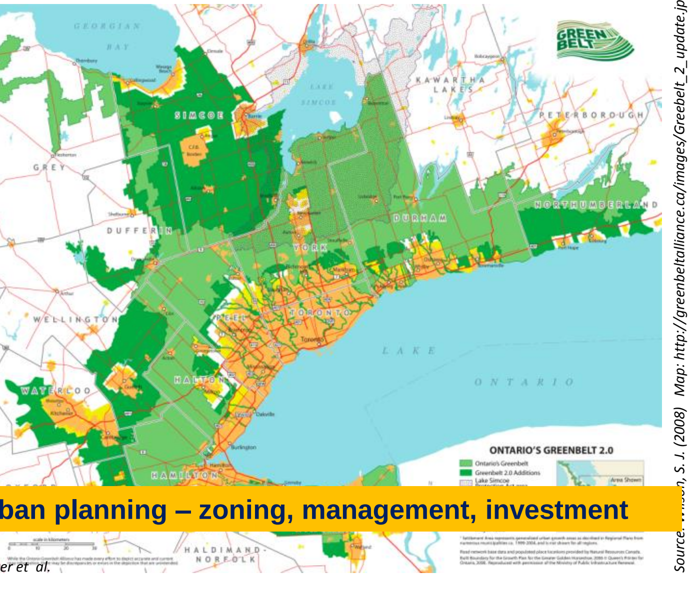
The Value of the Greenbelt for the Greater Toronto Area

The Greenbelt around the city offers 2.7 billion worth of non-market ecological services with an average value of $3, 571 per hectare.

Ecosystem Valuation Benefits	Annual Value (2005, CDN $)
Carbon Values	366 million
Air Protection Values	69 million
Watershed Values	409 million
Pollination Values	360 million
Biodiversity Value	98 million
Recreation Value	95 million
Agricultural Land Value	329 million

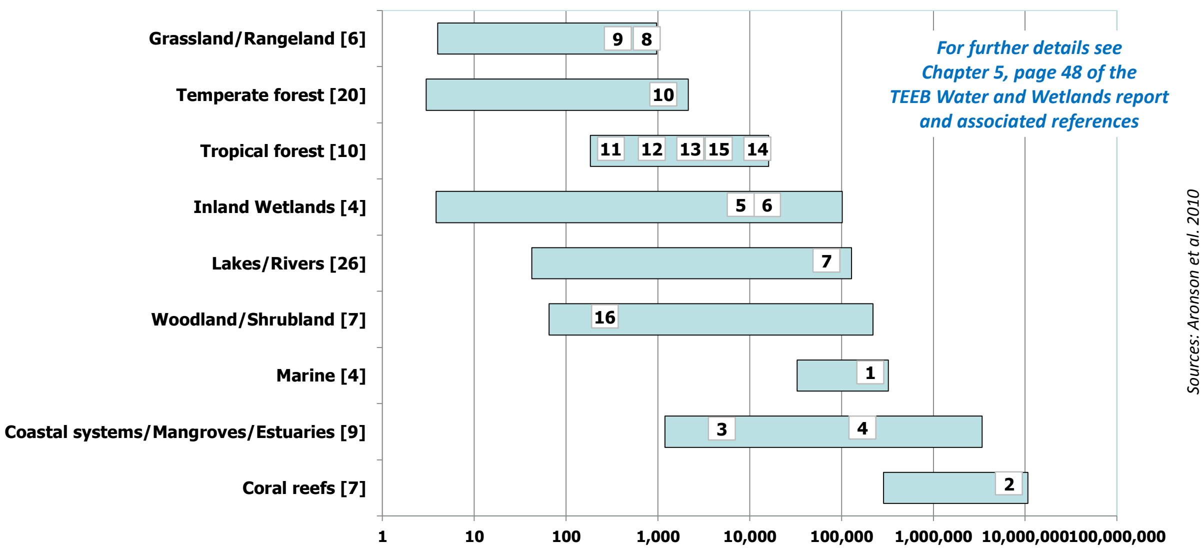


Source: ...n, S. J. (2008) Map: http://greenbeltalliance.ca/images/Greebelt_2_update.jpg

Appreciating values can help with urban planning – zoning, management, investment

Adapted from slide by UFZ team: Heidi Wittmer, Augustin Berghöfer, Johannes Förster et al.

Restoration: can be costly, but can offer good returns



For example: **Germany:** peatland restoration: avoidance cost of CO2 ~ 8 to 12 €/t CO_2 (0-4 alt. land use). Lower than many other carbon capture and storage options

Wetlands provide natural infrastructure that can help meet a range of policy objectives.

Beyond water availability and quality, they are invaluable in:

- **Climate change mitigation and adaptation;**
- **Health and livelihoods,**
- **Food/nutrition**
- **Local development and poverty eradication**
- **Social and regional cohesion and development**

Important inputs to sectors: Agriculture, Water, Fish, Energy…

But to achieve this we need the wise use of wetlands and the use of a range of different policy instruments and management approaches