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

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TEEB for Cities and Urban-Rural Interactions with a Special Focus on Wetland Ecosystem Services
6th Sino-German Workshop on Biodiversity Conservation
Germany | 15-18 July 2013
Presentation overview

1. TEEB & The TEEB for Water and Wetlands Project
2. Water and wetlands: what benefits do we derive and what do we risk losing?
3. Integrating the values of water and wetlands into decision making
4. Recommendations: Transforming our approach to water and wetlands
TEEB’s Genesis, Aims and progress

**G8+5 Potsdam**

“Potsdam Initiative – Biological Diversity 2010”
The economic significance of the global loss of biological diversity
Importance of recognising, demonstrating & responding to values of nature
Engagement: ~500 authors, reviewers & cases from across the globe

**Interim Report**

**Climate Issues Update**

**TEEB End User Reports**

**TEEB Books**

**Phase 1**

CBD COP 9
Bonn 2008

Input to
UNFCCC 2009

**Phase 2**

India, Brazil, Belgium,
Japan & South Africa
Sept. 2010

BD COP 10
Nagoya,
Oct. 2010
**TEEB outputs**

- **TEEB Books**
  - The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations
  - The Economics of Ecosystems and Biodiversity: Nature for GE
  - TEEB for Cities

- **TEEB Reports**
  - TEEB W&W
  - Nature & GE
  - TEEB Oceans

- **TEEB for Cities**

- **TEEB studies**
  - The Netherlands, Germany, Nordics, Norway, India, Brazil, Finland....

- **Guidance**
  - TEEB Implementation Manual
  - Aichi Target Guides

- **NBSAPs & BD values**

- **TEEB Cases**

- **TEEB for Business**
  - Value of PAs
  - Regional Development

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**Phase 2**

**Phase 3: TEEB Implementation**
Ecosystems provide multiple ecosystem services

<table>
<thead>
<tr>
<th>Provisioning services</th>
<th>Regulating Services</th>
<th>Cultural Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td>Climate regulation</td>
<td>Aesthetics</td>
</tr>
<tr>
<td>Fibre</td>
<td>Water and waste purification</td>
<td>Landscape value,</td>
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<tr>
<td>Fuel</td>
<td>Air purification</td>
<td>Recreation &amp; Tourism</td>
</tr>
<tr>
<td>Water provision</td>
<td>Natural hazards management</td>
<td>Cultural values</td>
</tr>
<tr>
<td>Ornamental resources</td>
<td>Erosion control</td>
<td>Inspirational services</td>
</tr>
<tr>
<td>Genetic resources</td>
<td>Pollination</td>
<td>Education</td>
</tr>
<tr>
<td>Medicinal resources</td>
<td>Biological control</td>
<td>Scientific Knowledge</td>
</tr>
</tbody>
</table>

Supporting Services: Soil formation & fertility, photosynthesis, nutrient cycle
Habitat services such as nursery service, gene pool protection.

Some are private goods (eg food provisioning), others public goods that can become (part) private (eg tourism, pollination), others are pure public goods (eg health, identify)
1. TEEB & The TEEB for Water and Wetlands Project

2. Water and wetlands: what benefits do we derive and what do we risk losing?

3. Integrating the values of water and wetlands into decision making

4. Recommendations: Transforming our approach to water and wetlands

For further details see Chapter 2 (page 5 to 17) and Chapter 3 (pages 19 to 33) of the TEEB Water and Wetlands report
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.

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

Beyond water availability and quality, they are invaluable in supporting climate change mitigation and adaptation, support health as well as livelihoods, local development and poverty eradication.

- Despite their values and potential policy synergies, wetlands have been and continue to be lost or 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.
Values of both coastal and inland wetland ecosystem services are typically higher than for other ecosystem types.
<table>
<thead>
<tr>
<th>Ecosystem services</th>
<th>Coral reefs</th>
<th>Mangroves &amp; tidal marshes</th>
<th>Coastal systems (habitat complexes e.g. shallow seas, rocky shores &amp; estuaries)</th>
<th>Inland vegetated wetlands (floodplains, swamps/marshes and peatlands)</th>
<th>Freshwater lakes &amp; rivers</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Relative ecosystem service importance</td>
<td>No. of valuation studies</td>
<td>Relative ecosystem service importance</td>
<td>No. of valuation studies</td>
<td>Relative ecosystem service importance</td>
<td>No. of valuation studies</td>
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<td>Influence on air quality</td>
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<tr>
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<td>Moderation of extreme events</td>
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<td>Regulation of water flows</td>
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<td>Waste treatment/ water purification</td>
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<td>Nutrient cycling/ maintenance of soil fertility</td>
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<td>Pollination</td>
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<td>Habitat</td>
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<td>Lifecycle maintenance (a.k.a. biodiversity)</td>
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<td>33 (●)</td>
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<td>Gene pool protection</td>
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<td>8 (●)</td>
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<td>5 (●)</td>
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<td>1 (●)</td>
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<tr>
<td>Cultural</td>
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<tr>
<td>Aesthetic information</td>
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<td>0 (●)</td>
<td>●</td>
<td>1 (●)</td>
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<td>Recreation/ tourism opportunities</td>
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<td>●</td>
<td>13 (●)</td>
<td>●</td>
<td>7 (●)</td>
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<tr>
<td>Inspiration for culture, art &amp; design</td>
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<tr>
<td>Spiritual experience</td>
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</tbody>
</table>

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.
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)
- **Finland**: restoring green infrastructure for cost-effective flood mitigation (~15% cheaper)
- **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
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.

<table>
<thead>
<tr>
<th>Ecosystem Valuation Benefits</th>
<th>Annual Value (2005, CDN $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Values</td>
<td>366 million</td>
</tr>
<tr>
<td>Air Protection Values</td>
<td>69 million</td>
</tr>
<tr>
<td>Watershed Values</td>
<td>409 million</td>
</tr>
<tr>
<td>Pollination Values</td>
<td>360 million</td>
</tr>
<tr>
<td>Biodiversity Value</td>
<td>98 million</td>
</tr>
<tr>
<td>Recreation Value</td>
<td>95 million</td>
</tr>
<tr>
<td>Agricultural Land Value</td>
<td>329 million</td>
</tr>
</tbody>
</table>

Map: http://greenbeltalliance.ca/images/Greenbelt_2_update.jpg
Adapted from slide by UFZ team: Heidi Wittmer, Augustin Berghöfer, Johannes Förster et al.
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

Sources: New Zealand Department of Conservation, 2006; BPL, 2006
City of Cape Town, SA – ES valuation Process

- City has diverse natural assets: mountains, beaches, green space, wetlands and marine life.
- State of the Environment Report indicated that 60% of original natural areas have been lost, 30% of vegetation is endangered or critical endangered.
- Municipal budget allocations constrained, City’s Environmental Management Department needed to develop a business case for investment in conversation and protection of natural assets.

Source: De Wit and van Zyl, 2011; De Wit et al. 2009
City of Cape Town, SA – ES Valuation Process, Results

- Tourism value: US $ 137 million to $148 million/ year
- Recreation (local): $58 million to $70 million/ year
- $32 million has been donated to preserve biodiversity in CT
- The value natural assets was measured by proxy using the film and advertising industry revenues, valued at $18.8 to $56.4 million/ year
- Natural hazard regulation: $650,000 to $8.6 million/ year
- Clean up costs for Zeekoevlei Wetland $8.5 to $9.6 million/ year

Source: De Wit and van Zyl, 2011; De Wit et al. 2009
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For further details see Chapter 4 (page 35 to 45) of the TEEB Water and Wetlands report
3. Integrating the values of water and wetlands into decision making

- **Policy synergies:** Working with nature can be a cost effective way of meeting a range of policy, business and private objectives.

- **Integrated water resource management (IWRM), Integrated coastal zone management (ICZM) and Maritime Spatial Planning (MSP)** if properly applied can help meet **multiple objectives**

- **Range of instruments can help manage & protect wetland ecosystem services**
  - Site management and investment
  - Regulation and land-use planning (PAs, zoning)
  - Property rights (ownership, use, access etc)
  - Market creation – information, pricing, incentives
  - Subsidy reform, funds, trading schemes & payment for ecosystem services
  - Voluntary schemes (offsets et al).
Water Fund in East Cauca Valley, Columbia

Fondo de Agua por la Vida y la Sostenibilidad (FAVS): The Nature Conservancy TNC, Asocaña, local authorities and stakeholders

Upstream users (farmers)

Land conversion leads to degradation and erosion

Downstream users (sugarcane producers, beverage industry, drinking water)

US$ 16m over 5 years for the conservation and restoration of 600 square miles of moist tropical forests and montane grasslands

920,000 people in the cities of Palmira, El Cerrito, Pradera, Florida and Miranda benefit.

Securing ecosystems, biodiversity and water-related services: reducing erosion and maintaining regular water flows


Adapted from slide by UFZ team: Heidi Wittmer, Augustin Berghöfer, Johannes Förster et al.
Hail Haor, Bangladesh – Wetland Management and Conservation

- Hail Haor, largest over exploited wetland; history of draining for agriculture
- In 1998, the Bangladeshi Government and USAID initiated a project, Management of Aquatic Ecosystems through Community Husbandry (MACH), a community based approach to wetland restoration, completed in 2008

Results

- Formation of Resource Management Organisations (RMOs) formally recognised by the government
- Restoration of wetland and fishing restrictions saw increase of 45% in fish consumption
- Endorsement by government for community management has seen an annual lease income of $1,500 USD

Sources: Thompson and Colavito, 2007; Thompson and Balasinorwala, 2010
National Example: MEXICO

- The Payment for Hydrological Environmental Services Program
- Purpose: Finance the hydrological ecosystem services provided by forest, especially watersheds and aquifer recharge
- Tools: Federal taxes on water, and remuneration incentives for forest owners to maintain forest cover in water sensitive areas.

Sources: TEEBCases for TEEB for local and regional policy Munoz 2010; Muñoz-Piña et al. 2008; Muñoz-Piña et al. 2007.
Results:
Deforestation rate fell from 1.6 % to 0.6 %.
18.3 thousand hectares of avoided deforestation
Avoided GHG emissions ~ 3.2 million tCO2e

Hydrological services: Aquifer recharge;
Improved surface water quality, reduce frequency &
damage from flooding

Reduce Deforestation

Address Poverty

Aquifers and Watersheds

Munoz 2010; Muñoz-Piña et al. 2008; Muñoz-Piña et al. 2007.
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For further details see Chapter 5 (page 47 to 58) of the TEEB Water and Wetlands report
4. Transforming our approach to water and wetlands

Wetlands and water-related ecosystem services need to become an integral part of water management in order to make the transition to a resource efficient sustainable economy.

- Investing in restoration
- Incorporating traditional knowledge
- Sustainable tourism
- Aiming for synergies between restoration and poverty alleviation
- Engage in transition management.

Action at all levels and by all stakeholders is needed if the opportunities and benefits of working with water and wetlands are to be fully realised and the consequences of continuing wetland loss appreciated and acted upon.
Restoration: can be costly, but can offer good returns

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

For further details see Chapter 5, page 48 of the TEEB Water and Wetlands report and associated references
The Essex Marshes, UK

- Over 25 years the Essex coast lost approximately 50% of its 30,000 ha of salt marshes, and **1% continues to be lost every year**
- In 2002, the Essex Wildlife Trust created a coastal re-alignment project to restore the salt marshes

Results

- Over the next 20 years monetary benefits are expected to be **£500 000/ year** through savings and income generation
- Additional benefits include: sea wall maintenance, improved water quality, flood defence, and ecotourism opportunities

Sources: Natura 2000 web page, [http://www.natura.org](http://www.natura.org)
Working for Water (WfW): SA & The Manalana wetland

• Severely degraded by erosion that threatened to consume the entire system
• WfW public works programme intervened in 2006 to reduce the erosion and improve the wetland’s ability to continue providing its beneficial services

Results
• Livelihood benefits from degraded wetland was just 34% of healthy ecosystem
• Rehabilitated wetland contributes provisioning services at 297 EUR/household/year
• Livelihood benefits ~ 182,000 EUR by the rehabilitated wetland; x2 costs
• The Manalana wetland acts as a safety net for households.

Sources: Pollard et al. 2008; Wunder et al 2008a; http://www.dwaf.gov.za/wfw/
Global: Strategic Plan Biodiversity 2011-2020 & integration in MEAs

National: Integration of values into decision making, strategies and make use of NBSAPs

Local: Assess interlinks: wetlands, communities, man-made infrastructures and the economy

Site managers: Develop site management plans to ensure wise use of wetlands, including sustained provision of ecosystem services

Academia: Contribute to fill the knowledge gaps

Development cooperation community: Integrate appreciation of multiple benefits and potential cost savings into dev co-op objectives and implementation on the ground

NGOs: Support wetland mang’t via funding & expertise, inc. volunteers

Business: Identify impacts and dependencies, risks & opportunities, and EP&Ls
Thank you!

谢谢


See also [www.teeb4me.com](http://www.teeb4me.com)

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