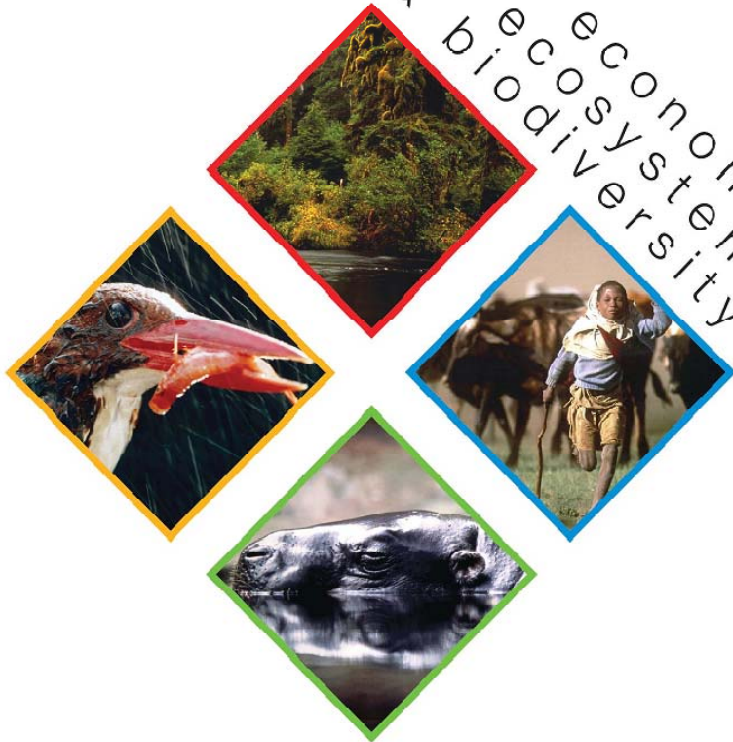


The Economics of Ecosystems & Biodiversity



The economics
& of ecosystems
& biodiversity



TEEB: Overview of the initiative and the approach

Dr. Heidi Wittmer,
TEEB scientific coordination

Christoph Schröter Schlaack, Augustin Berghöfer,
Carsten Neßhöver, Johannes Förster
Helmholtz-Zentrum für Umweltforschung – UFZ



INCA DAAD Workshop Leipzig 4.8.2011



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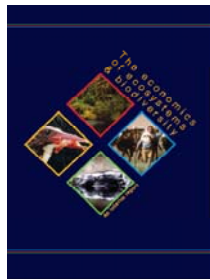


TEEB's genesis ...



“Potsdam Initiative – Biological Diversity 2010”

.....the economic significance of the global loss of biological diversity....



**TEEB Interim Report
CBD COP-9, Bonn, May 2008**



**TEEB Climate Issues Update
Strömstad September 2009.**



**TEEB Main Reports
Nov. 2009 – Oct. 2010**



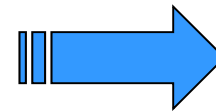
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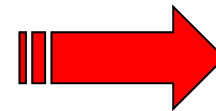
TEEB's main reports



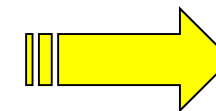
Ecological & Economic Foundations



Policy Evaluation for National Policy Makers



Assessment and Policies for Local and Regional Policy Makers



Business Risks & Opportunities



Synthesis

TEEB's mission is to make Nature economically visible

The Economics of Ecosystems & Biodiversity



TEEB is not....

- It is not a research project
- no new methods developed

TEEB is

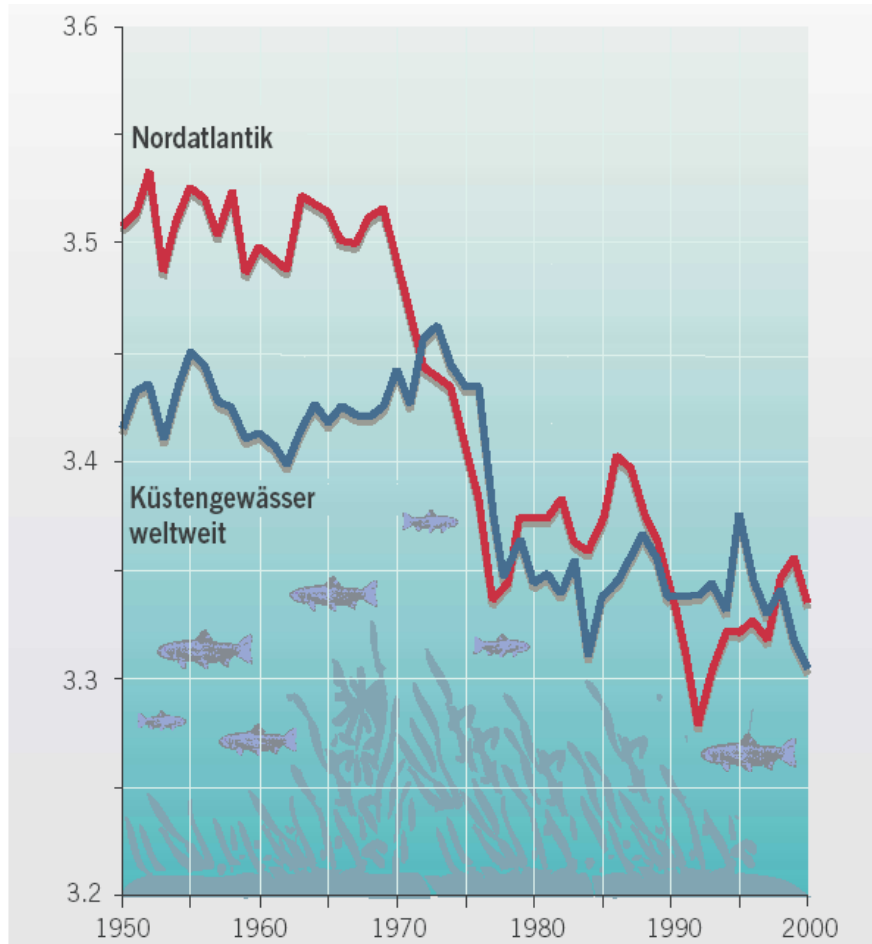
- A rapidly evolving multi-donor initiative, 2007-2010, hosted by UNEP, to explore economic perspectives on nature
- An “Open Architecture” project... over 500 contributors
- Maker of “Global Public Goods”: the TEEB Report suite
- Catalyst of Change within Society: relationship to Nature, Economics,

What TEEB has aimed for...

- Synthesis of existing knowledge and experience on economics of ecosystems & biodiversity
- Prepared for different users in public politics and business
- Active and worldwide dissemination to these users
- Awareness raising and mainstreaming



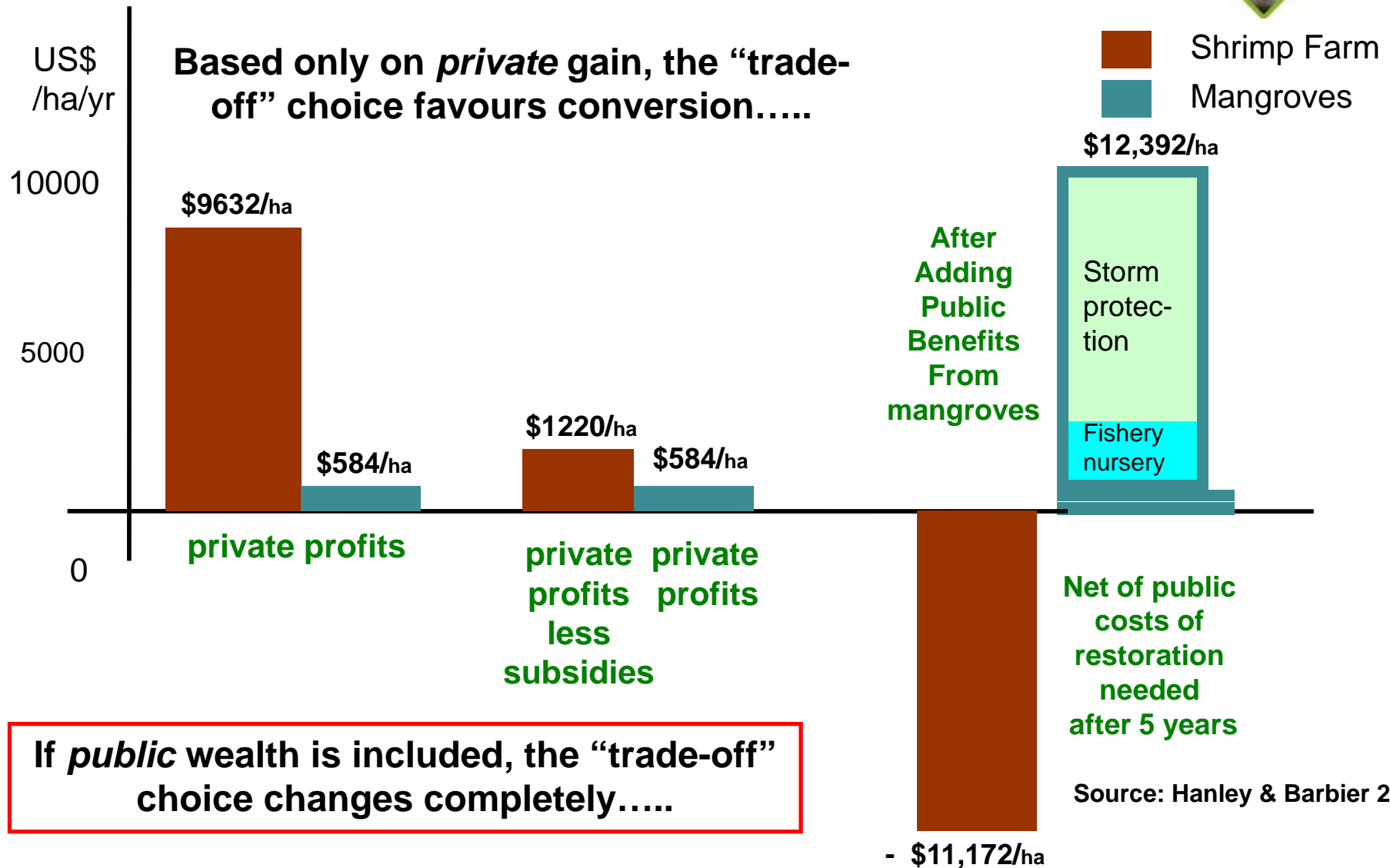
Sizing the problem



Source: Pauly und Watson 2005, MA

- Half of all fishstocks fully exploited
one fourth overexploited
- *At risk: approx. 27 Million jobs*
- *At risk: \$ 80-100 Billion income*
- ***More than 1 Billion people depend on fish for main source of protein***
- *Currently already losing \$ 50 Billion/year*
- Subsidies main reason for damages

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Local Example: River Elbe floodings 2002, Germany

- Damage: >2billion €
- Flood damage (+cost of dams) by far exceed costs of upstream flooding arrangements with land holders – **the land's value for flood regulation was re-discovered**
- Local authorities start changing spatial planning + seek flooding arrangements

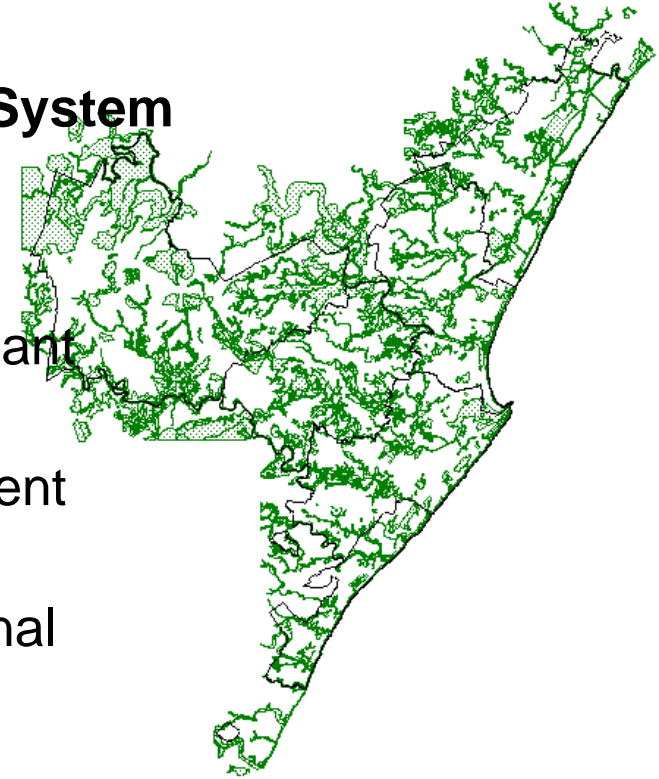


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Example : Durban Metropolitan Open Space System

- South Africa's major port, 3 million population, 30-40% unemployment
- 4 of South Africa's 7 biomes, 2000 indigenous plant taxa, 97km coastline
- ES valued at US\$400 million annually (replacement value excluding tourism related income)
- Most of remaining open space in private/communal hands and zoned for development
- Principal pressures: landcover change, climate change, invasives
- Dube TradePort (airport and trade zone)
Investments: ca. US \$1 billion (7-8bn R)
Expected jobs: 150 – 240 thousand
Expected GDP growth: US \$1-1.5bn (8-13bn R)





What are the challenges?

Challenges when valuing ecosystem services (ES)

1. The little we know: complex local social-ecological systems, external influences, future properties of systemic change
2. Tough choices: How precise do we need to be? Which time horizon to choose? Discount rates: 0%? 4%? 8%? Can we focus on some ES and ignore others?
3. How do we consider the fact that people differ in their dependence upon ES? Monetary values do not by themselves reflect dependence.
4. Can we adequately assess „sacredness“, „aesthetic inspiration“ or „home“?





For a new orientation of decision making:

„TEEB Needs-Oriented Appraisal of Ecosystem Services“:

- Which ESS are at risk?
- Which ESS are used and unused?
- Which uses are damaging our natural capital?
- Which framework conditions (policies) further damaging use?

Possible fields of application: Urban management, Spatial planning, rural development, energy policy

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Looking at the full set of ecosystem services for informed choices (S. Vidanage, S. Perera and M. Kallesoe, 2005. In: Emerton 2005)

Traditional water retention tanks in Sri Lankan river basin or modern irrigation for paddy rice?

The Value of Tank Water and Biological Resources in Rajangana and Angamauwa Sub-Catchments of the Kala Oya Basin (per tank)

Resource	% of households	Value per Household (US\$/hh/yr)	Value per Unit Area* (US\$/ha/yr)
Paddy cultivation	13%	177	161
Vegetable cultivation	7%	86	39
Banana cultivation	3%	1150	209
Coconut cultivation	13%	238	216
Domestic water	93%	226	1,469
Livestock water	13%	369	335
Commercial water	2%	132	12
Fishery	16%	309	351
Lotus flowers	10%	106	72
Lotus roots	7%	235	107
		Total	2,972

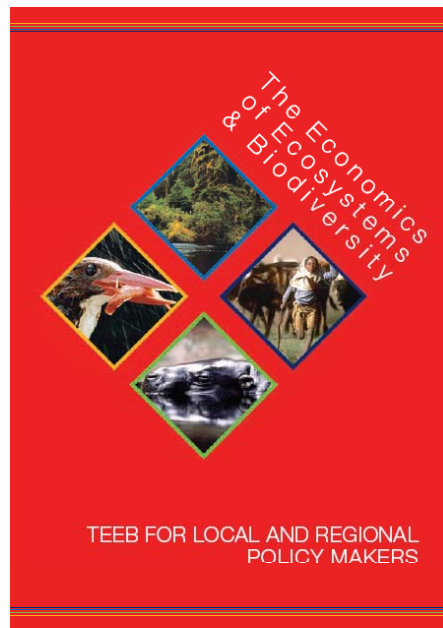
* Total inundated area



TEEB's stepwise approach:

Six steps for effectively appraising ecosystem services

This approach is not a fixed recipe. It is intended to guide policy makers in designing their own processes:



1. Specify and agree the policy issue with stakeholders.
2. Identify which ecosystem services are most relevant.
3. Define the information needs and select appropriate methods.
4. Assess ecosystem services.
5. Identify and appraise policy options.
6. Assess distributional impacts of policy options.

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Example from the TEEBcase collection:

Enhancing nature's benefits through a focus on ecosystem services: silvo-pastoral management in Colombia.



(picture: CIPAV)

The problem

Pasture degradation resulting in income loss, further expansion of pasture area.

Focus on Ecosystem services

How to tackle poor pasture practices and with it soil erosion, increase of water runoff and biodiversity loss?

Policy response

Silvo-pastoral management on 3.500ha: planting improved grasses, fodder shrubs and trees. GEF-funded payment for biodiversity and carbon fixation (PES) to cover initial investment costs.

Results:

1. Enhanced local benefits: nutrient recycling, fruit, fodder, timber, water flow regulation, protection against landslides.
2. After the project, farmers still keep the silvopastoral systems without the PES, due to its multiple benefits.

Source:
TEEBcase Silvopastoral Project

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Compensation scheme for upstream farmers
Moyobamba, Peru 🇵🇪

CONTEXT: 3 watersheds supply water for 42.000 habitants

THE PROBLEM: Decrease in water quality and quantity
Degradation of watersheds
Extreme poverty upstream

**First Peruvian PES scheme:
Urban water users compensate upstream
farmers to promote better land use**

Rising treatment costs
Restriction on water supply



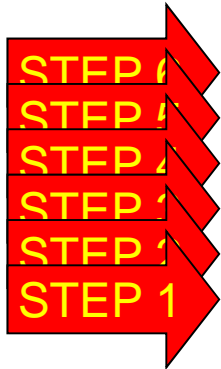
Erosion, Contamination,
Deforestation



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TEEB approach lenses on Moyobamba's case



STEP 6	Distributional impacts of policy options
STEP 5	Identify and appraise policy options
STEP 4	Define the information needs and select appropriate methods
STEP 3	Specify and agree on the problem
STEP 2	<p>Urban population supported the fee</p> <p>Water supply company and partners</p> <p>Design the scheme (after water supply</p> <p>feasibility studies)</p>
STEP 1	<p>alternatives): fee on water to promote</p> <p>services for current land uses with</p> <p>challenging scenarios were estimated</p>
	<p>Multi-stakeholder involvement:</p> <p>understand stakeholder relations</p> <p>upstream</p>
	<p>Currently under implementation</p> <p>• challenge</p>
	<p>• identify land use alternatives</p> <p>Well described process</p>

7 years process: 2004-2010





Capetown,
South Africa

Nature's Value in Tourism and Recreation

Green open spaces: R270 – R326 m/a



Tourism: R965 m - R2.95 bn/a



Annual value of important natural
capital (low valuation):

R4 Billion/a (R10 ~ €1)



Nature Reserves: R 68 – R83 m/a



Beaches: R70 – R85 m/a

Source:
Martin De Wit et al.

*These values are an estimation of **nature's share** in the production and consumption of ecosystem goods and services.*



Capetown valuation as a process

- Make a business case for biodiversity, consulted with all relevant line managers
 - Identification of ESS with 4 aspects: relative importance, link to development, possibility to influence, risk ranking.
 - Strong focus on human benefits, e.g. importance to attract skilled labour
 - Ratio public value generation (Gross geographic product) per public expenditure, Unit reference value (amount needed for 1 Rand of benefit)
- “ a fantastic foundation for further development of environmental fiscal reform strategies” – process as important as outcome



Ecosystem Services a powerful tool in communication

- Help to recognise and communicate values (beyond the market)
- Allow to demonstrate value in terms of
 - qualitative description
 - biophysical or socioeconomic quantification
 - monetary valuation
 - who benefits and who loses
- Facilitate giving the full picture and communicating limitations
- Economic values can help to identify solutions that conserve the environment and help to eradicate poverty



The Lessons

There is room to manoeuvre – recognising ecosystem services is the first step to make your natural capital work for local development and human well-being

Adapt appraisal design to your needs – in order to get useful results you need to understand and decide what is being measured or valued and how

Find the right place for your results in decision making – if economics is weaponry, then paying attention to rights, knowledge and participation help you take care against backfiring

Build on the full range of values – cashing in on single services provides incentives for degrading the entire system we depend on.

It is better to err on the side of caution – ecology is complex and our understanding limited – but future damage costs are too high to risk doubting



How to turn ES assessments into more useful support for policy making?

- Claimed usefulness lies in helping with planning:
 - Eg. the annual budgeting cycle, government programmes/strategies or projects.
- **Some key questions**
 - appropriate metrics for poverty related dependence on ES and social impact
 - African cities growth rates so high that local ES collapse before their management is put in place - what kind/format of advice does this require?
 - Policy processes are messy business - buy-in and learning by department personnel is as important as the results themselves - how do research and practice need to be structured?
 - Combining economic information with other knowledge: how to connect arguments from different world views to enhance policy leverage?



The challenges ahead

- Capacity building with an understanding of tiered approach
- Pragmatic yet robust methodologies
- Environment vs poverty eradication: Understand causalities and identify viable solutions and their practical preconditions
- Balanced processes? Legitimacy, fairness, representativity?
 - Market design! Process design?
- Role of the TEEB project (phase 3):
 - Step back vs. **facilitation & service centre** vs. project management?
 - UNEP secretariat in Geneva, UFZ, IEEP, GIST continue
 - National TEEB studies in Brazil, India, NL, Norway, Nordic, ...

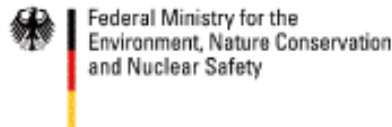


Herzlichen Dank!

- Weitere Informationen unter: www.teebweb.org,
www.teeb4me.com
- Wissenschaftliche Koordination des TEEB-Projektes: teeb@ufz.de
- Weitere Beitragende:



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City
catchment



Harbour
catchment

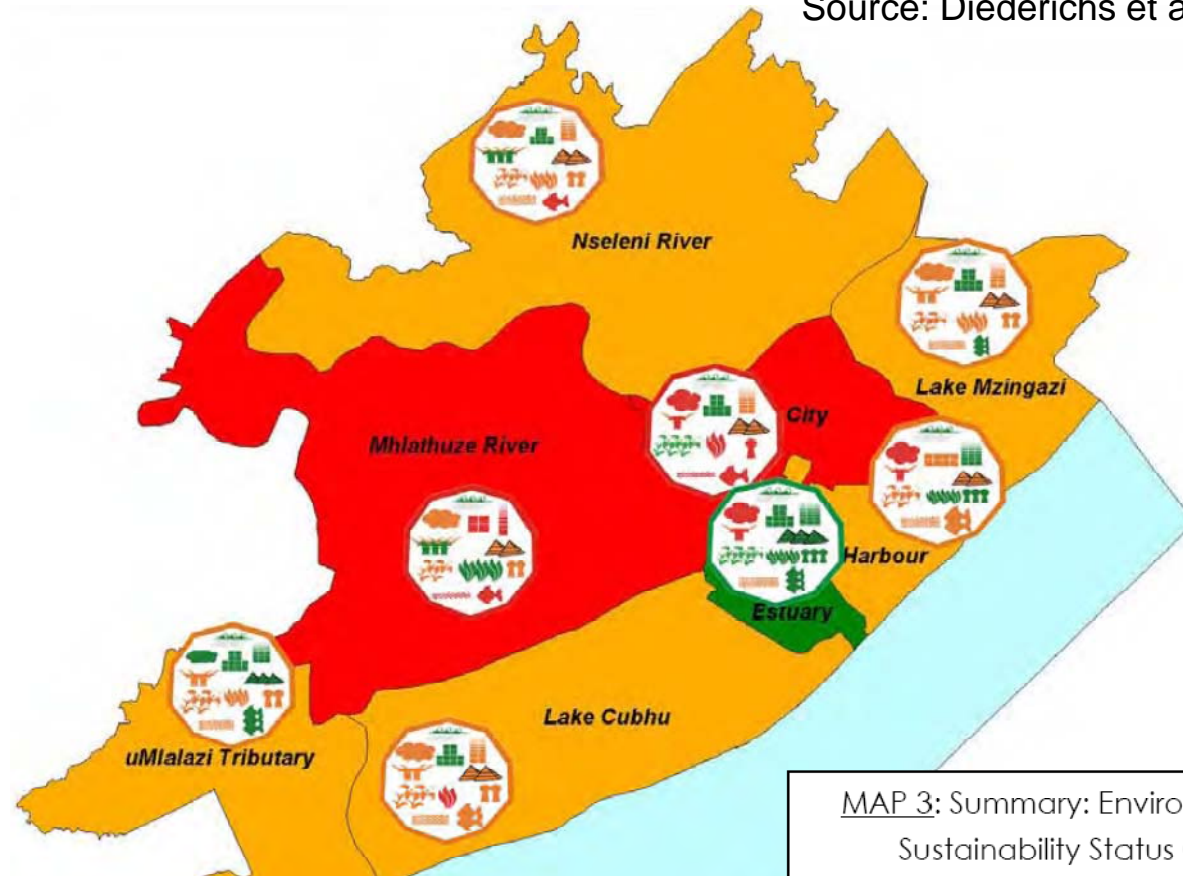


Estuary
catchment

uMhlathuze, South Africa

ES: Air quality / Climate / Flood risk / Water quality
Sediment control / Agric. productivity / Natural products
Pest & disease control / Terrestrial-aquatic biodiversity
Recreation & cultural amenity

Source: Diederichs et al. 2004





„Verzerrungen“ von Entscheidungen

- Selten einen systematischen Überblick über alle betroffenen Ökosystemleistungen
- Bestehende Märkte erfassen nur wenige, privatisierbare Ökosystemleistungen
- Regulierende Ökosystemleistungen oft als gegeben betrachtet
- Schwellenwerte für die sichere zukünftige Bereitstellung von Ökosystemleistungen umstritten
- Ökosysteme liefern immer Bündel von interdependenten öffentlichen und privaten Gütern: keine einfache Grundlage für Regelungen.
- Kosten für Biodiversitäts-Schutz fallen sofort an, oft auf regionaler oder lokaler Ebene, während die Nutzen weit gestreut und in der Zukunft auftreten.



12 Staaten mit ökologischem Finanzausgleich in Brasilien (2008)



Basis:

Mehrwertsteuereinnahmen auf Landes-
ebene – Rückverteilung über Finanz-
zuweisungen an kommunale Ebene

Ökologische Indikatoren

- Naturschutzflächen
- Trinkwasserschutzgebiete
- Abfallentsorgung
- Abwasserentsorgung
- Brandrodungskontrolle
- Bodenschutz
- Lokale Umweltpolitik



Paraná: Zunahme der Schutzgebiete

Schutzgebiete	Bis 1991 [ha]	Ausgewiesen nach 1991 [ha]	Gesamt bis 2000 [ha]	Zunahme [%]
Öffentlich				
Bund	289.582	50.846	340.428	18
Land	39.859	13.804	53.663	35
Kommune	1.429	2.740	4.169	192
Privat/gemischt				
APA	306.693	905.631	1.212.324	295
RPPN	0	26.124	26.124	
Sonstige	0	53.607	53.607	
Gesamt	637.563	1.052.752	1.690.315	165

APAs ("Umweltschutzgebiete") können auf Bundes-, Landes- oder kommunaler Ebene ausgewiesen werden.
RPPNs (Private Schutzgebiete) können auf Bundes- oder Landesebene ausgewiesen werden.

May et al. 2002, Ring 2008b





Payments for ecosystem services: Costa Rica

National level: 4 options: forest, carbon, biodiversity and landscape beauty.

- Forest conservation continues only if payments continue
- Problematic: high dependence on fuel tax
- Better: connecting PES to water tariffs
- Expected PES:
 - US\$ 5 Mio./year for water
 - US\$ 1 Mio./year for carbon
- Missing: Long-term funding for biodiversity
 - Biodiversity Conservation Trust Fund
- (Fondo para la Biodiversidad Sostenible, FBS)

(Pagiola 2007)



TEEB – Vision

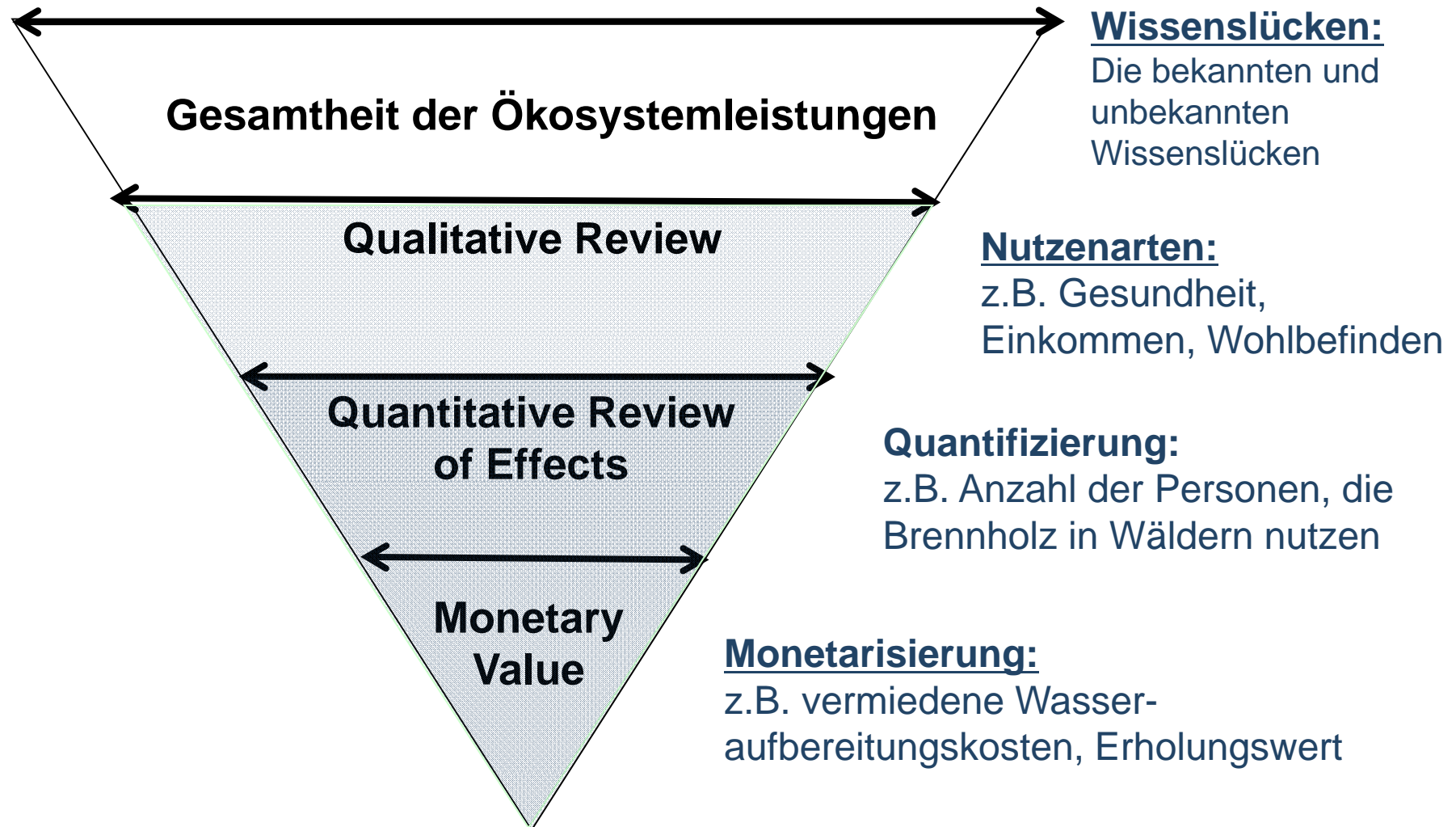
“Die Gesellschaft muss dringend ihren mangelhaften ökonomischen Kompass ersetzen, damit sie nicht das menschliche Wohlergehen und die Gesundheit des Planeten durch die Unterbewertung und den dauerhaften Verlust von Ökosystemen und Biodiversität aufs Spiel setzt.“

Pavan Sukhdev, TEEB Studienleiter
29.5.2008, COP 9





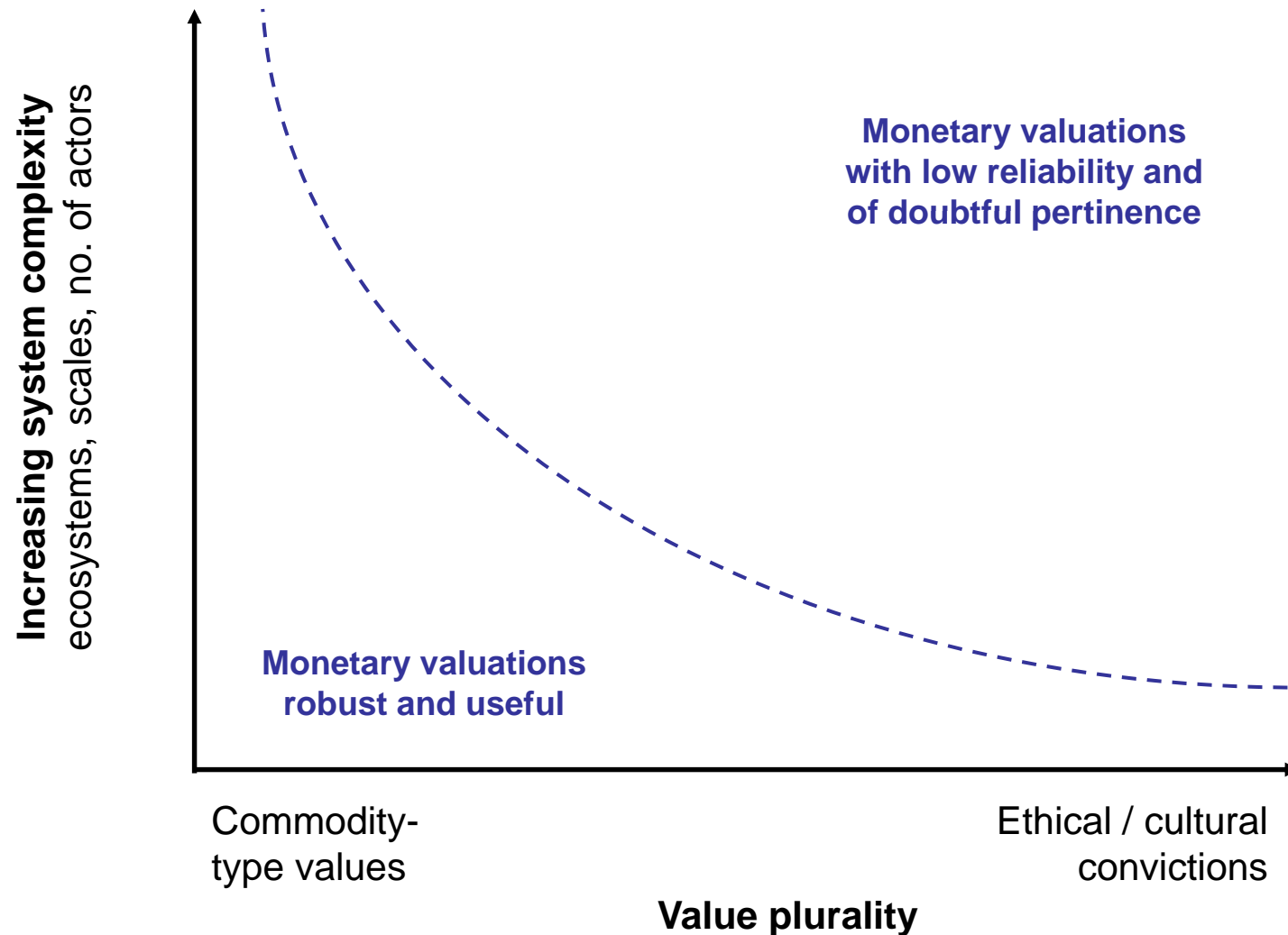
Verschiedene Ebenen der Analyse



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Die Eignung ökonomischer Bewertung zur Wertermittlung



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Yasuni : Internationale Zahlungen für ÖDL?

- Biodiversity Hotspot: 1 Hektar beherbergt mehr Arten als in ganz Nordamerika zusammen - 596 Vogelarten, 200 Säugetierarten, 150 Amphibienarten, 655 Baumarten, 100.000 Insektenarten (Bass et al. 2010)

Yasuni ITT Treuhandfond

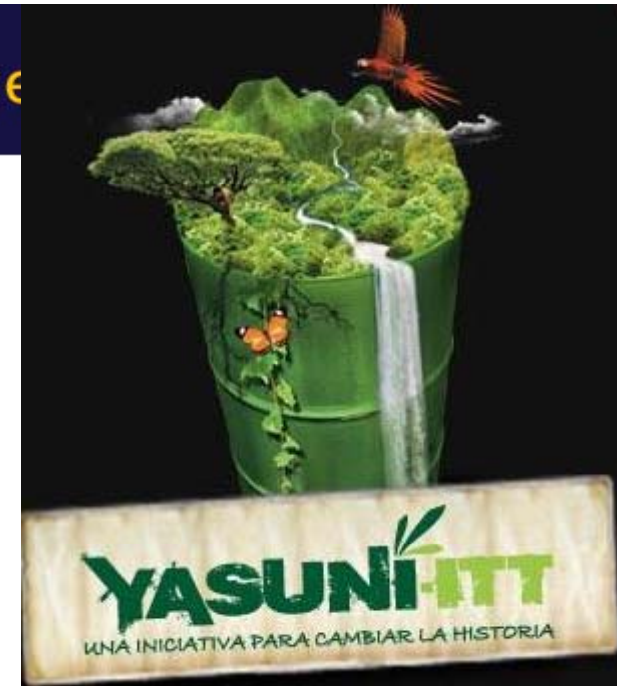
- 846 Mio. barrel Öl permanent unter der Erde lassen
- 407 Mio. t CO2 Emissionen könnten vermieden werden
- 20% Ecuadors unter Schutz
- Erhalt der Lebensgrundlage der indigenen Bevölkerung

Forderung von Ecuador:

- 50 % der verlorenen Öl-Einnahmen ersetzen (= US\$ 3.6 Milliarden über 13 Jahre)
- US\$ 100 Millionen bis Dezember 2011

Leistung von Ecuador:

- Erhalt von globalen Gütern (Biodiversität, Klimaschutz, etc.)



http://amerika21.de/files/a21/imagecache/bild_voll/img/archiv/gysi-936464-yasuni.jpg

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Capital Fund Window (eingezahlt von Geberländern)

- Finanzierung von erneuerbare Energieprojekten

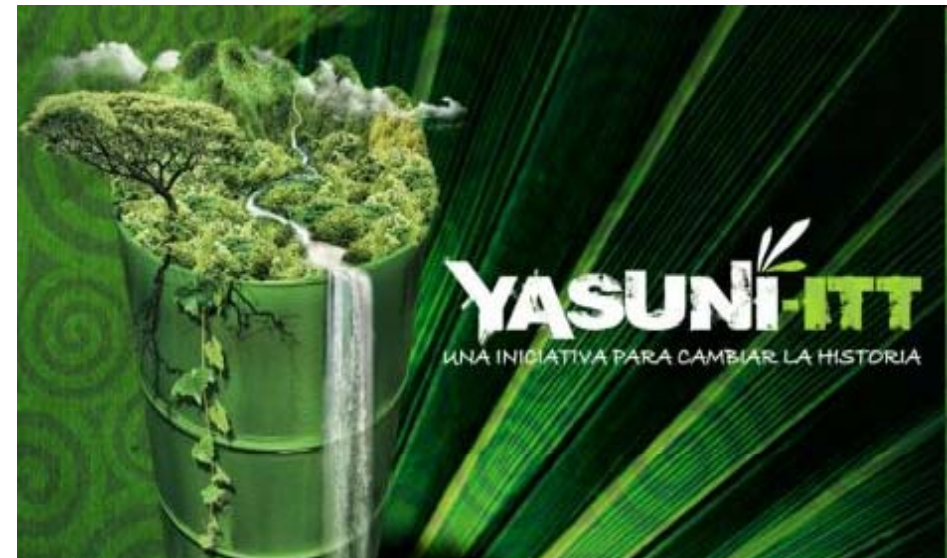
Revenue Fund Window (Einnahmen aus erneuerbarer Energie)

- Für Entwicklungsprojekte (Waldschutz, soziale Projekte, Gesundheitsversorgung, Bildung, Energieeffizienz, Forschung)
- Beide Fonds von UNDP verwaltet
- Komitee: 3 Regierungsvertreter Ecuador, 2 Geberländer, 1 Repräsentant der Zivilgesellschaft

Emissionshandel

- Yasuni Gurantee Certificates (YGCs)
- Werden mit Geldern aus dem Capital Fond ersetzt im Fall in Zukunft doch Öl gefördert wird

Source: UNDP (<http://mdtf.undp.org/yasuni>)



Source: http://yasuni-itt.gob.ec/files/2010/09/yasuni_cr.jpg



Counting Carbon in the Amazon

- Greg Asner (Stanford) in Peru: remote sensing with airborne laser
- Exact estimate of biomass, including lower forest strata not visible in Landsat satellite images
- Preliminary conclusion for Amazon: Degradation has a 20 times higher carbon footprint than deforestation rates
(Tollefson, Nature Vol 461, 2009)





Risiken

- Emissionszertifikate erlauben Industrie in anderen Gebieten zu emittieren (kein wirklicher Klimaschutz)
- Wasserkraftwerke können auch negativen Einfluss haben (Emissionen und Flächenverbrauch)
- Finanzierung der Entwicklungsprojekte kommen erst wenn erneuerbare Energien Einnahmen generieren (kann Jahre dauern)
- Unklarheit im Fall doch Öl gebohrt wird: werden auch alle Zertifikate aus dem Kapital Fond ersetzt?
- Leakage möglich: neben Yasuni gibt es weitere Ölfelder wo Förderung erhöht werden könnten.

(Präzedenzfall für Zahlung für Unterlassung auch in anderen Ländern (z.B. Golfstaaten)?)

Source: Finer and Martin, Mongabay 2010,
http://news.mongabay.com/2010/0913-yasuni_ITT_finer-martin.html



Auswirkungen des ökologischen Finanzausgleichs auf die kommunalen Einnahmen

Paraná:

- Piraquara (100% TWSG + Naturschutzgebiete): kommunale Einnahmen steigen um 84% bis 1995
- São Jorge do Patrocínio (52% Naturschutzgebiete): 71% der Finanzausweisungen aus der MwSt. gehen auf Schutzgebiete zurück (2000)

Minas Gerais:

- Marliéria (55% Schutzgebiete): 68% der Finanzausweisungen aus der MwSt. (ICMS) gehen auf Schutzgebiete zurück; Steigerung der Zuweisungen von 36.648 BRL (1995 vor ICMS-Ecológico) auf 811.335 BRL (1996 nach Einführung der ökologischen ICMS)

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TEEB is ...

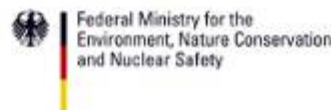
- A rapidly evolving multi-donor initiative, 2007-2010, hosted by UNEP, to explore economic perspectives on nature
- An “Open Architecture” project... over 500 contributors across partner institutions, universities, individuals..
- Maker of “Global Public Goods”: the TEEB Report suite
- Catalyst of Change within Society: Economics, Accounts, Philosophy
- With a focus on policy advice



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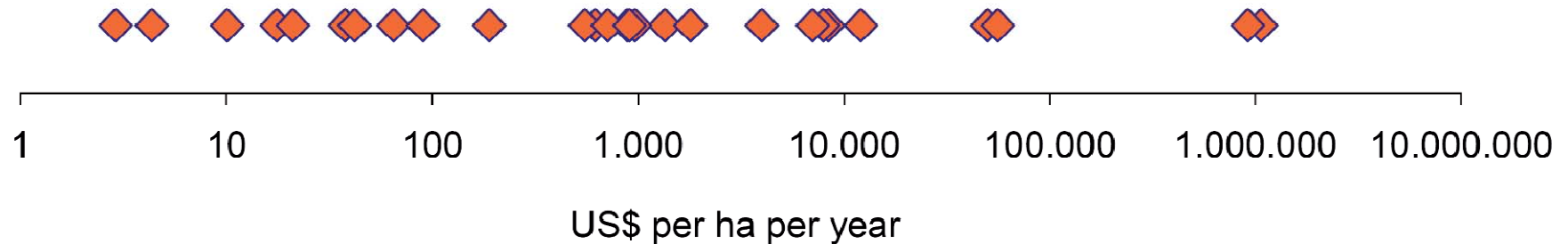
Rijksoverheid





Wieviel ist ein Hektar Korallenriff für Tourismus wert?

The range of the value of coral reefs for tourism





Caveats

for employing valuation results in conservation politics

Contexts of poor governance,
high inequality and
conflicting understandings of
nature

Stirring appetites: Can we
control the future use of
valuation results disclosing
potential market value?

PES: Demanding requirements
on the ground



„Relax, we're from Conservation, Inc. ...“ (Chapin 2004)

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Market-based conservation schemes: highly demanding requirements

„It is often argued that environmental services markets will be effective and equitable:

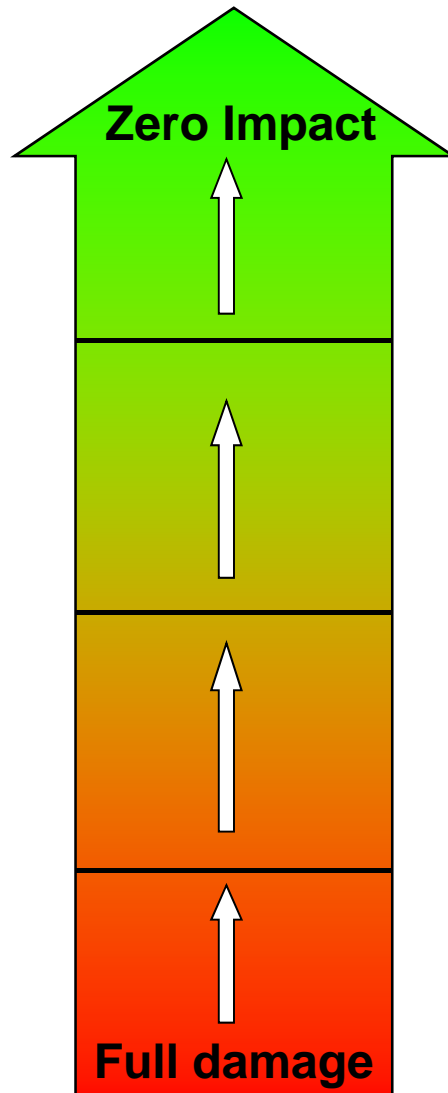
1. If all ecosystem values are properly accounted for
2. If rights are equitably distributed amongst the proper “owners”
3. If the market is properly regulated and those regulations are effectively enforced
4. If there is a level playing field, so that biodiversity producers and consumers can all participate equitably

However, in reality most of these conditions simply do not exist“





„Combination matters“ – Policy Mixes



Environmental policy ‘over shooting’

- costs of regulation exceeding benefits (inefficient from an economic perspective)
- residual damage costs borne by society

Environmental policy based on policy mix

- incentive-based regulation to meet targets beyond standards (subsidies, payments, taxes, permits)
- additional costs of attainment borne by resource user (taxes, permits) or by society (subsidies, payments)

Environmental policy based on regulation

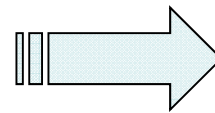
- standard-setting to avoid hazardous damages
- costs of attainment borne by resource user, remaining environmental costs borne by society

No environmental policy

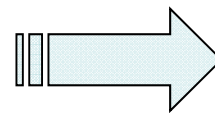
- no regulation (or only self-regulation by user to avoid self-damaging practices)
- environmental costs borne by society



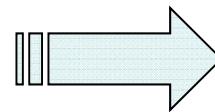
TEEB Climate Issues Update – Sachstandsbericht zur Klimaproblematik



Notstand der Korallenriffe



**Waldkohlenstoff zur
Abschwächung der
Klimaänderungen**



**Ökosysteminvestitionen
zur Anpassung an den
Klimawandel**



Bewertung von Korallenriffen

Table 1: Benefits from ecosystem services in coral reef ecosystems

CORAL REEFS	Value of ecosystem services (in US\$ / ha / year – 2007 values)		
	Average	Maximum	Number of Studies
Ecosystem Service			
Provisioning services			
Food	470	3,818	22
Raw materials	400	1,990	5
Ornamental resources	264	347	3
Regulating services			
Climate regulation	648	648	3
Moderation of extreme events	25,200	34,408	9
Waste treatment / water purification	42	81	2
Biological control	4	7	2
Cultural Services			
Aesthetic information / Amenity	7,425	27,484	4
Opportunities for recreation and tourism	79,099	1,063,946	29
Information for cognitive development	2,154	6,461	4
Total	115,704	1,139,190	83
Supporting Services			
Maintenance of genetic diversity	13,541	57,133	7

Note: these estimates are based on ongoing analyses for TEEB. As the TEEB data base and value-analysis are still under development, this table is for illustrative purposes only.



Ökonomische Bewertung von Korallenriffen und die Rolle von Grenzwerten...

- Die Leistungen von Korallenriffen weisen hohe ökonomische Werte je Hektar auf: Globale Bewertungsstudien veranschlagen Werte bis zu 172 Mrd. US\$ je Jahr
- Allerdings.... befinden sich Korallenriffe an der Schwelle irreversibler Veränderungen
- “Die Ökonomie stellt lediglich die Werkzeuge zur Verfügung – letztlich geht es um ethische Entscheidungen“
CO₂ Stabilisierungsziele als ethische Entscheidung ...
 - 450 ppm CO₂ zur Erreichung des 2-Grad Ziels in der Klimapolitik
 - 350 ppm CO₂ für ein langfristiges Überleben der Korallenriffe

The Economics of Ecosystems & Biodiversity



Referenzen Yasuni:

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- Mongabay: http://news.mongabay.com/2010/0913-yasuni_ITT_finer-martin.html
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- Finer et al. 2009 Ecuador's Yasuní Biosphere Reserve: a brief modern history and conservation challenges. Conservation Letters. <http://iopscience.iop.org/1748-9326/4/3/034005/fulltext>
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Finanzausgleich:

Ein bekanntes Instrument **ökologisch** neu eingesetzt

1. Internationale Transfers (IPES)

z.B. Indonesien: Wichtige Rolle lokaler Gebietskörperschaften für den Tropenwaldschutz. Notwendigkeit, internationale und nationale Finanzierungsmechanismen des Waldschutzes (REDD+) mit Finanzausweisungen an die kommunale Ebene zu verbinden.

2. Nationale Ebene

z.B. Portugal, neues Kommunalfinanzierungsgesetz seit Jan. 2007: Natura 2000 und andere Schutzgebiete als Indikatoren für Finanzausweisungen von der nationalen an die kommunale Ebene.

3. Regionale Ebene (Länder, Provinzen,...)

z.B. ökologischer Finanzausgleich in Brasilien: Schutzgebiete als Indikator für Finanzausweisungen von der Landesebene an die Kommunen.



“Das volle Blatt spielen” – die verschiedenen “Farben” des Kohlenstoffs

Brauner Kohlenstoff

CO₂ Emissionen
aus anthropogener
Energienutzung und
Industriequellen

Grüner Kohlenstoff

gespeichert in
terrestrischen
Ökosystemen,
Wäldern, Böden...

Blauer Kohlenstoff

55% des Kohlen-
stoffs der Lebe-
wesen ist in den
Meeren gespeichert

- **Stoppen** wir den **Verlust** des “**grünen**” und “**blauen**” Kohlenstoffes, könnten wir bis zu 25% der Gesamt-Treibhausgasemissionen vermeiden
- Dies brächte „nebenbei“ einen großen Nutzen für die **Biodiversität**, die **Nahrungssicherheit** und die Erhaltung der **Lebensgrundlagen** insbesondere der armen Bevölkerungsteile auf der Erde
(IPCC 2007, Nellemann et al. in press)