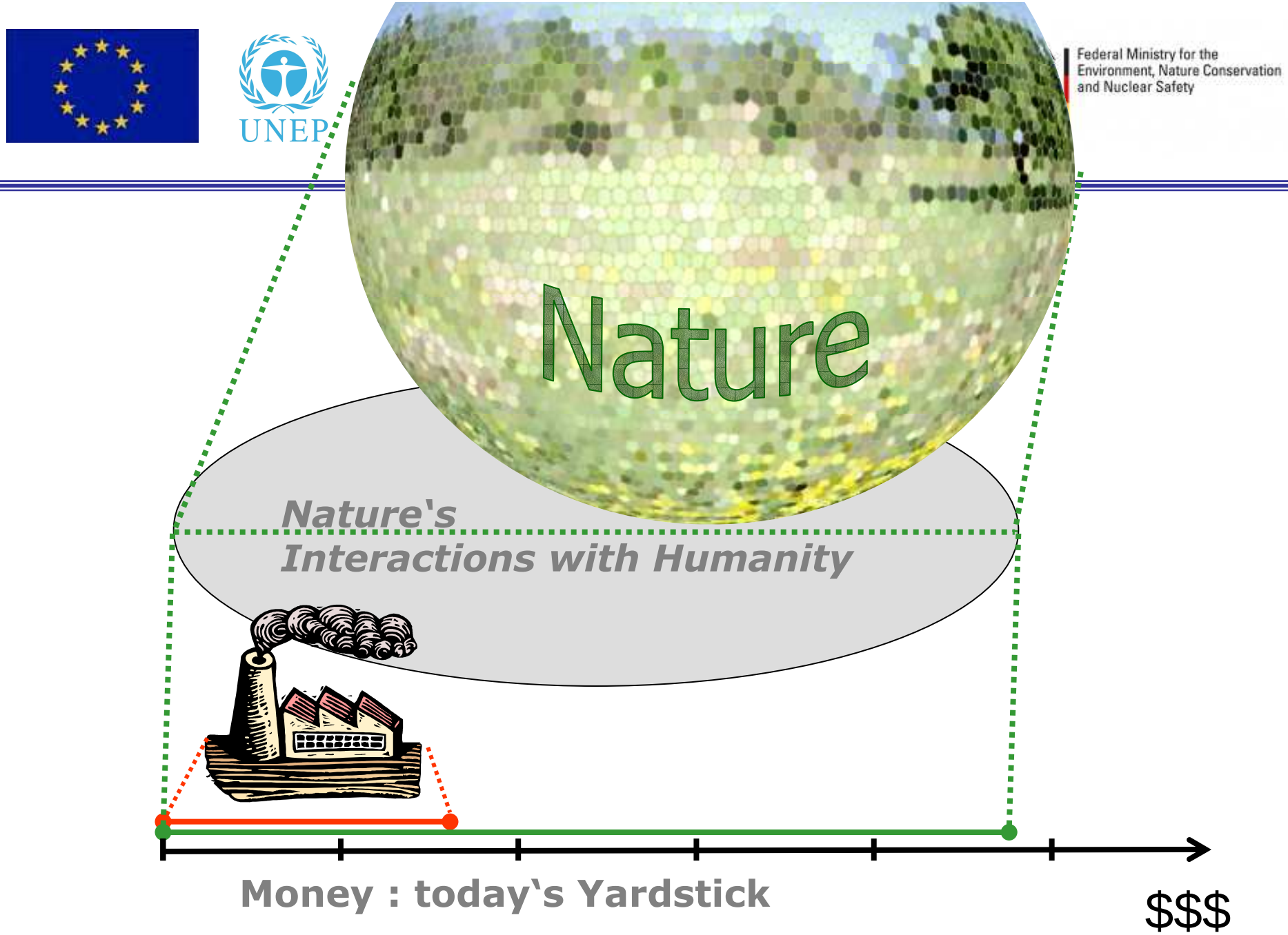
23rd Oct 2009
UNEP-FI
Cape Town

TEEB

Pavan Sukhdev
Study Leader, TEEB



Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Photo: C.Neßhöver, UFZ

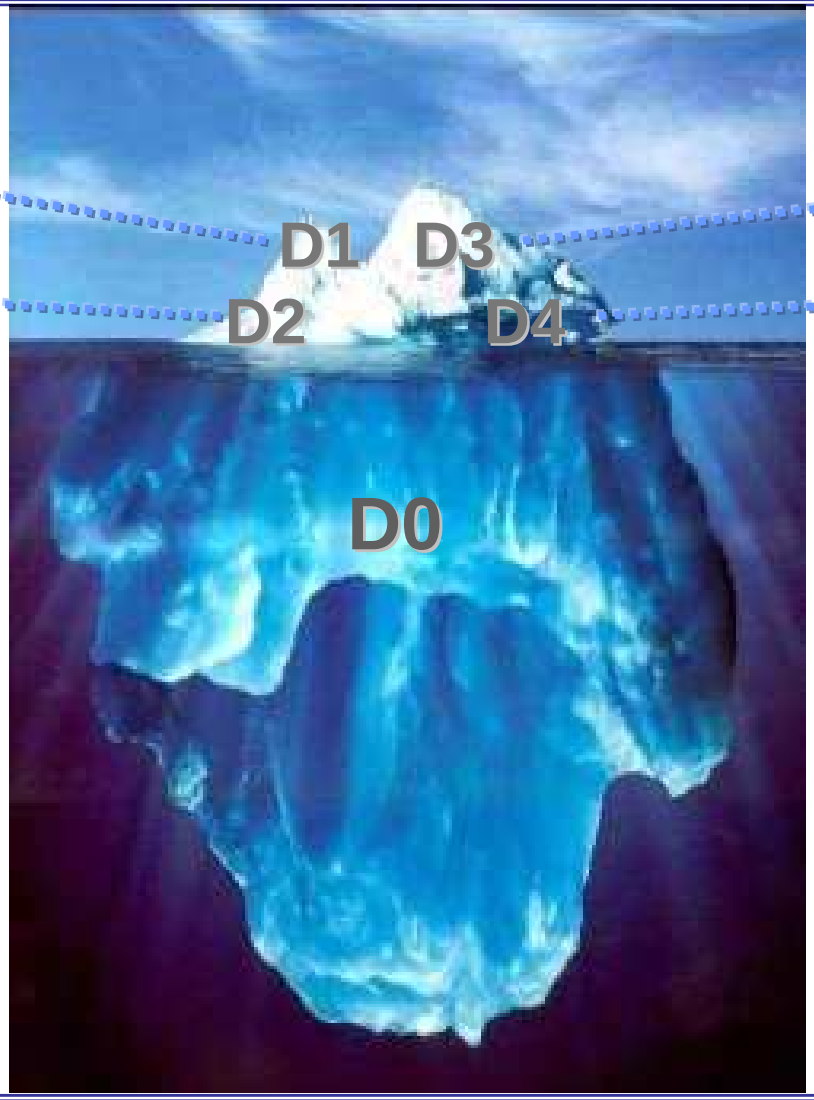
TEEB – Final Reports
Nov 2009 – August 2010

- Science & Economics Foundations, Policy Costs, & Costs of Inaction
- Policy Evaluation for Policy-Makers
- Decision Support for Administrators
- Business Risks & Opportunities
- Citizen & Consumer Ownership

TEEB Outreach
Role of "D0"...

Policy-Makers..

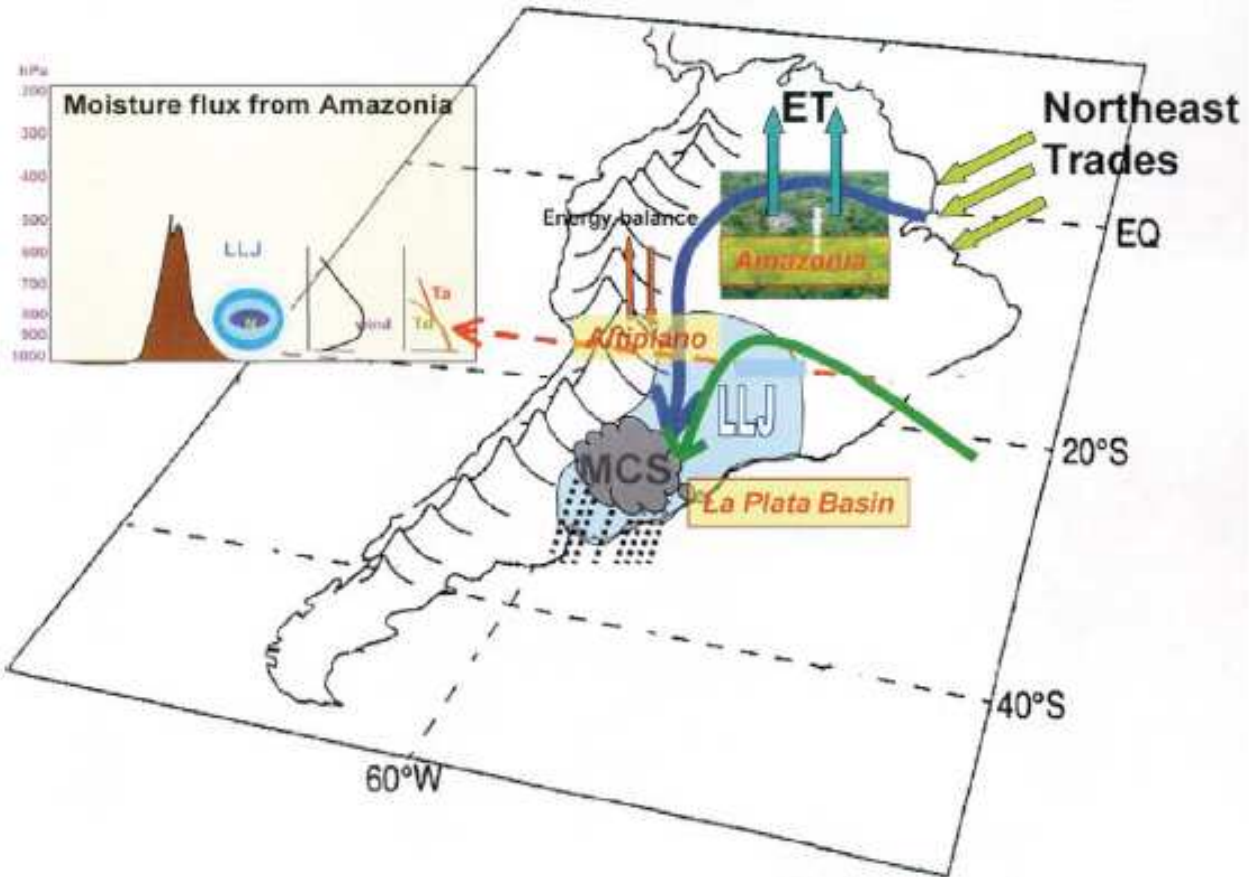
Administrators..



Businesses..

Citizens..

Amazon Water Pump : Regional IPES ?



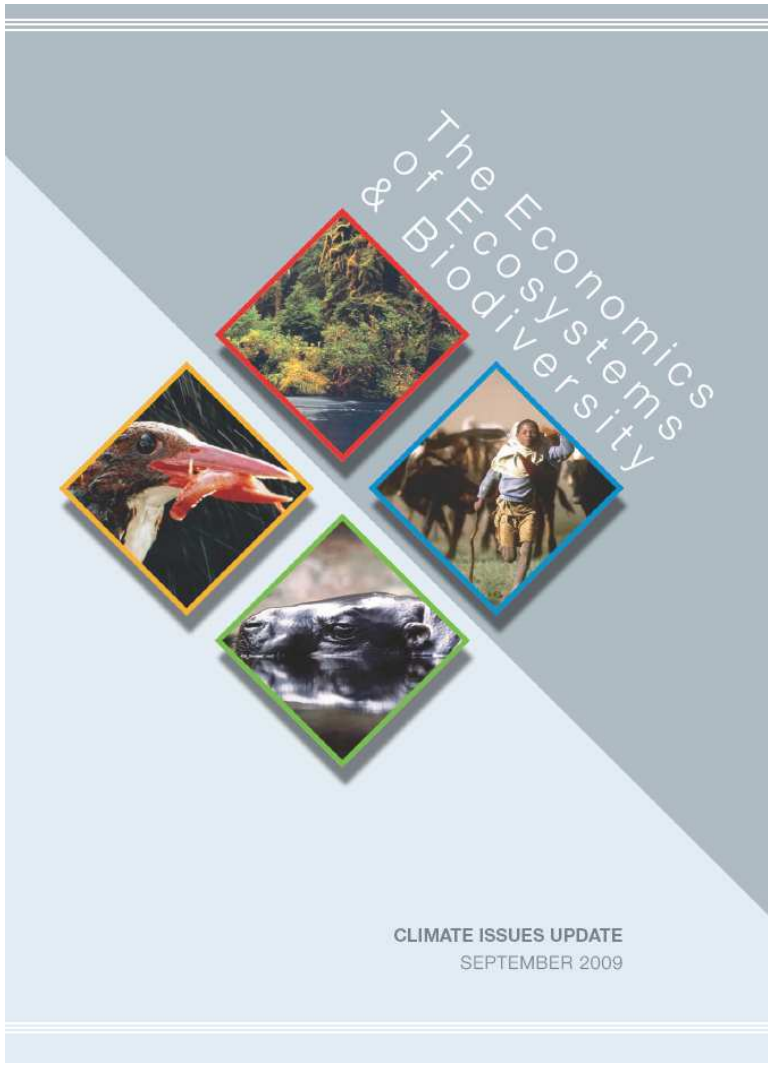
Marengo et al. 2004, Journal of Climate

Amazon Rainforest "Water Pump"

Evapo-transpiration puts 20 billion tonnes of water into the atmosphere daily, some of which falls as rain in the Rio Plata Basin…

(Global Canopy Programme & Canopy Capital Ltd, 2008)

TEEB - Climate Issues Update



- Coral reef emergency
- **Forest carbon for climate mitigation**
- National accounting for forest carbon
- Ecosystem investment for climate adaptation

The Colours of Carbon

Brown Carbon

CO_2 emissions from energy use and industry

Blue Carbon

55% of all carbon in living organisms is stored in oceans

Green Carbon

carbon stored in terrestrial ecosystems, including tropical forests

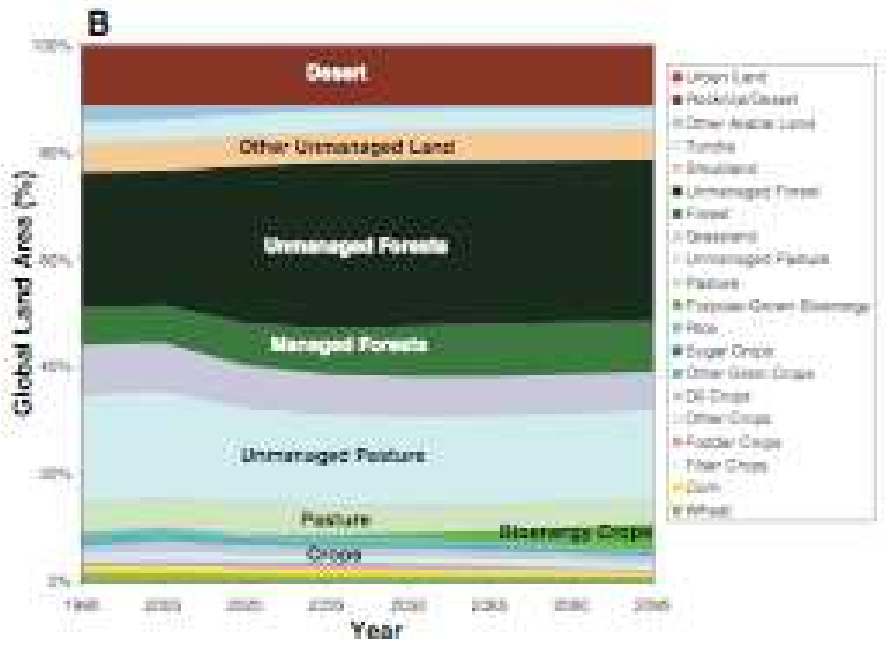
Black Carbon

Carbon (soot) emitted by inefficient wood & coal burning

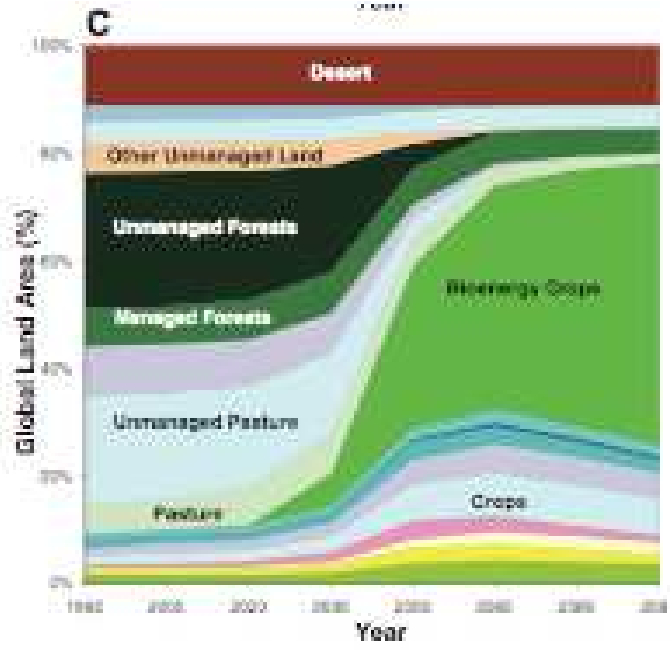
Halting the **loss** of **"green"** and **"blue"** carbon could mitigate as much as 25% of total GHG emissions, with co-benefits for **biodiversity, food & water security, and livelihoods** (IPCC 2007, Nellemann et al. in press)

Why "Brown Carbon Only" Regime Is Not an Option…

(B) Land use under a pathway defined to achieve a CO2 concentration target of 450 ppm, which limits fossil fuel, industrial, and terrestrial carbon emissions with a common carbon tax on emissions.



(C) Land use along the corresponding scenario in which only fossil fuel and industrial emissions are controlled to achieve the same 450-ppm CO2 concentration

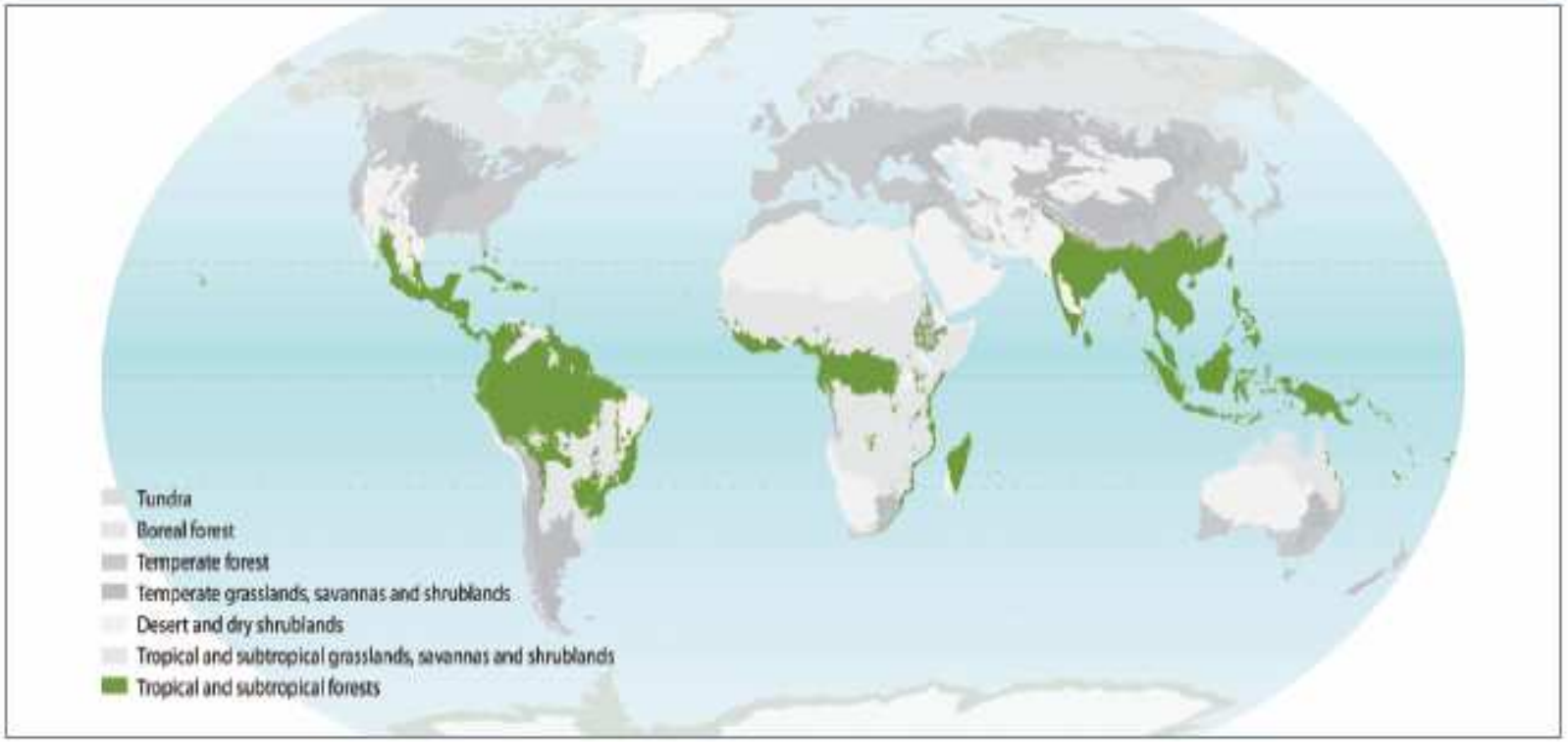


Source : M. Wise et al, SCIENCE, VOL 324 29 MAY 2009

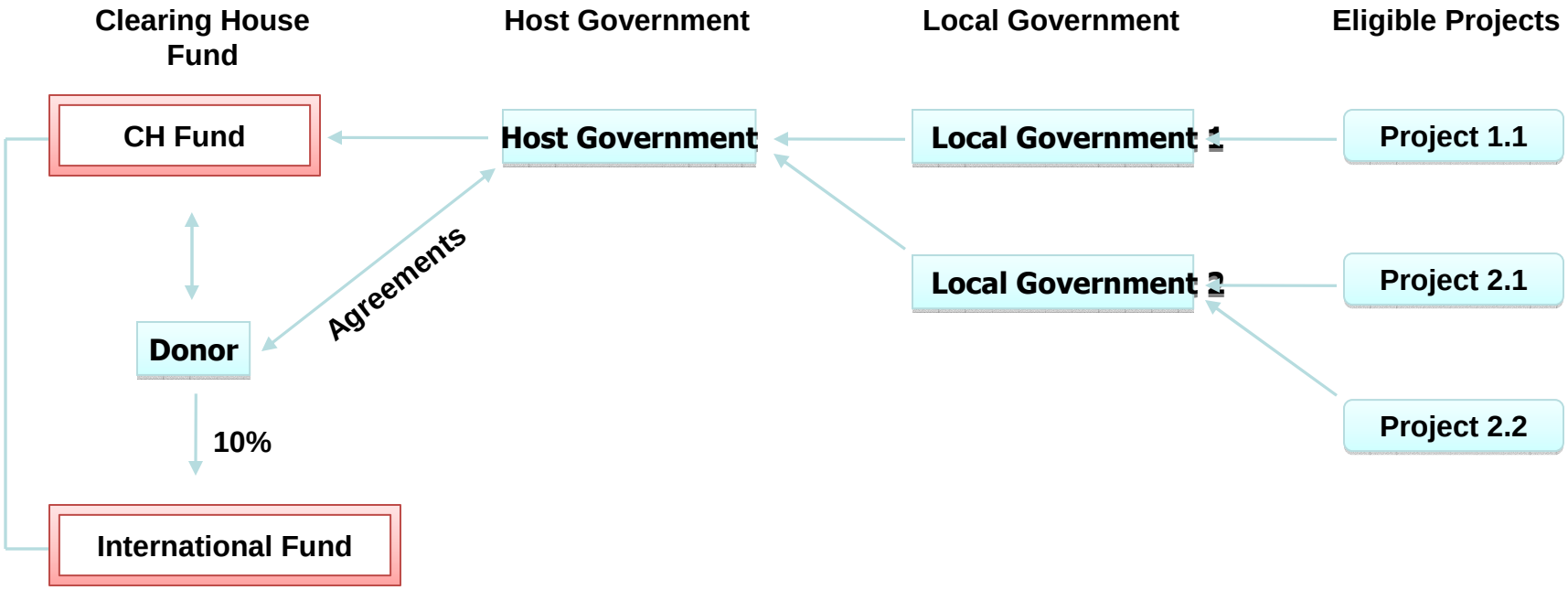
Tropical Forests of the World…. Largest Terrestrial Carbon Sinks

- store a fourth of all terrestrial carbon (Trumper et al, 2009)
- capture up to 4.8 Gt CO2 annually (Lewis & White, 2009)

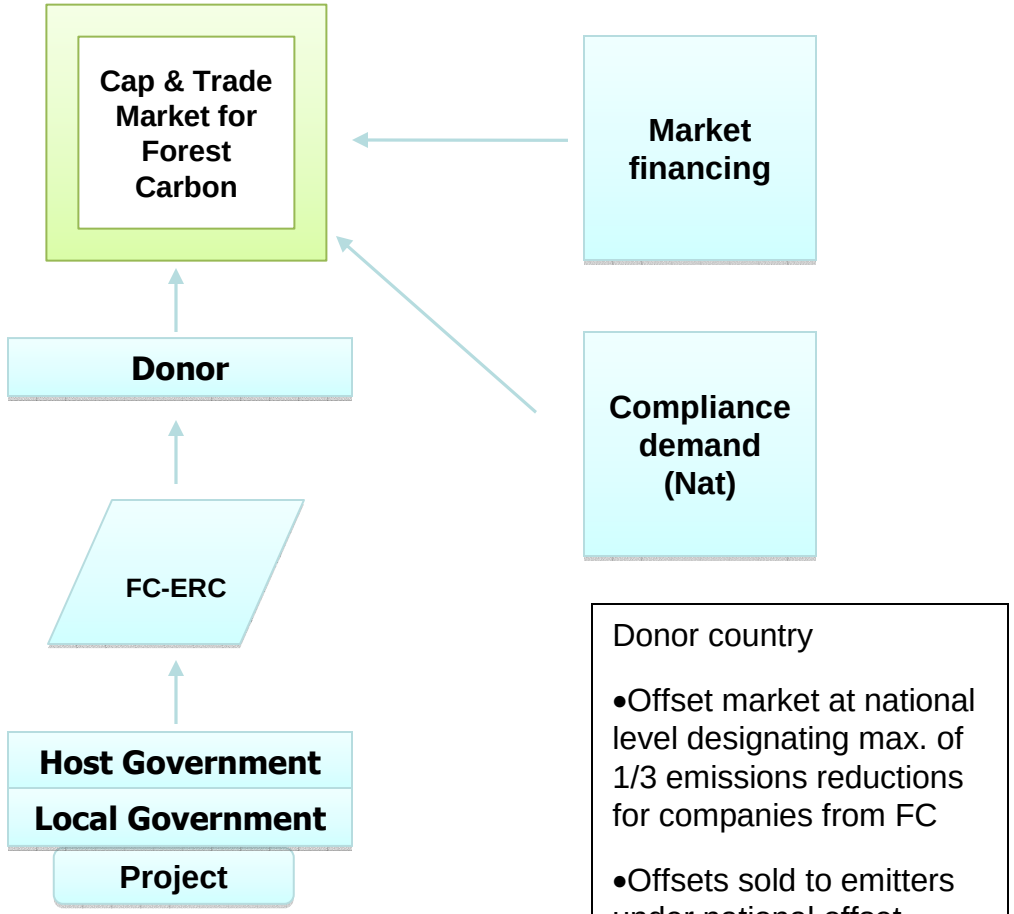
Figure 2: Geographical distribution of tropical forests *Source: adapted from Olson et al., 2001.*



Phase 2 : "Sell" side - from the project to host country level



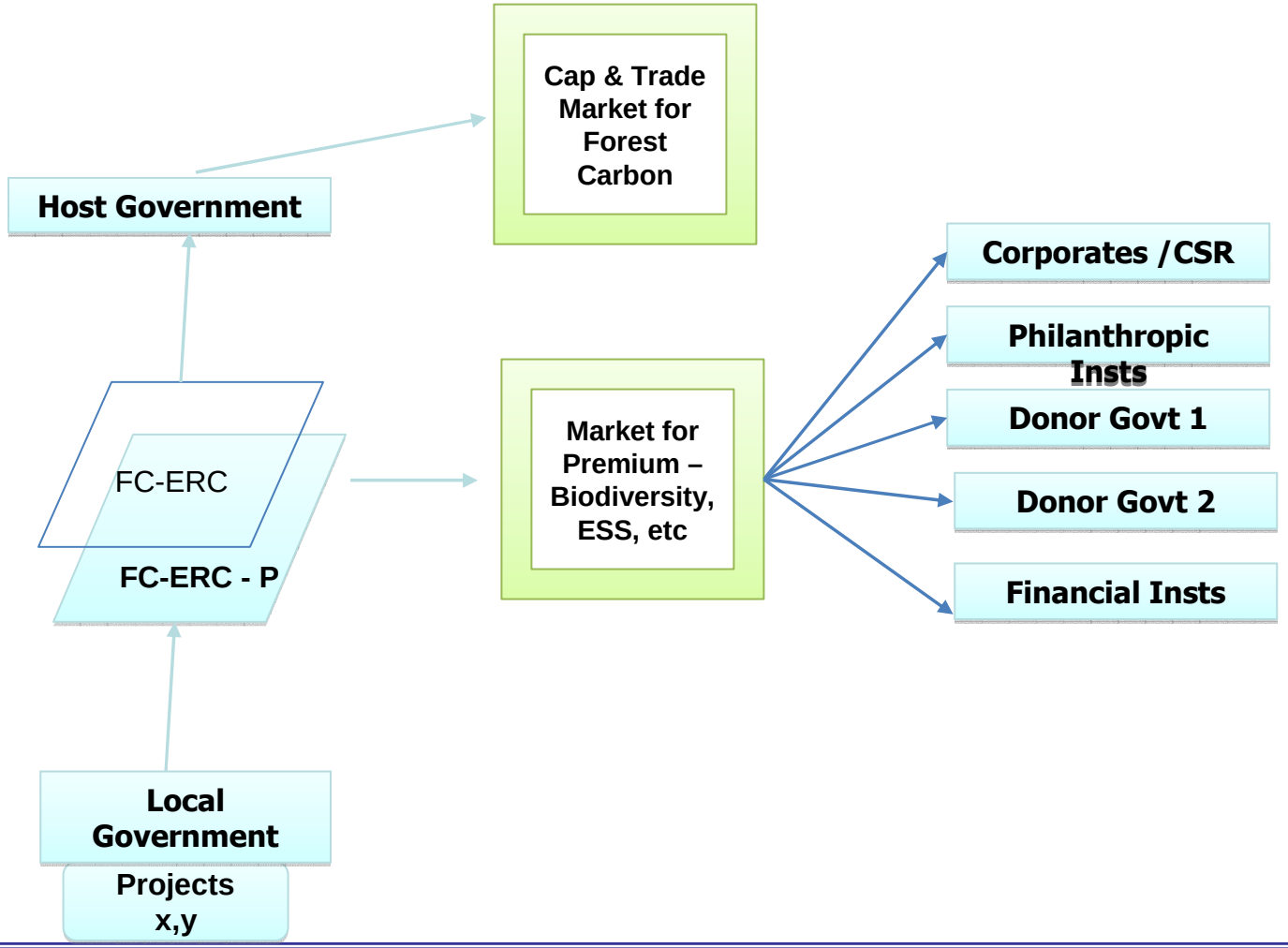
Phase 3 : FC-ERCs in the Compliance Market



Donor country

- Offset market at national level designating max. of 1/3 emissions reductions for companies from FC
- Offsets sold to emitters under national offset strategy

Phase 3 : Adjunct Market for Premium FC-ERCs



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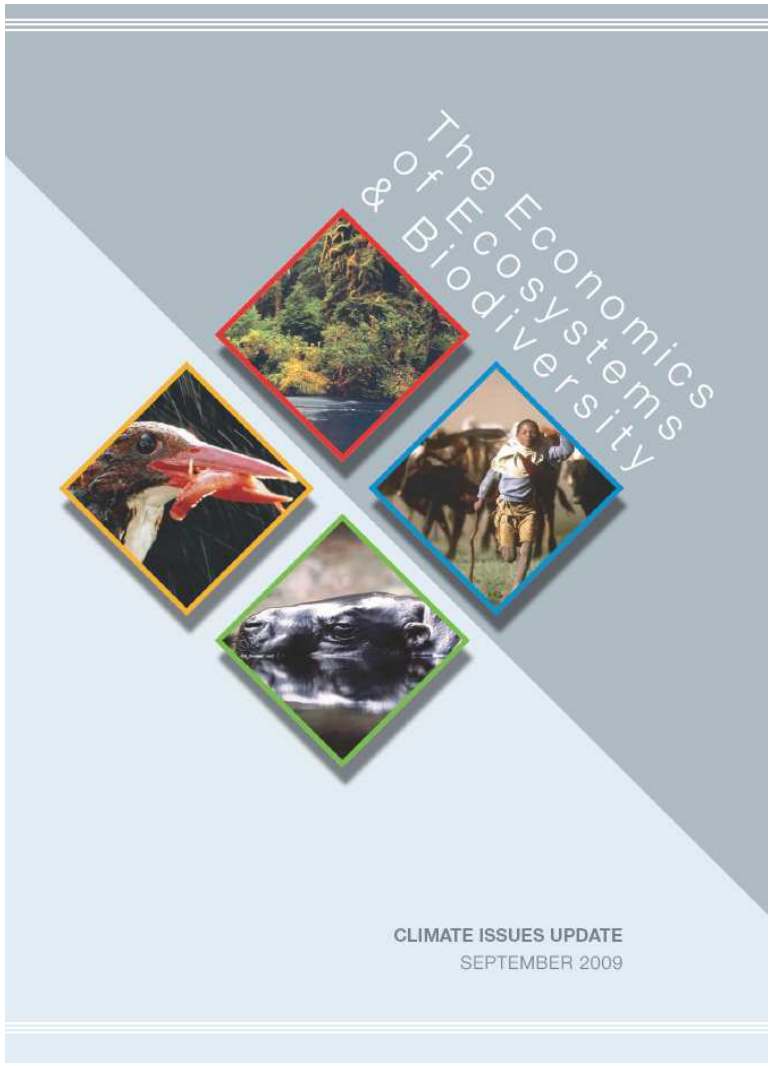

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ADAPTING TO THREE BIG CLIMATE IMPACTS

1. **Freshwater Scarcity :** Maintain and Restore Forests, Lakes, Wetlands

2. **Agricultural & Fisheries Productivity** : Forests for nutrients and freshwater flows, Mangroves and Coral reefs as fish nurseries, and small-scale natural buffers (forest and grassland patches) agricultural areas

3. **Natural Hazards :** Storm & Cyclone damage reduction through Coral reefs, mangrove forests ; flood and drought damage limitation through forest cover

Exceptional Returns from Ecosystem Restoration...

Table 3: Estimates of costs and benefits of restoration projects in different biomes

	Biome/Ecosystem	Typical cost of restoration (high scenario)	Estimated annual benefits from restoration (avg. scenario)	Net present value of benefits over 40 years	Internal rate of return	Benefit/cost ratio
		US$/ha	US$/ha	US$/ha	%	Ratio
1	Coral reefs	542,500	129,200	1,166,000	7%	2,8
2	Coastal	232,700	73,900	935,400	11%	4.4
3	Mangroves	2,880	4,290	86,900	40%	26.4
4	Inland wetlands	33,000	14,200	171,300	12%	5.4
5	Lakes/rivers	4,000	3,800	69,700	27%	15.5
6	Tropical forests	3,450	7,000	148,700	50%	37.3
7	Other forests	2,390	1,620	26,300	20%	10.3
8	Woodland/shrubland	990	1,571	32,180	42%	28.4
9	Grasslands	260	1,010	22,600	79%	75.1

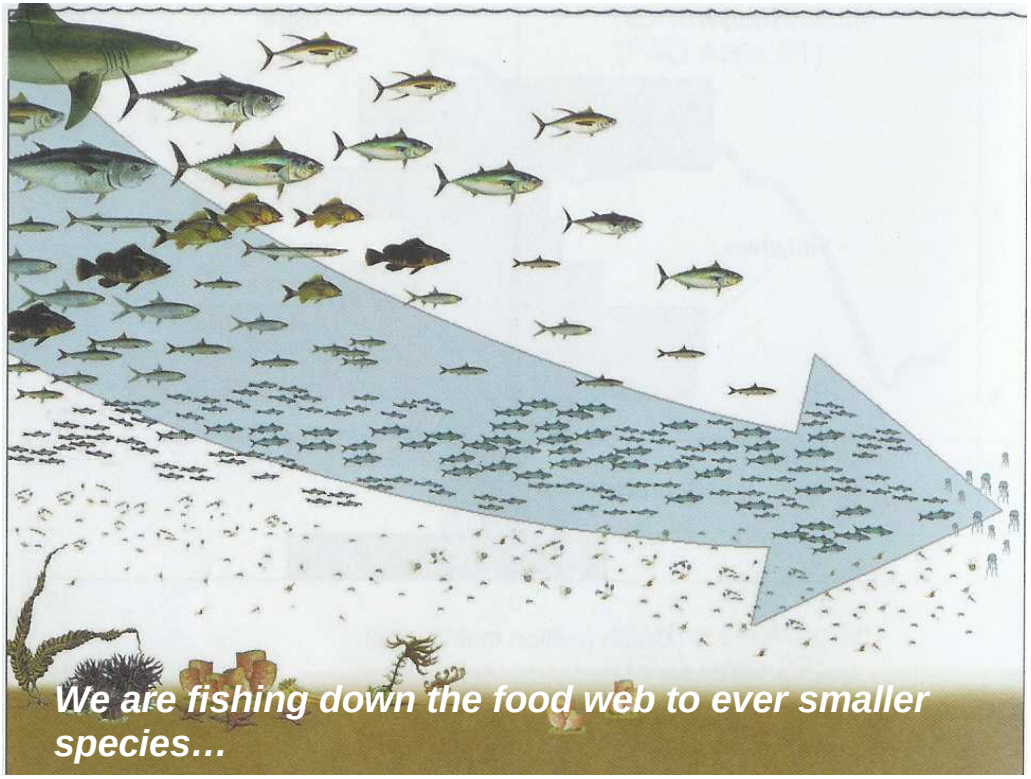
Note: Costs are based on an analysis of appropriate case studies; benefits have been calculated using a benefit transfer approach. The time horizon for the benefit calculation are 40 years (consistent with our scenario analysis horizon to 2050); Discount rate = 1%, and discount rate sensitivity by flexing to 4%, consistent with TEEB 2008). All estimates are based on ongoing analyses for TEEB (see chapter 7 TEEB D0 forthcoming). As the TEEB data base and value-analysis are still under development, this table is for illustrative purposes only.

Sensitivity Analysis.... 5 key parameters

	Ecosystem	Typical cost	Avg. benefit	NPV	IRR	BCR
	Coral	542,497	129,245	1,165,988	7%	2.8
	Coastal	232,674	73,852	935,379	11%	4.4
	Mangroves	2,876	4,346	88,297	40%	26.8
	Inland wetlands	33,007	14,245	171,296	12%	5.4
	Lakes / rivers	4,032	3,803	69,687	27%	15.5
	Tropical forest	3,448	7,022	148,675	50%	37.3
	Temperate forests	2,387	1,618	26,273	20%	10.3
	Woodland / shrubland	987	4,343	97,696	85%	84.3
	Grasslands / rangelands	257	1,012	22,624	79%	75.1

	Ecosystem	Typical cost	Avg. benefit	NPV	IRR	BCR
	Tropical forest	**3,448**	**7,022**	**148,675**	**50%**	**37.3**
1	**Benefits peak @ 70%, instead of 80% of Generic**				**42%**	**31.5**
2	**Costs @ 100%, instead of 120% of Typical**				**57%**	**45.4**
3	**Maintenance Cost (10%) stops after 5 years**				**51%**	**40.0**
4	**Benefits flows accounted for 50 yrs, instead of 40**				**50%**	**45.4**
5	**Discount rate 4%, instead of 1%**				**50%**	**21.7**

Global Loss of Fisheries…
Human Welfare Impact

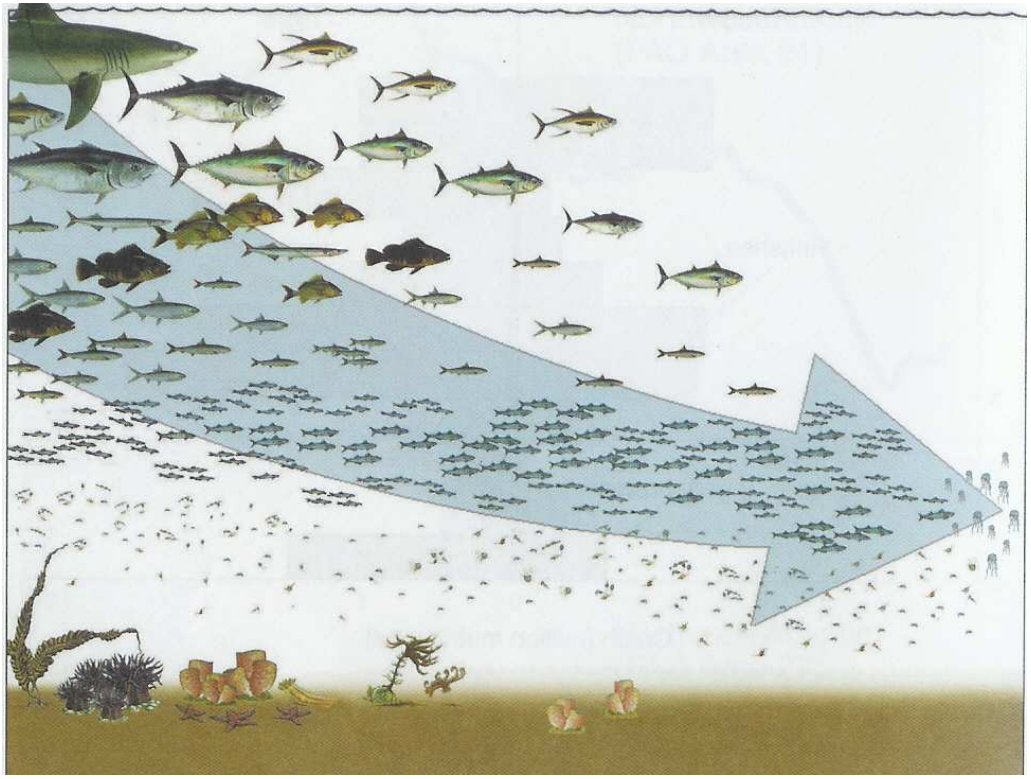


- ❑ **Open Access & Perverse Subsidies are key drivers of the loss of fisheries**
- ❑ **Half of wild marine fisheries are fully exploited, with a further quarter already over-exploited**
- ❑ ***at risk : $ 80-100 billion income from the sector***
- ❑ ***at risk : est. 27 million jobs***
- ❑ ***but most important of all…..***

at risk : Health … over a billion rely on fish as their main or sole source of animal protein, especially in developing countries.

Source: Ben ten Brink (MNP) presentation at the Workshop: ***The Economics of the Global Loss of Biological Diversity 5-6 March 2008, Brussels, Belgium. Original source: Pauly***

Global Loss of Fisheries… Is there a Solution ?



We are fishing down the food web to ever smaller species…

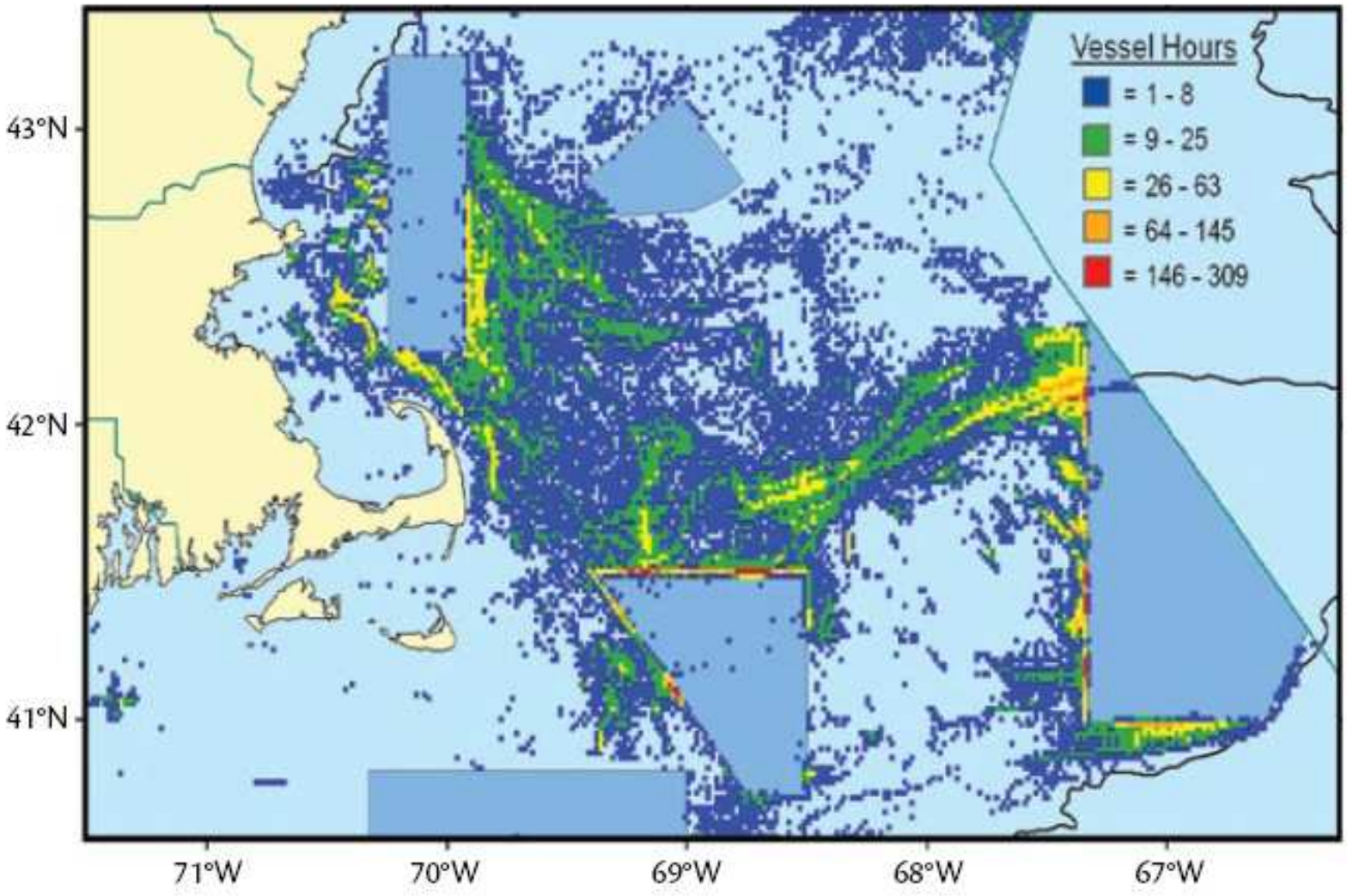
Is there evidence that reserves work ?

Reserves all over the world show dramatic increases in spawning stocks

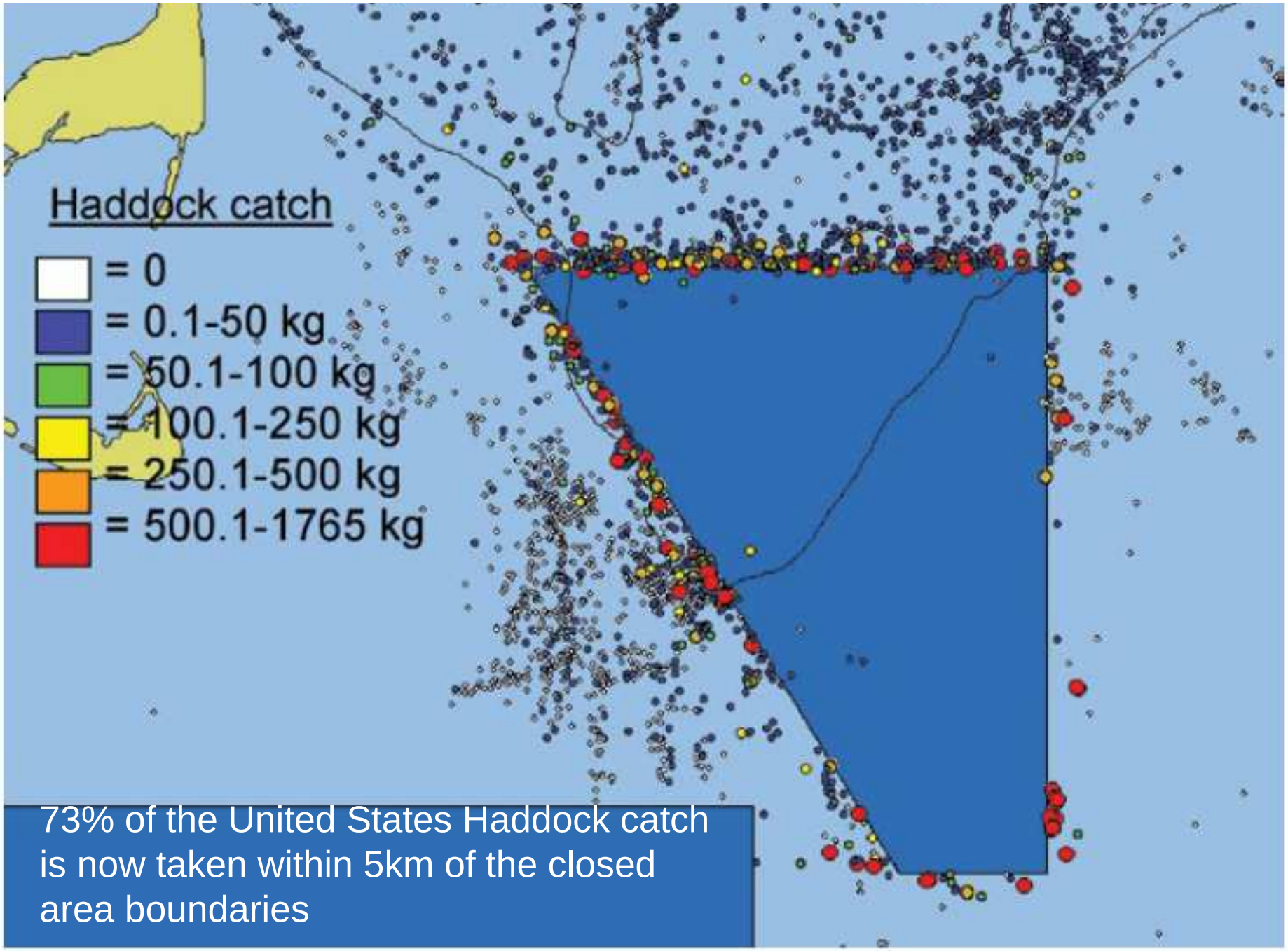
(Source : Prof. Callum Roberts, University of

An Economic Solution to Collapsing Fisheries ?

Eg : Georges Bank closed areas



Source: Fogarty et al. (2007)



Source: Fogarty et al. (2007)

Thank you !

Further information

www.teebweb.org

UNEP
United Nations Environment Programme

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

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Department for Environment Food and Rural Affairs

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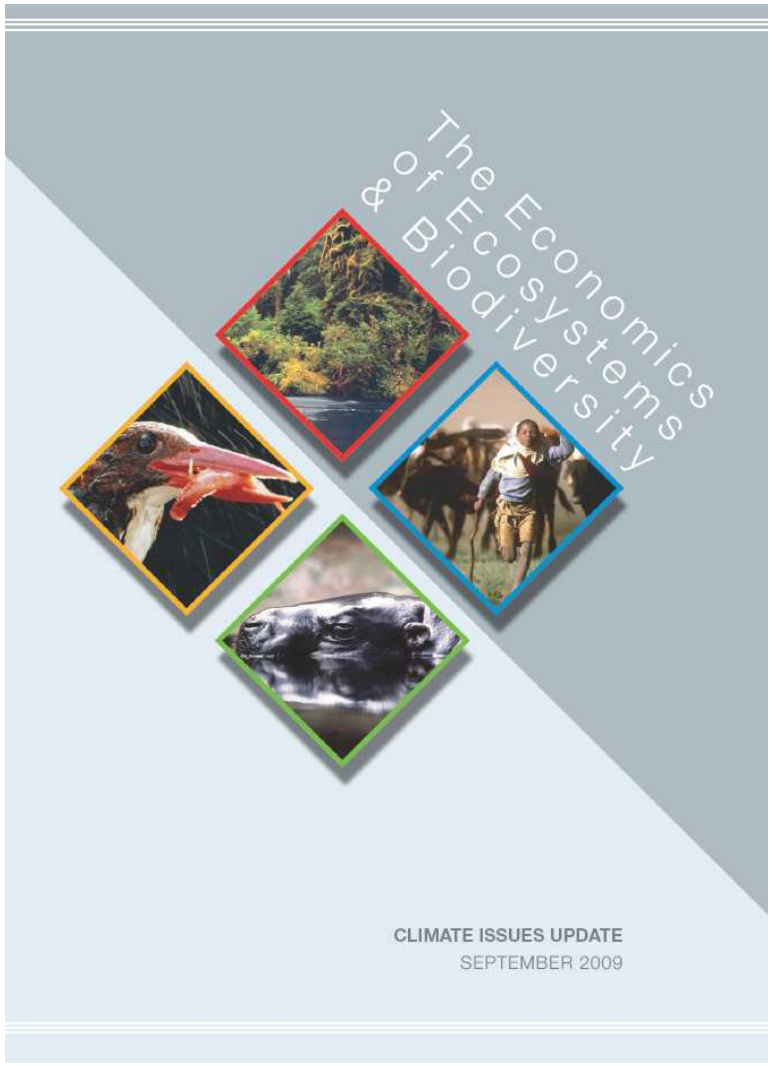

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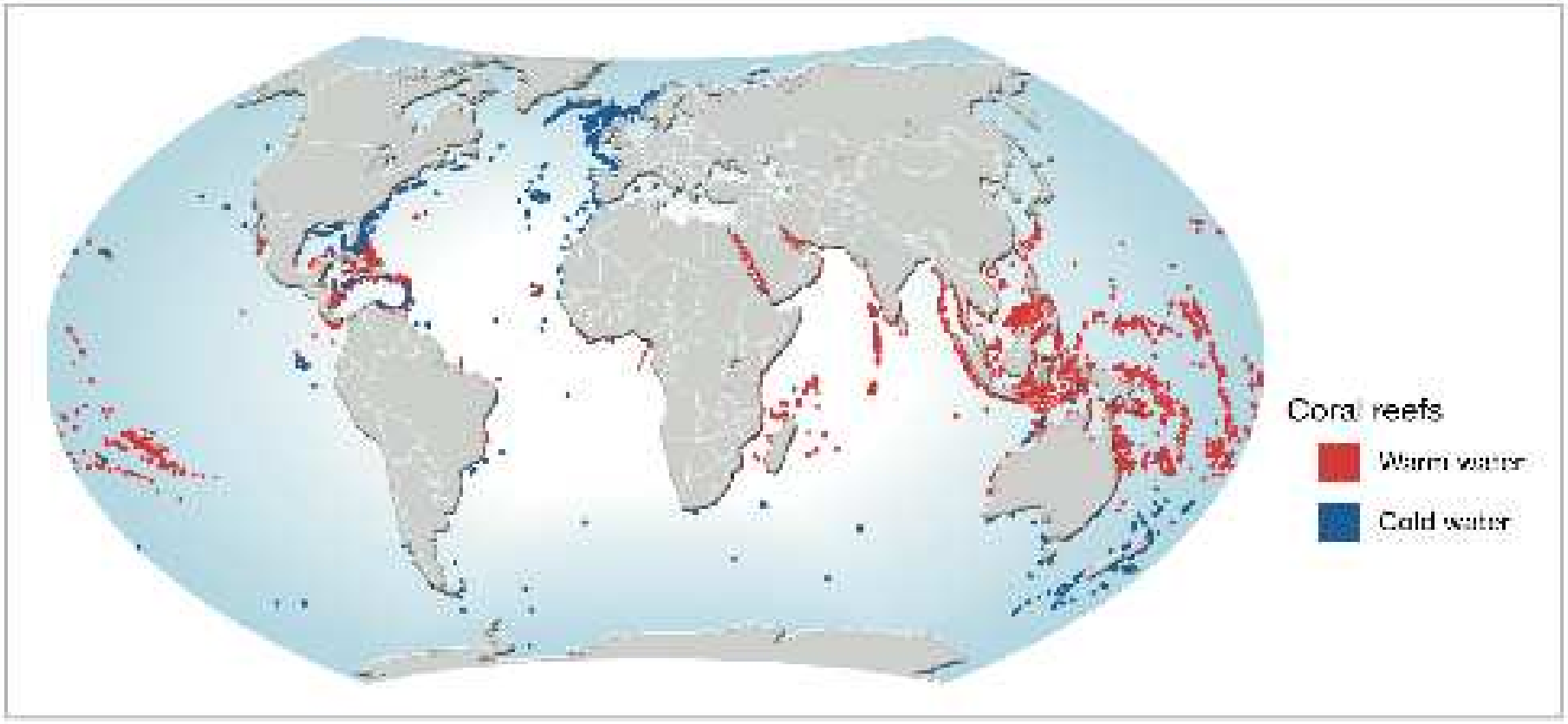
Coral Reefs…



Coral Reef valuations (from TEEB "D0" matrix)

CORAL REEFS	Value of ecosystem services (in US$ / ha / year – 2007 values)		
Ecosystem Service	**Average**	**Maximum**	**Number of Studies**
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

Table 1: Benefits from ecosystem services in coral reef ecosystems

Note: these estimates are based on ongoing analyses for TEEB (TEEB Ecological and Economic Foundations, Chapter 7). As the TEEB data base and value-analysis are still under development, this table is for illustrative purposes only.

WHAT WE THINK CORAL REEFS LOOK LIKE….

WHAT THEY ACTUALLY LOOK LIKE….

Coral Reef Valuations & Thresholds…

- Tropical Coral Reefs are at a threshold of irreversibility
- *"Economics is mere weaponry, its targets are ethical choices"*
- Ethical choice coming up : Stabilization targets …

  @ 450 ppm CO2

  Or

  @ 350 ppm CO2 ?

for Tropical Coral Reef survival in the long term….

Thank you !

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