

**UK Biodiversity Partnership**  
7-8 October, York University **Conference 2009**



**Pavan Sukhdev**  
Green Economy Initiative



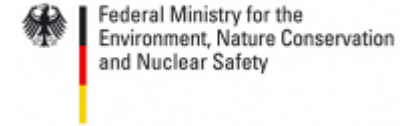
**8<sup>th</sup> Oct 2009**  
**DEFRA, York**

## **TEEB & Climate Issues - An Update**

**Pavan Sukhdev**  
**Study Leader, TEEB**



# About TEEB...



- An “Open Architecture” project... over 500 contributors across partner institutions, governments, universities, individuals..
- An international and diverse “Community” of economists and ecologists..
- Makers of “Global Public Goods” : the TEEB Report suite
- Catalysts of Change for Society : Economics, Accounts, Philosophy
- Some key partners....

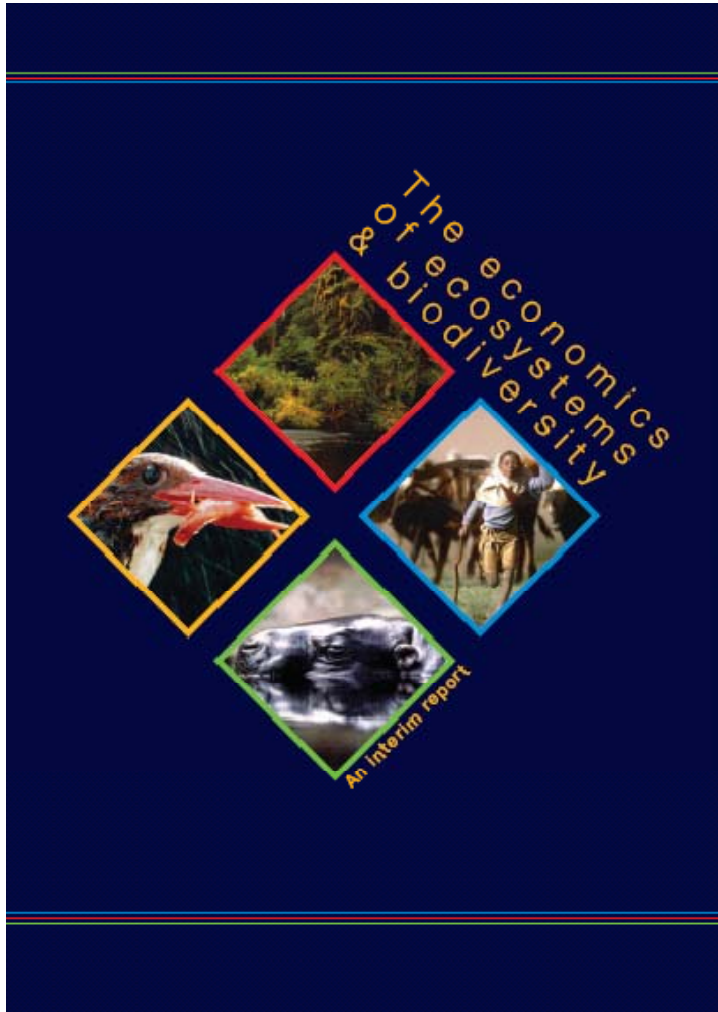




# TEEB – Interim Report Three Key Messages



Federal Ministry for the  
Environment, Nature Conservation  
and Nuclear Safety



Economic Size &  
Welfare Impact of  
Losses is huge



Strong link with  
Poverty & risk of  
MDG's failure



Discount rates  
are *ethical* choices



# 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"...

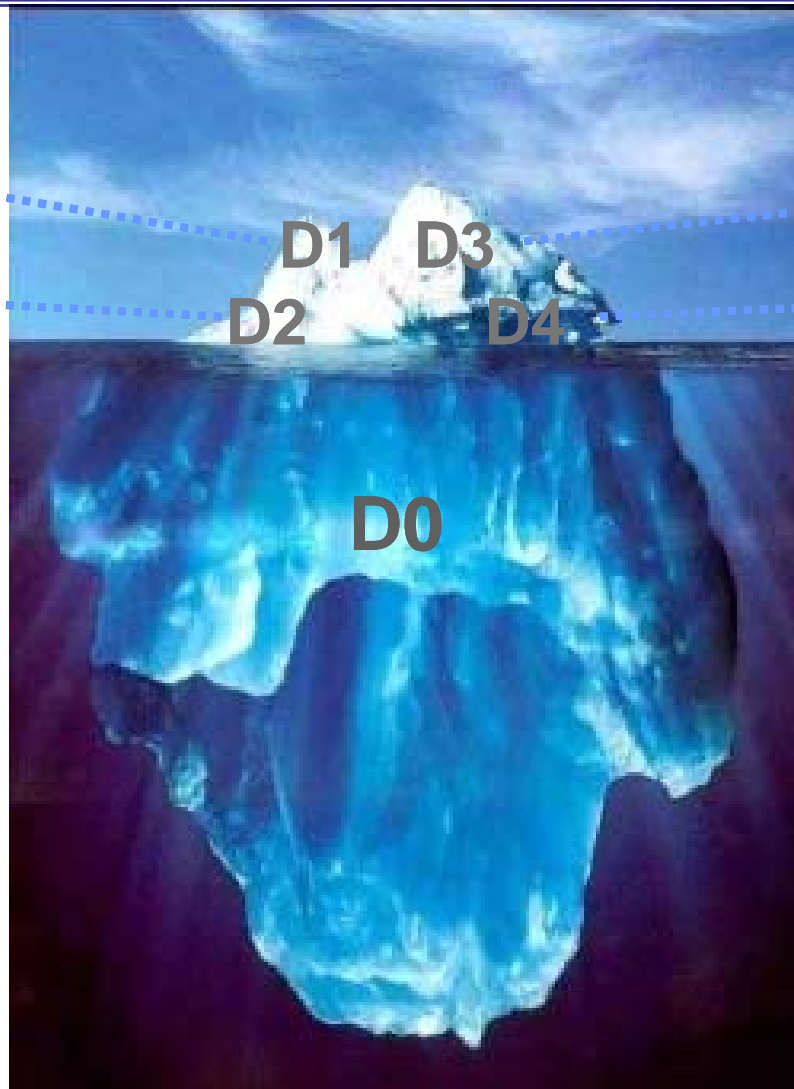


Policy-Makers..

Administrators..

Businesses..

Citizens..





# ECUADOR'S Proposal : Yasuni Preserved, Oil stays in ground



Federal Ministry for the  
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and Nuclear Safety



Yasuni National Park –  
the most biodiverse  
wilderness on Earth



## ECUADOR : YASUNI - ITT Proposal



Federal Ministry for the  
Environment, Nature Conservation  
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- Ecuador commits **not to exploit 20% of its proven oil reserves** (846 million barrels), (ITT oil fields, within the **Yasuní National Park**.
- **Ecuador's Opportunity Cost** : ( @ US\$ 75 WTI) is an NPV of **US\$11.6 billion**.
- **World's CO<sub>2</sub> Storage** : 407 million Mt CO<sub>2</sub>; @ market (EU-ETS), US\$28.85/ Mt, **US\$11.7 billion**.
- **Note : Social Cost of CO<sub>2</sub>** far exceeds market price ...
- ***ECUADOR seeks investors now ....***
- ECUADOR shows a way... Does the World have the will ?

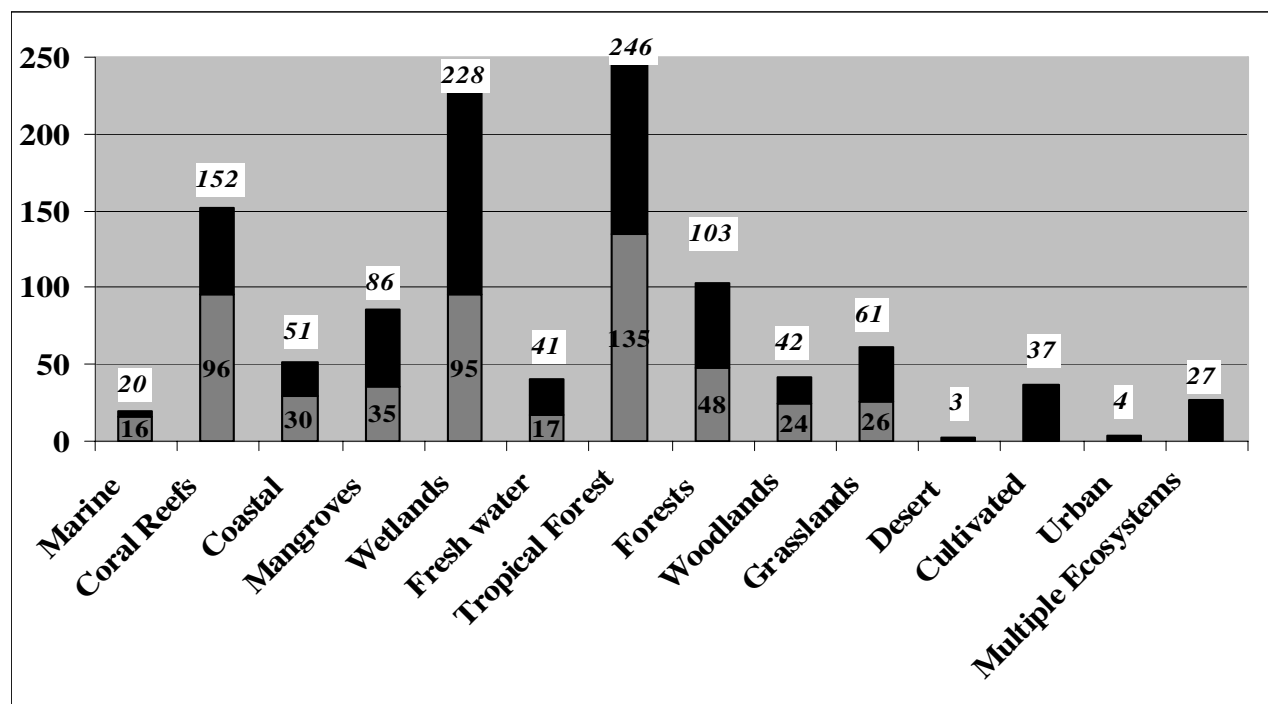


## Phase 2 : Valuations Database



Federal Ministry for the  
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and Nuclear Safety

- Three main sources used: COPI database, Costanza (post-1990 only) and Case Base
- 230 publications, of which 54 from Case Base; 110 from COPI and 66 from Costanza
- In total 1100 monetary values have been entered in the TEEB database.
- Of which, from Peer Reviewed studies, 522 values were selected for the calculation of the main matrix (i.e. by Biome, ESS, and socio-economic category).



The table shows the  
distribution among  
ecosystems

black = total number of  
values;  
grey = number of values  
used for TEEB D1 etc  
modelling



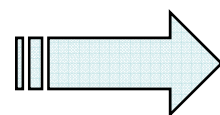
# TEEB - Climate Issues Update



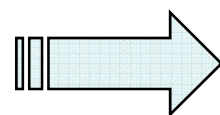
Federal Ministry for the  
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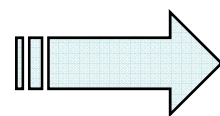
**Coral reef emergency**



**Forest carbon for climate mitigation**



**National accounting for forest carbon**



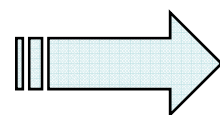
**Ecosystem investment for climate adaptation**



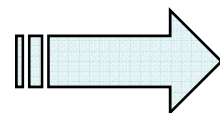
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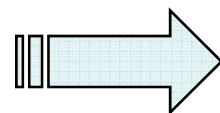
Federal Ministry for the  
Environment, Nature Conservation  
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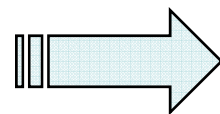
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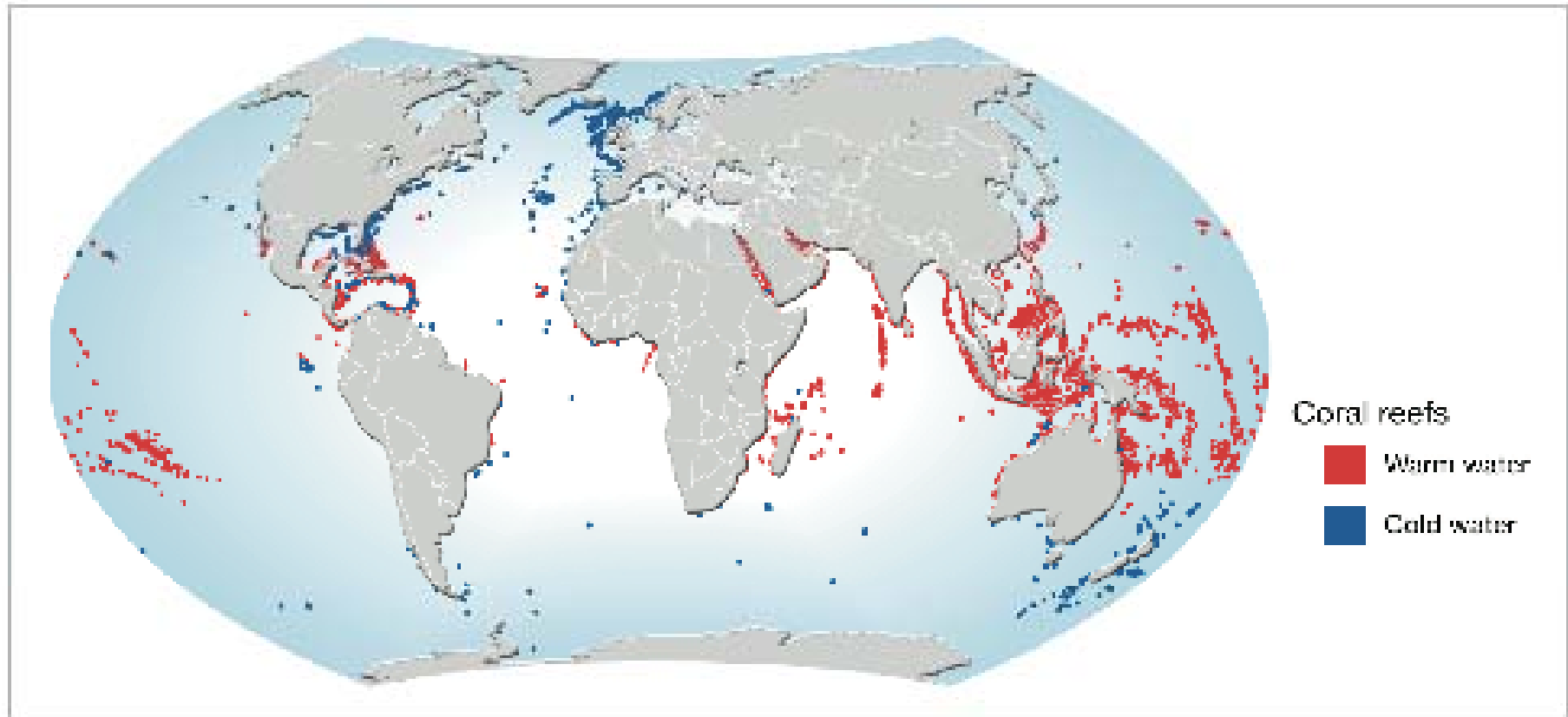
Ecosystem investment for climate adaptation



# Coral Reefs...



Federal Ministry for the Environment, Nature Conservation and Nuclear Safety





# Coral Reef valuations (from TEEB “D0” matrix)



Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

**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
<b>Provisioning services</b>			
Food	470	3,818	22
Raw materials	400	1,990	5
Ornamental resources	264	347	3
<b>Regulating services</b>			
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
<b>Cultural Services</b>			
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
<b>Total</b>	<b>115,704</b>	<b>1,139,190</b>	<b>83</b>
<b>Supporting Services</b>			
Maintenance of genetic diversity	13,541	57,133	7

*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...



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and Nuclear Safety

- ❖ 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 CO<sub>2</sub>
  - Or
  - @ 350 ppm CO<sub>2</sub> ?

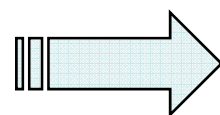
for Tropical Coral Reef survival in the long term....



# TEEB - Climate Issues Update



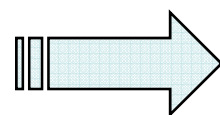
Federal Ministry for the  
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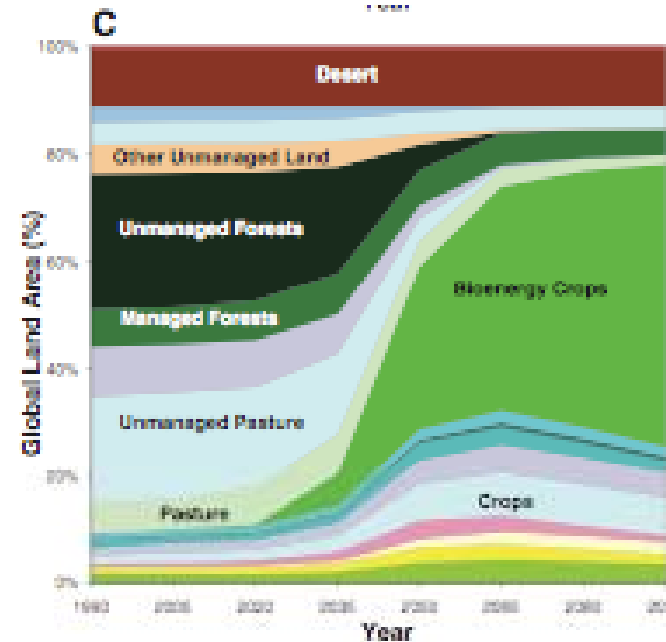
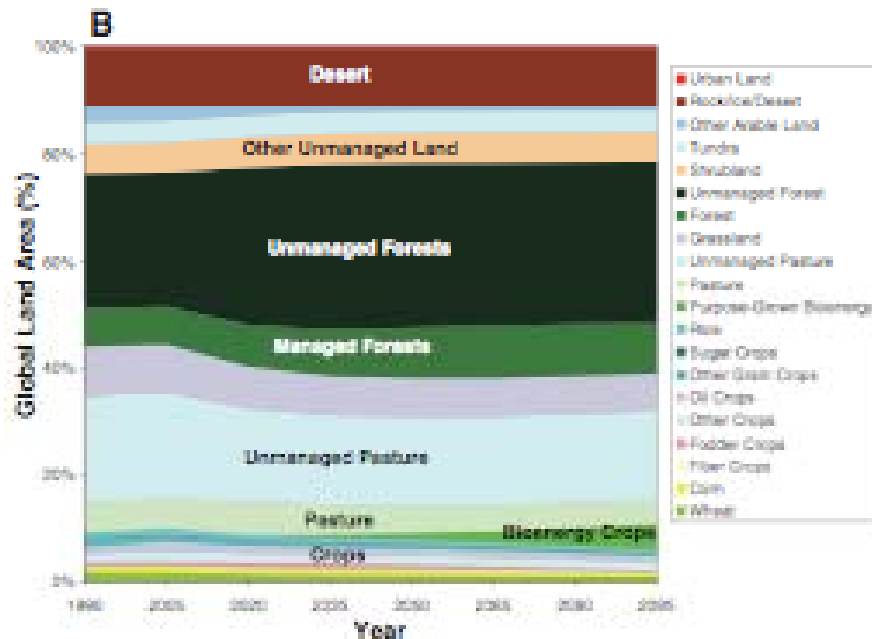
# No Terrestrial Carbon in an Emissions Control Regime Is Not an Option...



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(B) Land use under a pathway defined to achieve a CO<sub>2</sub> 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 CO<sub>2</sub> concentration





# Tropical Forests of the World.... Largest Terrestrial Carbon Sinks

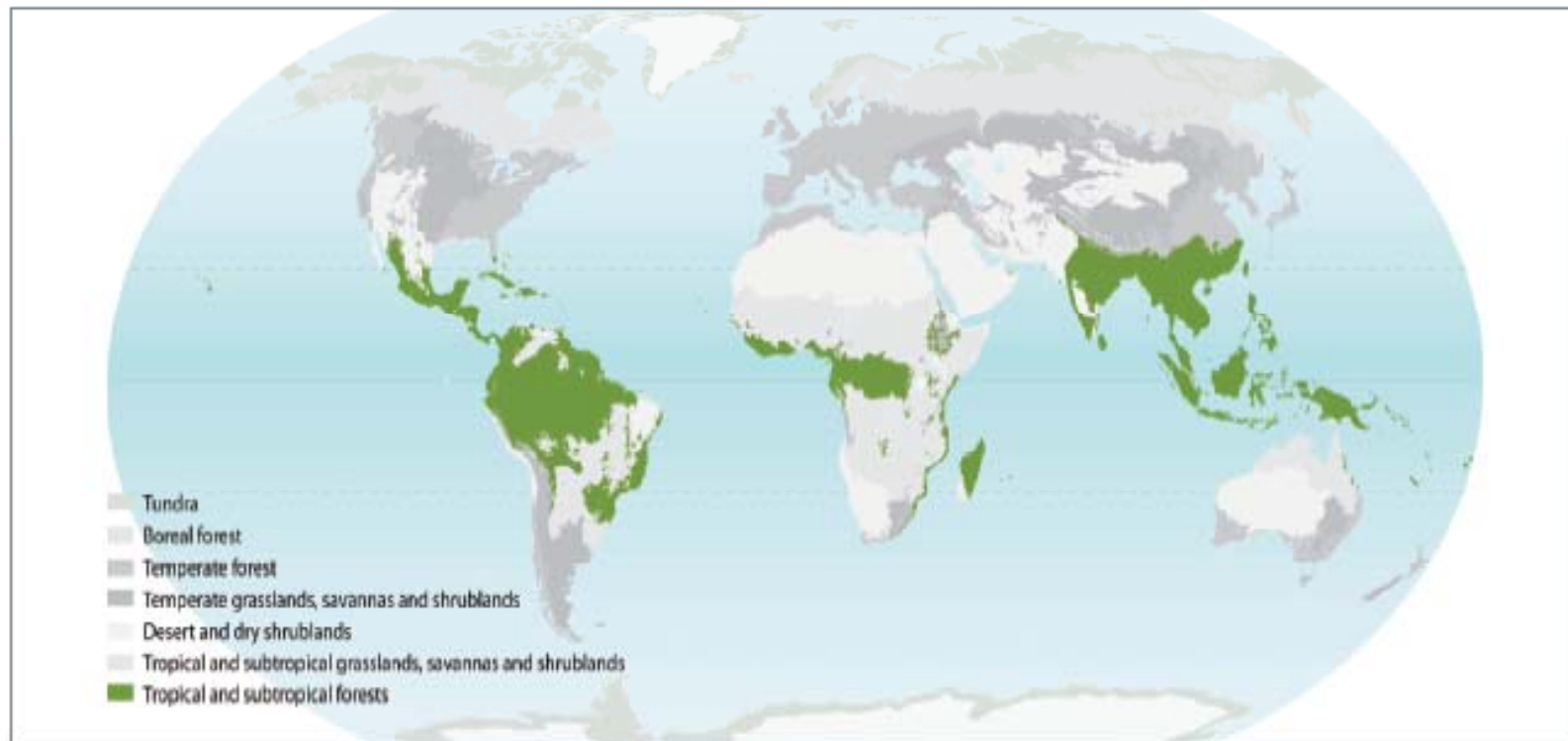


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and Nuclear Safety

- ❖ store a fourth of all terrestrial carbon (Trumper et al, 2009)
- ❖ capture up to 4.8 Gt CO<sub>2</sub> annually (Lewis & White, 2009)

Figure 2: Geographical distribution of tropical forests

Source: adapted from Olson et al., 2001.

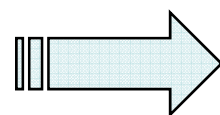




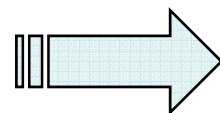
# TEEB - Climate Issues Update



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and Nuclear Safety



Coral reef emergency



Forest carbon for climate mitigation



National accounting for forest carbon



**Ecosystem investment for climate adaptation**



# Ecological Infrastructure for Adaptation



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Environment, Nature Conservation  
and Nuclear Safety

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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...



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**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



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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
<b>Tropical forest</b>	<b>3,448</b>	<b>7,022</b>	<b>148,675</b>	<b>50%</b>	<b>37.3</b>
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
	<b>Tropical forest</b>	<b>3,448</b>	<b>7,022</b>	<b>148,675</b>	<b>50%</b>	<b>37.3</b>
1	<b>Benefits peak @ 70%, instead of 80% of Generic</b>				<b>42%</b>	<b>31.5</b>
2	<b>Costs @ 100%, instead of 120% of Typical</b>				<b>57%</b>	<b>45.4</b>
3	<b>Maintenance Cost (10%) stops after 5 years</b>				<b>51%</b>	<b>40.0</b>
4	<b>Benefits flows accounted for 50 yrs, instead of 40</b>				<b>50%</b>	<b>45.4</b>
5	<b>Discount rate 4%, instead of 1%</b>				<b>50%</b>	<b>21.7</b>

# The Economics of Ecosystems & Biodiversity



**Thank you !**

Further information

**[www.teebweb.org](http://www.teebweb.org)**

