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The Economics of Biodiversity Loss

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Presentation Outline

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What is Biodiversity?

- ***Biological diversity or Biodiversity*** means "…the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems."
- ***Biological resources*** include genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity.
- ***Convention on Biological Diversity*** (1992):190 Parties – one of the most subscribed conventions in the world.
  - Goals
  1. the conservation of biological diversity
  2. the sustainable use of its components
  3. the fair and equitable sharing of the benefits from the use of genetic resources.

What is being lost?

- ***Biodiversity is a clear example of global commons***: Actions taken by one region or country affect others beyond their geographical limits; thus biodiversity has public goods and external effects that may require policy intervention. But markets may also be of great help in sustainable use and conservation.
- ***Biodiversity has clear social aspects***: Developed or developing countries rely directly or indirectly on biodiversity, but its value is predominantly implicit rather than explicit. The understanding of its links to poverty and different forms of capital (e.g. social capital) are still incipient. Yet, a world without biodiversity is unlikely to sustain human life.
- ***Adequate and widely accepted biodiversity indicators are lacking***. There is no scientific consensus on how to measure biodiversity but different proxy indicators point to the direction that biodiversity is already under severe distress or may be in the foreseeable future.
  - the extinction of species is increasing and the rate of extinction is between 100 and 10,000 times more than their would-be natural rate (IUCN).
  - Between 1980 and 2000, about 25% of the mangrove area worldwide was lost (FAO, 2003); 20% of the world coral reefs have been destroyed, 24% are under imminent risk of collapse and 26% are under a longer term threat of collapse (Wilkinson 2004); the worldwide loss of tropical rainforest caused by human intervention is around 15 million hectares per year, and if recent rates of tropical forest loss continue for the next 25 years, it is estimated that the number of species in forests would be reduced by 4 to 8 percent (Waller-Hunter and Biller 2001). Several fisheries are under severe threat of collapse due to over fishing and environmental degradation, and threats related to climate change and invasive species (mostly introduced by humans) significantly compound the odds against biodiversity.
  - Only a few ecosystems around the world have not suffered from human intervention.

Why place economic values on biodiversity?

- Placing a value on any public good or service is complex but for biodiversity is even more. For example, does diversity per se have value or would one focus on the individual components of biodiversity?
- Yet, placing economic values on biodiversity is important because:
  - ***Supports cost benefit analysis (CBA)*** of investment projects and policies, which properly incorporates environmental costs and benefits, and this is essential to enable policy makers to choose the investment or policy option that maximizes total net benefits to society.
  - ***Assists on environmental accounting*** at the national level (green national accounts), local level (community green accounts) and firm level (environmental reporting), which adjusts the gross domestic product (GDP) and other standard ways of measuring final outputs to take into account any depreciation in the natural capital and hence improve planning.
  - ***Enables proper valuation of the benefits [costs] provided by biodiversity and other environmental public goods [bads] in the absence of markets***, which is useful in the design of policy instrument to address market failures and essential in order to level the playing field between conservation and economic development.
  - ***Facilitates Natural Resource Damage Assessment (NRDA)*** where relevant due to laws resulting in compensation payments for natural resource damage from man-made accidents such as pollution spills, among others.

How to place economic values on biodiversity?
Total Economic Value (TEV) of a mangrove = USE VALUE + NON-USE VALUE

Use values			Non-use values
Direct value	Indirect value	Option value	
Timber, fuelwood, charcoal	Shoreline, riverbank stabilisation	Future direct and indirect values	Cultural, aesthetic
Fisheries	Groundwater recharge/discharge		Spiritual, religious
Forest products: food, medicine, wildlife etc	Flood and flow control		Global existence value
Agricultural resources	Waste storage and recycling		
Water supply	Biodiversity maintenance		
Water transport	Provision of migration habitat		
Genetic resources	Nursery/breeding grounds for fish		
Tourism and recreation	Nutrient retention		
Human habitat	Coral reef maintenance and protection		
	Prevention of saline water intrusion		
Information			

Source: Pearce (2001)

Economic Valuation Methods

Methods:

- Net Present Value Cost-Benefit Analysis
- Revealed Preferences – Ex: Hedonic Prices, Travel costs
- Stated Preferences – Ex: Contingent Valuation, Conjoint Analysis
- Benefit Transfer

Function:

- Lead to better decisions via:
  - Information gathering and dissemination
  - Facilitate priority setting, and
  - Allow for capture and allocation of benefits via better incentives design

Valuing Ecosystems 1

Area	Benefits included	Costs included	Estimates (Timeframe, discount rate)
Protected Areas in Madagascar	Biodiversity, tourism, water supply	Management, Opportunity [Source: Carret and Loyer (2003)]	B= US$88.3/ha, C= US$72.6/ha (15 years, 10%)
Mangrove conservation Thailand	Direct-use values by local communities and indirect use values for off-shore fisheries and coastline protection	Assess benefits from conversion to shrimp farming (i.e opportunity cost) [Source: Sthirathai (1998)]	NPV Conservation > NPV Conversion to shrimp farming (20 years, 6-10%)
Leuser National Park, Indonesia	Water supply, fisheries, flood and drought prevention, agriculture, hydro-electricity, tourism, biodiversity, carbon sequestration, NTFP and timber	No cost included formerly but they compare the benefits for three scenarios: deforestation (D), conservation (C) and selective use (SU). [Source: Beukering et al. (2003)]	NPV(C)=US$9.5bn NPV(D)=US$7bn NPV(SU)=US$9.1bn (30 years, 4%)

Valuing Ecosystems 2

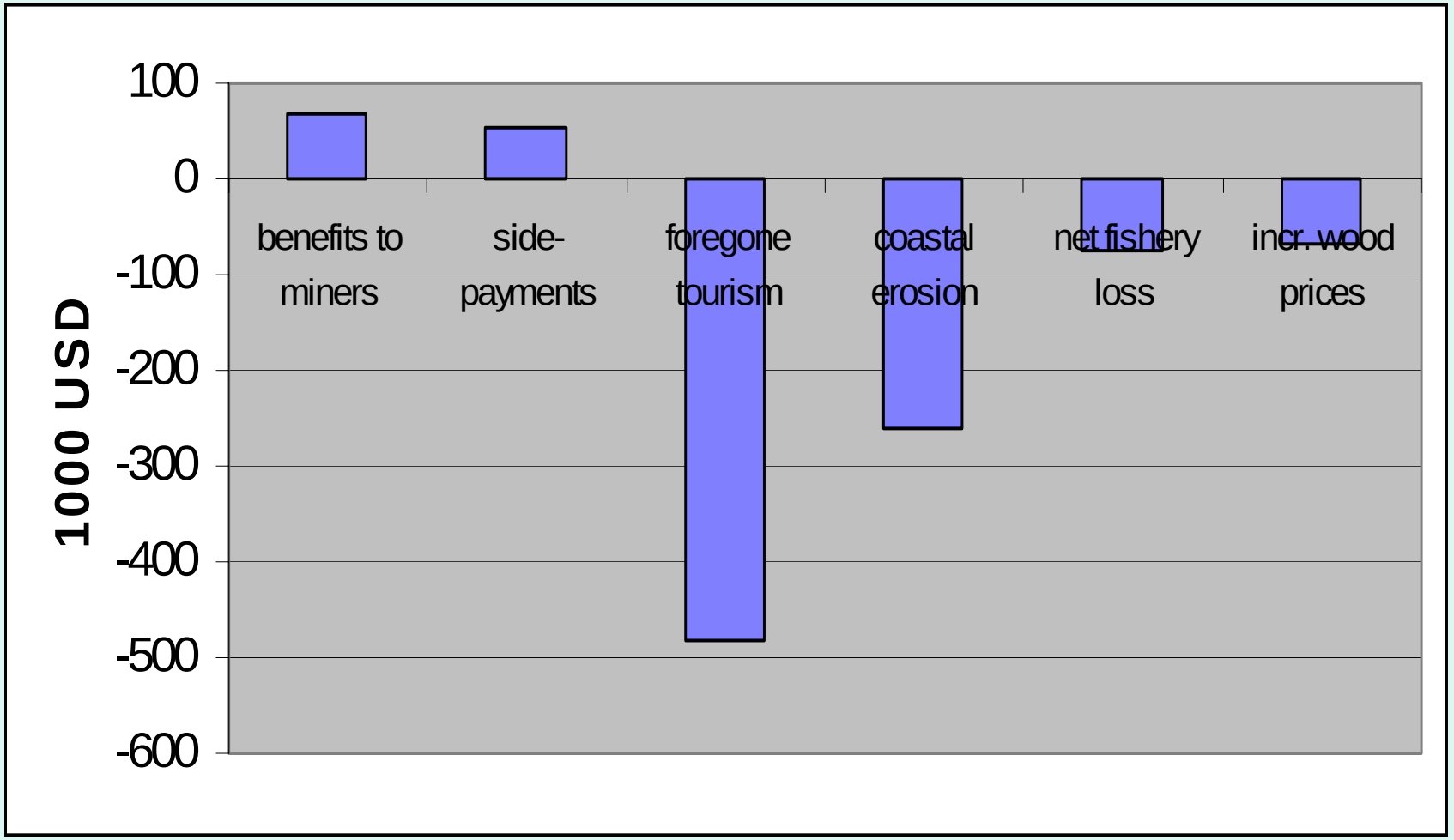
- CBA of Blast Fishing in Indonesia:
  - Net loss to society after 20 years between US$ 33,900 per km² and US$ 306,800 per km² of coral reef.
  - Economic costs to society 4 times higher than private benefits.
  - US$ 3.8 billion loss for not enforcing regulations.
- Jamaica Portland Blight Protected Area: (NPV terms over 25 years at 10 % discount rate):
  - Incremental costs = US$ 19.2 million while….
  - the incremental benefits = US $ 41 million to US $ 53 million depending on the tourism scenario.

Valuing species: Costs & Benefits of Cyanide Use in Philippines

Net Present Value of Poison Fishing to Individuals and Associated Losses to Society per km2 of reef in Large Scale Operations (in 1000 US$; over 25 years; with 10% discount rate)

Source: Cesar, 2001

Valuing Species: Costs and Benefits of Coral Mining ('High' Scenario Case) in Lombok, Indonesia



Valuing Specific Species

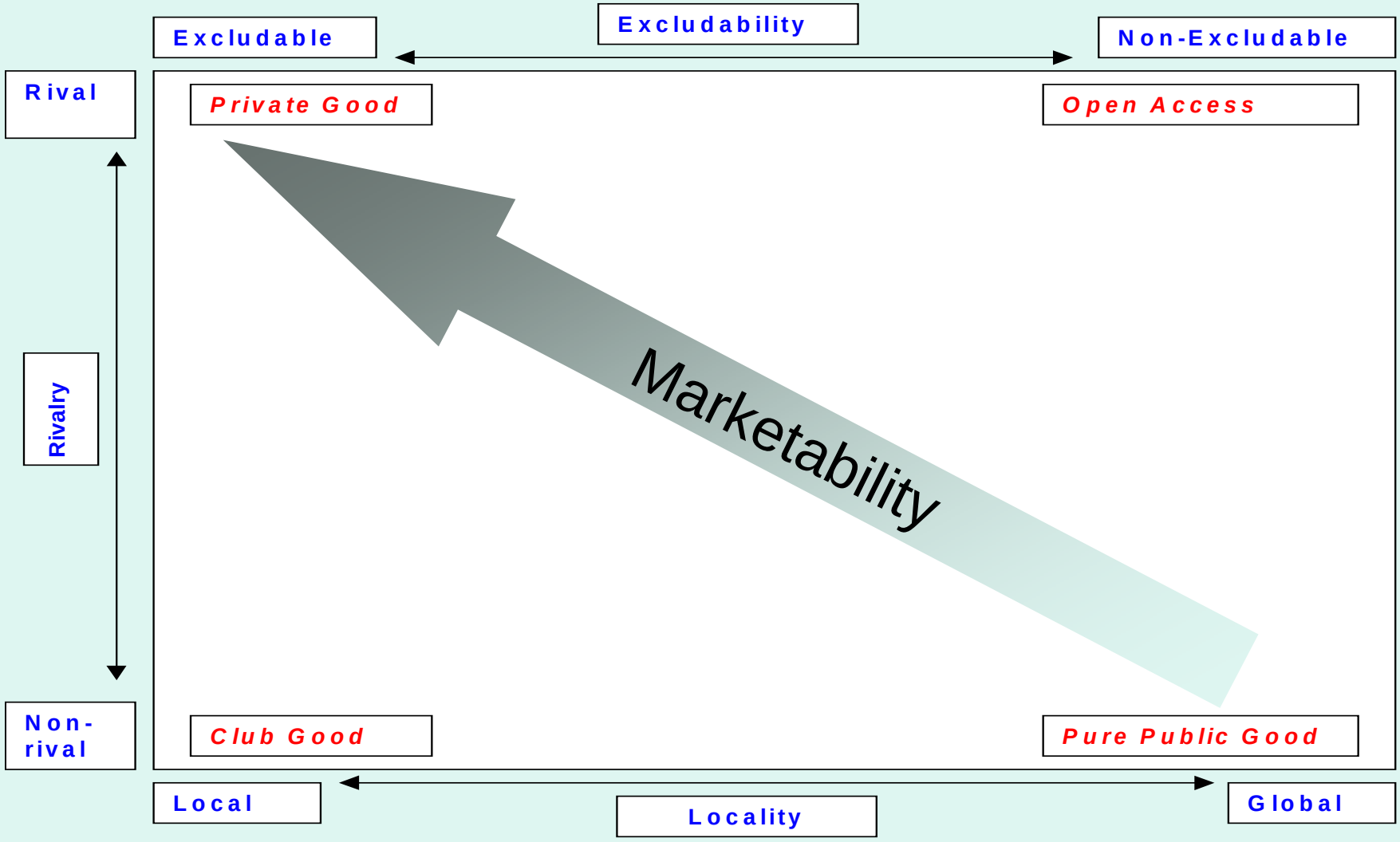
- Use values:
  - Giant Panda in China (Wolong Reserve, Potential for increase in eco-tourism by estimating the demand high-quality eco-tourism) - Benefits = US$ 145-210/ha per year. Lower bound estimate assumes only 30 tourists per day for 6 months/year.
- Non-use values:
  - Gray Whales – WTP = US $ 16 and US $ 18 per household per year
  - Black Rhinoceros in Namibia (Non-use values of UK residents) – WTP = 5 pounds per household per year.

The Solution: A generalized guide for policies to curtail biodiversity loss

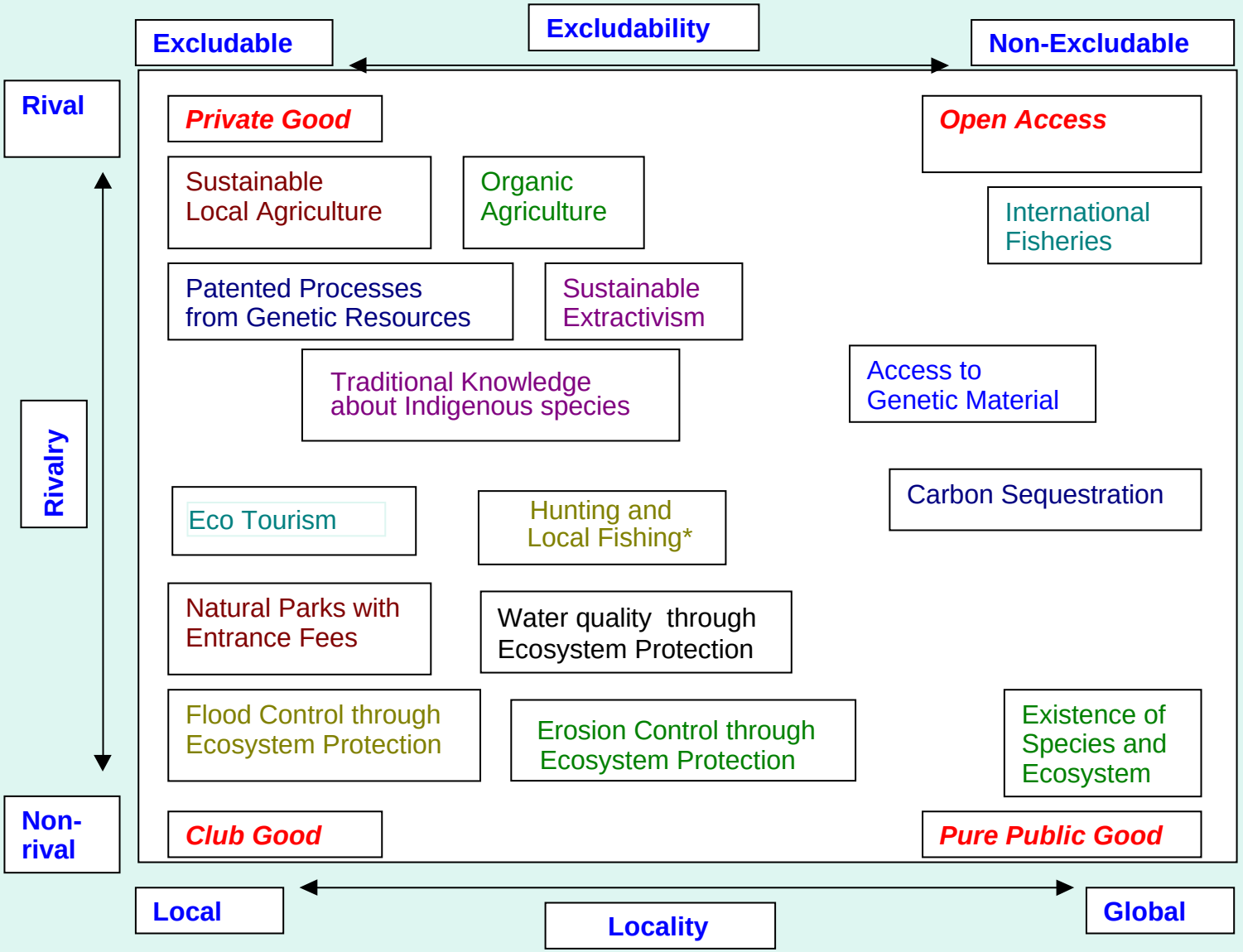
Option 1: Eliminate Perverse Incentives

- Rationale: Perverse incentives encourage environmental damage and biodiversity loss, generating rents through the consumption of natural resource intensive goods or supporting detrimental activities in important biodiversity economic sectors. For example, direct subsidies to agriculture in OECD countries were estimated to be as much as US$ 361 billion in 1999, while government support for marine capture fisheries amounted to US$ 6.3 billion and for coal production it was US$ 6.2 billion. Most of these funds contribute to further destroying the natural resource base, coastal zone degradation, and pollution generation. Some of this support is crucial to explain the collapse of different fisheries. Even climate change is at least in part related to perverse incentives. Perverse incentives deplete scarce government budgets, can be regressive in income affecting the poor more than the rich, discourage efficient markets by promoting rent seeking behavior, and have little economic basis.
- Benefits: Major benefits include diminishing rent seeking behavior, decreasing incentives that generate public bads like pollution and biodiversity loss, increasing economic efficiency, among others.
- Costs: The opportunity costs of negotiating outcomes such as potential temporary agreements towards sunset clauses related to the disappearance of the perverse incentives / subsidies.
- Note: If perverse incentives are clearly identified, the net benefit of this option is very large as the impacts of their elimination will benefit several sectors of the economy. Yet, as government attempts indicate, powerful vested interests may be difficult to change.

Option 2: Privatize the biodiversity that is feasible and involve local communities



Schematic Representation of Biodiversity Products and Services



Option 2: Privatize the biodiversity that is feasible and involve local communities

- Rationale: Biodiversity as a whole is often treated as a public good when in fact there are benefits that can be privately captured and / or provided. When the different attributes of biodiversity are not recognized, there is scope for under provision and degradation. Potential providers of ecosystem services have little incentive to provide them. Potential guardians of biological resources become poachers and destroyers of habitats. By taking advantage of the excludability of some biodiversity goods and services, clearly establishing enforceable property rights over them and allowing for trade, policy makers can potentially transform destroyers into conservationists.
- Benefits: Major benefits include decreasing incentives that generate public bads like pollution and biodiversity loss, increasing economic efficiency, improving monitoring and enforcement by local communities, improving technical skills of individuals within communities, harnessing international and national private financing by facilitating sustainable use, among others.
- Costs: Mainly those related to technical assistance and information provision to increase the likelihood that private biodiversity provision is sustainable.
- Note: There are several examples in developing and developed countries with variable degree of success signaling high net benefit. These include private parks in South Africa, local communities in Africa facilitating viewing safaris and controlled trophy hunting, indigenous communities being paid for the provision of ecosystem services such as conservation of watersheds in Mexico. Once again, this option frees scarce public resources to be devoted for the provision of public goods.

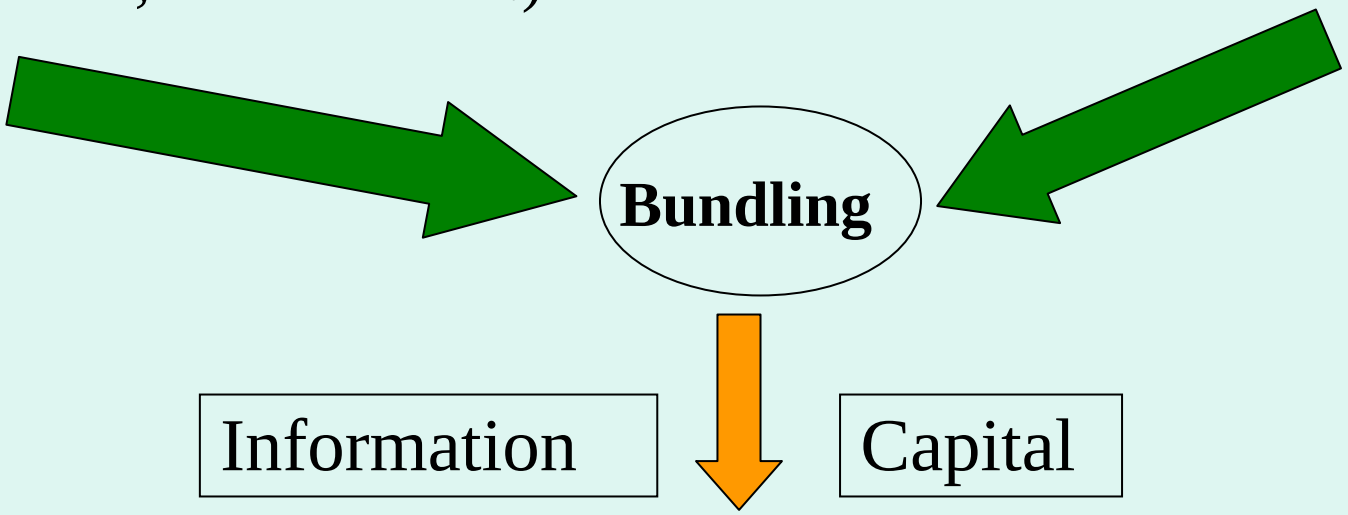
Option 3: Bundle non excludable attributes of biodiversity with its private goods and club goods and design economic instruments that take advantage of markets to deliver these attributes

Marketable Values

- ✓ Direct Extractive Use (food, plants etc.)
- ✓ Direct Non-Extractive Use (services such as R&D, eco-tourism, education etc.)

Public Good Characteristics

- ✓ Indirect Uses
- ✓ Option Values
- ✓ Existence or Bequest Values



Biodiversity Businesses

Option 3: Bundle and design economic instruments that take advantage of markets to deliver PG attributes

- Rationale: In policies targeting man-made infrastructure, a common goal is to unbundled service provision. This promotes competition and may drive technological change. Yet, in the case of biodiversity, certain goods and services are not easily divisible from others, and carry significant public good attributes. Enjoying marketable services together with positive externalities or additional public good aspects may justify some kind of government support or regulation rather than a direct attempt to unbundled biodiversity goods and services.
- Benefits: Major benefits include securing the optimal provision of public goods related to biodiversity, while taking advantage of market forces. Depending on the chosen instrument, this may even generate public funds.
- Costs: Depending on the instrument choice (e.g. subsidies), there is potential for rent seeking. Yet, this could be mitigated by sunset clauses, periodic revisions and provision of funds against the delivery of public goods measured by clearly defined indicators.
- Note: There are a number of examples that have successfully used markets to enforce regulations (e.g. tradable fishing quotas, tradable hunting quotas, etc). Even public payments if well design can successfully diminish threats to biodiversity, while diminishing the potential for rent seeking.

Option 4: Ensure the provision of biodiversity related public goods

- Rationale: As discussed before, the benefits of biodiversity conservation are still not well understood. This uncertainty is in part responsible for inaction – if one can't measure it properly, how can it be prioritized adequately? Yet, extinction is in principle irreversible, and policy makers may wish to secure a certain minimum level of biodiversity to avoid it. This suggests that a certain degree of precaution is advisable even if standard tools of economic analysis such as CBA may be biased against it.
- Benefits: Major benefits include securing the minimum provision of public goods related to biodiversity. As information is attained, closer to optimal provision is possible.
- Costs: Other policy interventions sacrificed.
- Note: If the outcome is irreversible, it may be justifiable to apply the precautionary principle. This is particularly relevant when securing the existence of species and ecosystems, where non use values are likely to play a major role.

Caveats and Conclusions

- “Efforts at valuation are therefore important but are unlikely to inform us of the scale of ‘tolerable’ change (OECD 2006)” thus use a precautionary approach.
  - ✓ A potential large “scale” effect;
  - ✓ Irreversibility;
  - ✓ Uncertainty.
  - ✓ the information stored over millions of years of evolution is at risk, since the world no longer has a ‘reserve’ of ecosystems [biodiversity] subject only to natural variation.
- Within the above and the results of CBAs involving biodiversity, biodiversity conservation and sustainable use should neither be penalized due to the lack of information associated with it nor punished because it is a new concern among development issues.
- By eliminating perverse incentives, policy makers have a unique opportunity to prevent biodiversity loss while improving economic gains. This is likely to do society a lot of good.

TAK!!!!