

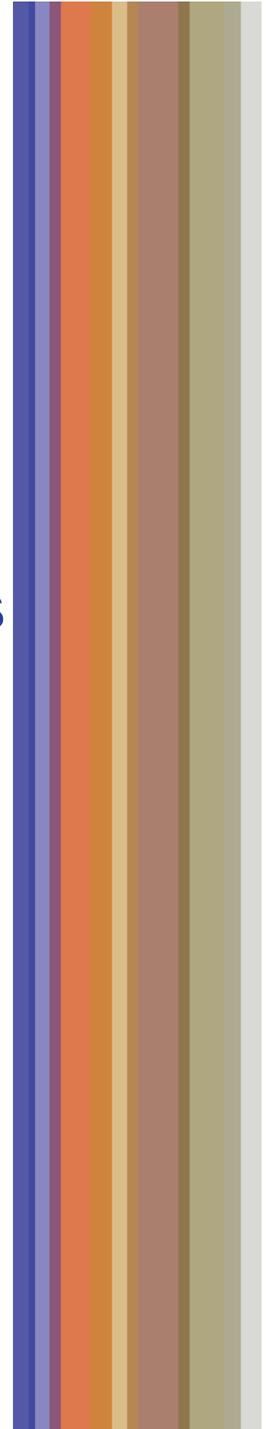


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The Contribution of Marine Turtles to the Provision of Ecosystem Goods and Services in Marine Ecosystems of the Caribbean Sea

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Biodiversity and Human Welfare

- **fundamental for the sustainability of current and future human livelihoods through the provision of “services”**
- **“the central environmental challenge of our time”**
- **Conservation as a tool to link between biodiversity and human welfare**
- **Income generating activities from biodiversity resources**

Why Focus on Latin America and the Caribbean?

- **Continued biodiversity loss as one of the world's principal environmental problems**
- **One of the biodiversity “hotspots” of the developing world**
- **One of the major livelihood and economic assets of the LAC region**
- **global biodiversity in the most danger in small islands**
- **The large-scale marine ecosystem of the Caribbean Sea under particular threat**

The Complexity of Biodiversity Valuation in the LAC

- a variety of available definitions
- challenges in valuation
- a broad range of stakeholders
- How to embed the valuations into decision-making
- The trans-national challenge, coordination and transaction costs
- Heterogeneity of geography, history, language, culture, political status
- Economic peculiarities
- Regional disconnect and lack of regional cooperation

Small Island Developing States (SIDS)

- **Highly vulnerable**
- **High ratio of coastal to land area**
- **Highly coupled terrestrial and marine ecosystems**
- **Heavy reliance on natural resource exploitation**
- **Small populations, high population densities**
- **High demands on natural resources**
- **Monocrop, subsistence economies**
- **Highly dependent on the developed world**

The Importance of Marine Resources

- **important economic resource for many small islands**
- **marine pollution and marine resources recognise few boundaries**
- **Lack of property rights in the global commons**
- **significant regional and international cooperation necessary**

The Caribbean Sea

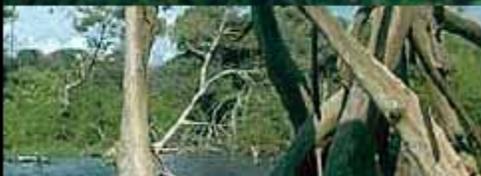
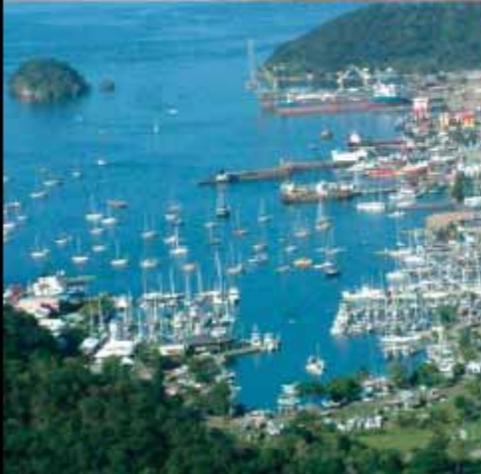
- **Of vital economic, ecological and social importance**
- **an estimated 9% of global coral reef area, a human population of over 116 million people, with over 50 million in coastal areas**
- **Economic, geographical and political heterogeneity coupled with oceanographic homogeneity**
- **heavy economic dependence, heavy welfare losses if left unmanaged**
- **a sub-global assessment of the MEA**



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Caribbean Sea

Caribbean Sea Ecosystem Assessment (CARSEA)

Project Summary

The semi-enclosed Caribbean Sea is a distinct ecological region, bounded to the north by the Bahamas and the Florida Keys, to the east by the Windward Islands, to the south by South America, and to the west by the isthmus of Central America. The Caribbean is the second largest sea in the world and covers an area of more than 3.2 million square kilometers. Included in the CARSEA assessment are the Caribbean Sea, the islands within the Sea and bordering it, and the river basins of continental territories draining into the Sea.

As the home to more than 116 million people of 22 independent states, the Caribbean has a complex political structure. Cooperative management is complicated by a history of struggle for control of the resources of the region, high cultural diversity, and lack of common agenda for sustainable use of the natural resources of the Caribbean. Economic well-being in the region is highly dependent upon tourism and fishing. The Caribbean is more dependent upon tourism than any other part of the world, relative to its size. Fishing is also a significant source of both income and subsistence for much of the population. Both of these services are, however, directly threatened by environmental deterioration.

Direct drivers of change in capacity of the ecosystem to provide services are changes in coastal land and sea use, sewage pollution, over-fishing, global climate change, river discharge, and alien species introduction. Urbanisation of coastal communities, high investment in unsustainable tourism, lack of coordinated governance, and international shipping rules unfavourable to environmental conservation are indirect drivers of change in ecosystem service capacity.

Results of the scenarios exercise in the Caribbean Sea sub-global assessment (CARSEA) indicate that long-term coordination for sustainable use of the Caribbean's natural resources amongst stakeholder countries is the most effective and practical activity to ensure improvement and maintenance of ecosystems services in the region.

Assessment Approach

The time frame evaluated for key ecosystem services were the following: amenity value (1990–2003); fish production (1950–2000); desalinated water (1992–2000); coral reef cover


[Altai-Sayan](#)
[Alternatives to Slash-and-Burn](#)
[Arafura and Timor Seas](#)
[Argentina \(Pampas\)](#)
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[China \(Western\)](#)
[Colombia \(Andean Coffee-Growing Region\)](#)
[Costa Rica \(Chirripó\)](#)
[Egypt \(Sinai\)](#)
[Fiji](#)
[Himalayas \(Eastern\)](#)
[Himalayas \(Hindu-Kush\)](#)
[India \(Local Villages\)](#)
[India \(Urban\)](#)
[Indonesia \(Jakarta Bay and Bunaken\)](#)
[Norway \(Glomma River Basin\)](#)
[Papua New Guinea](#)
[Peru \(Wilcanota\)](#)

The CARSEA Assessment

- **Vital services in jeopardy**
- **Declines in Caribbean corals, mammal and amphibian extinctions**
- **Need for new levels of regional cooperation**
- **Focuses on “fishing” and “tourism” as the main services**
- **Need for regional approach to fisheries**
- **Need for the capture of more of the value of tourism to be re-invested into protective measures**
- **International community has a role to play**

Why Turtles?

- **Ecosystem engineers**
- **Close integration between species and environment**
- **Help to sustain stability of marine ecosystems**
- **Highly migratory, well distributed through the LAC**
- **Potentially economically important (role as a source of eco-tourism activities, role in fisheries)**
- **Heavy presence in the WCR and under significant threat**

Marine Turtles of the LAC

Species	IUCN Status	Primary Nesting Location	Targeted for?
Loggerhead	endangered	South Florida	
Green	endangered	In the past, Cayman islands currently, Costa Rica	Most edible of all marine turtles species
Leatherback	Critically endangered	Trinidad and the Guianas Costa Rica-Panama coast Insular Caribbean	Meat, eggs
Hawksbill	Critically endangered	Yucatan Peninsula, Mexico	tortoiseshells
Kemp's Ridley	Critically endangered	Most localised of all species, life cycle confined largely to Gulf of Mexico	
Olive Ridley	endangered	Southern Caribbean, Guianas	eggs

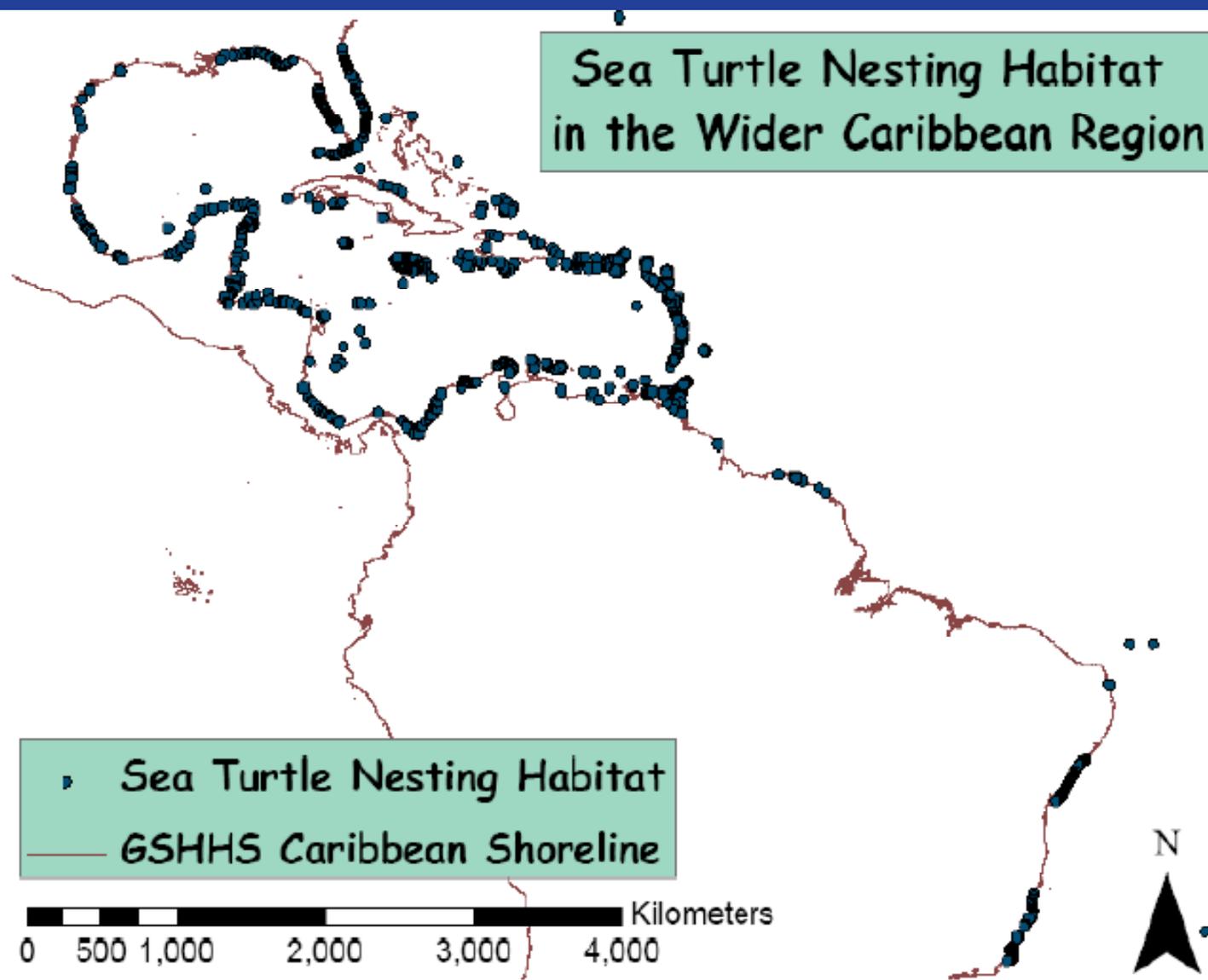
Ecosystem Engineers

- **Green turtle: as seagrass foragers, provide an overall health benefit to the marine habitat**
- **Hawksbill: as sponge consumers, provide an important ecological role to coral reef ecosystems**
- **Loggerhead: infaunal mining restructures benthic communities**
- **Leatherback: trophic role as jellyfish consumers, link to fishery resources**
- **Return of marine nutrients into terrestrial ecosystems**

Habitat Requirements

- **life cycles, trophic linkages, spatial/ seasonal distribution, population structure, size and stability**
- **Unobstructed sandy beaches for laying**
- **Healthy coral reef, seagrass and hard-bottom habitats for food and refuge**
- **Safe passage through complex migratory corridors**
- **The dangers of fisheries bycatch**

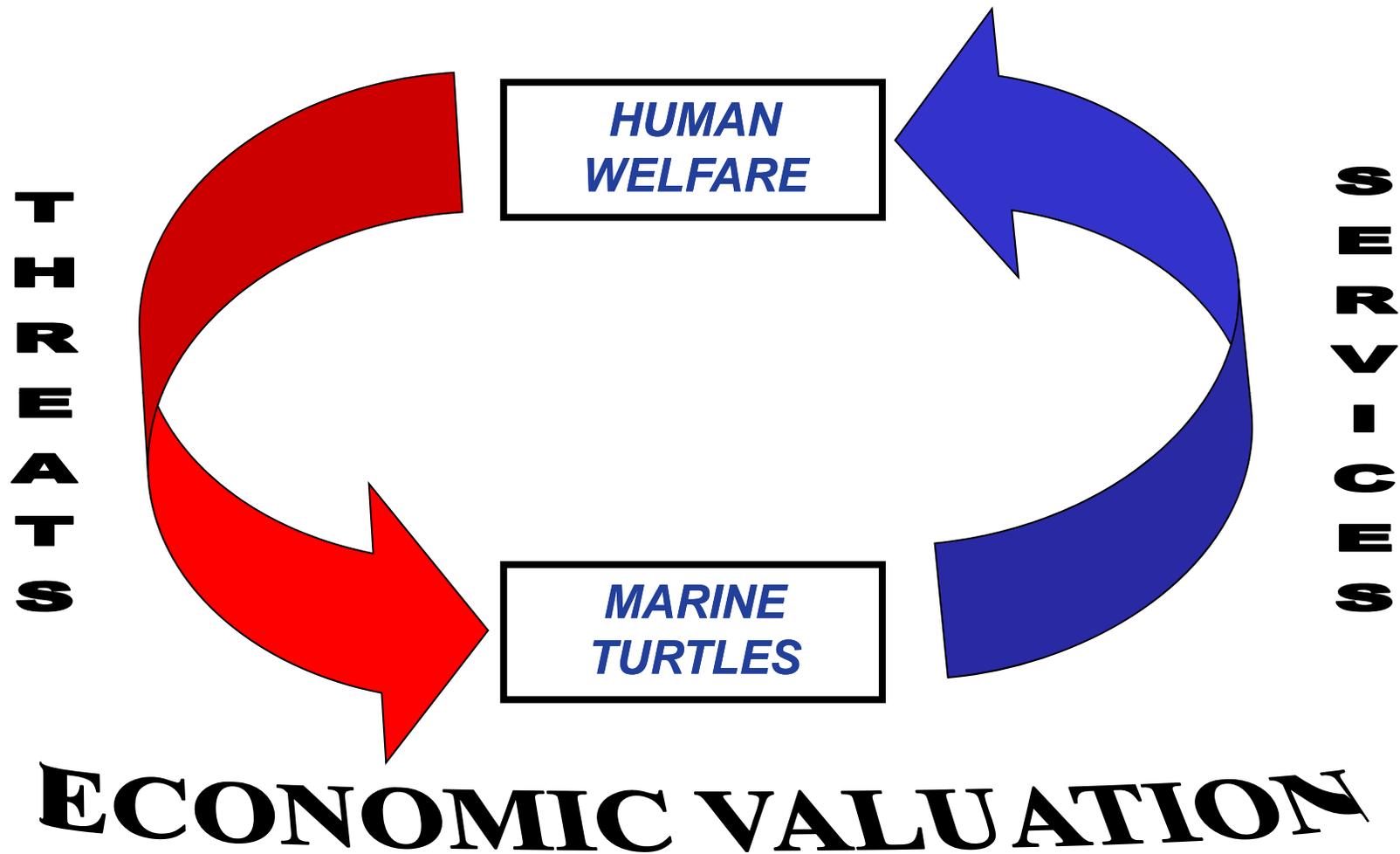
Nesting Habitats in the LAC (Dow et. Al. 2007)



The Regulatory Framework

- **“fragmented”**
- **Ranging from complete prohibition, indefinite or due to expire, exemptions for “traditional” take, and legal fisheries**
- **legal fisheries in opposition to available science**
- **Divergence between regulation and implementation**

Marine Turtles and Human Welfare



Identification of Threats

- **threats to nesting (beaches)**
- **threats to foraging and migration (open waters)**
- **Threats to nesting can be dealt with at community and national level (beach patrols etc.)**
- **Threats of open waters very difficult to manage across political jurisdictions and along the complex and lengthy migratory routes**

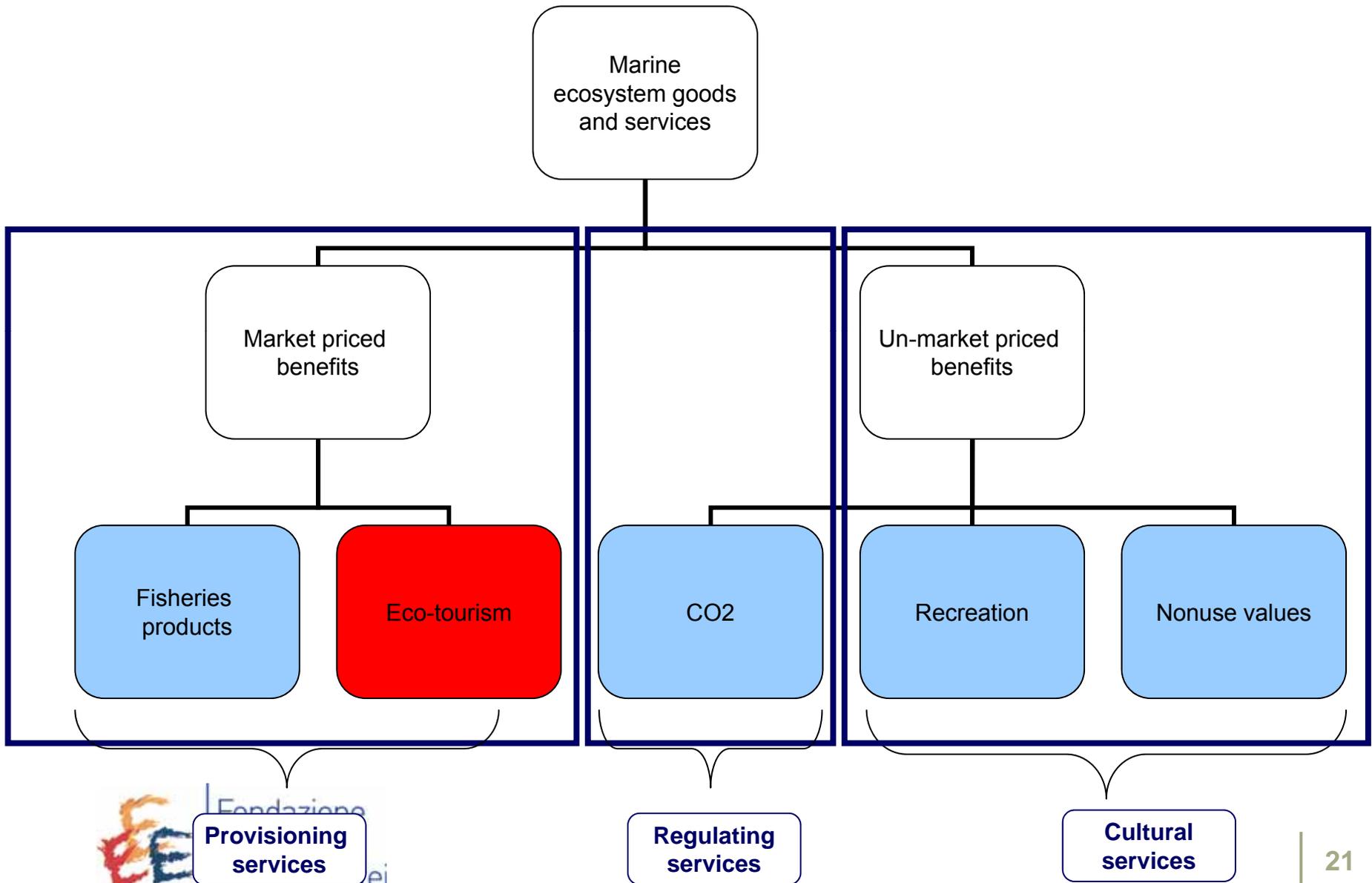
Marine Turtles and Ecosystem Goods and Services

	ECOSYSTEM SERVICE	THE ROLE OF TURTLES
provisioning	food	
	Eco-tourism	●
	Medicines, other resources	
regulating	Biological regulation	●
	Freshwater storage and retention	
	Hydrological balance	
	Atmospheric and climate regulation	
	Human disease control	
	Waste processing	●
	Flood/storm protection	
	Erosion control	
cultural	Cultural and amenity	●
	recreational	●
	Aesthetics	
	Education and research	
supporting	Biochemical	
	Nutrient cycling and fertility	

Eco-Tourism and Biodiversity

- **Eco-tourism often viewed as effective for promoting the conservation of endangered species and habitats in developing countries**
- **There is a close link between the biodiversity endowment of a country and its potential for ecotourism development**
- **Ecotourism as an economic activity can contribute to the sustainable economic and social development of the Caribbean region**
- **Ecotourism as ONE of the services provided by biodiversity**

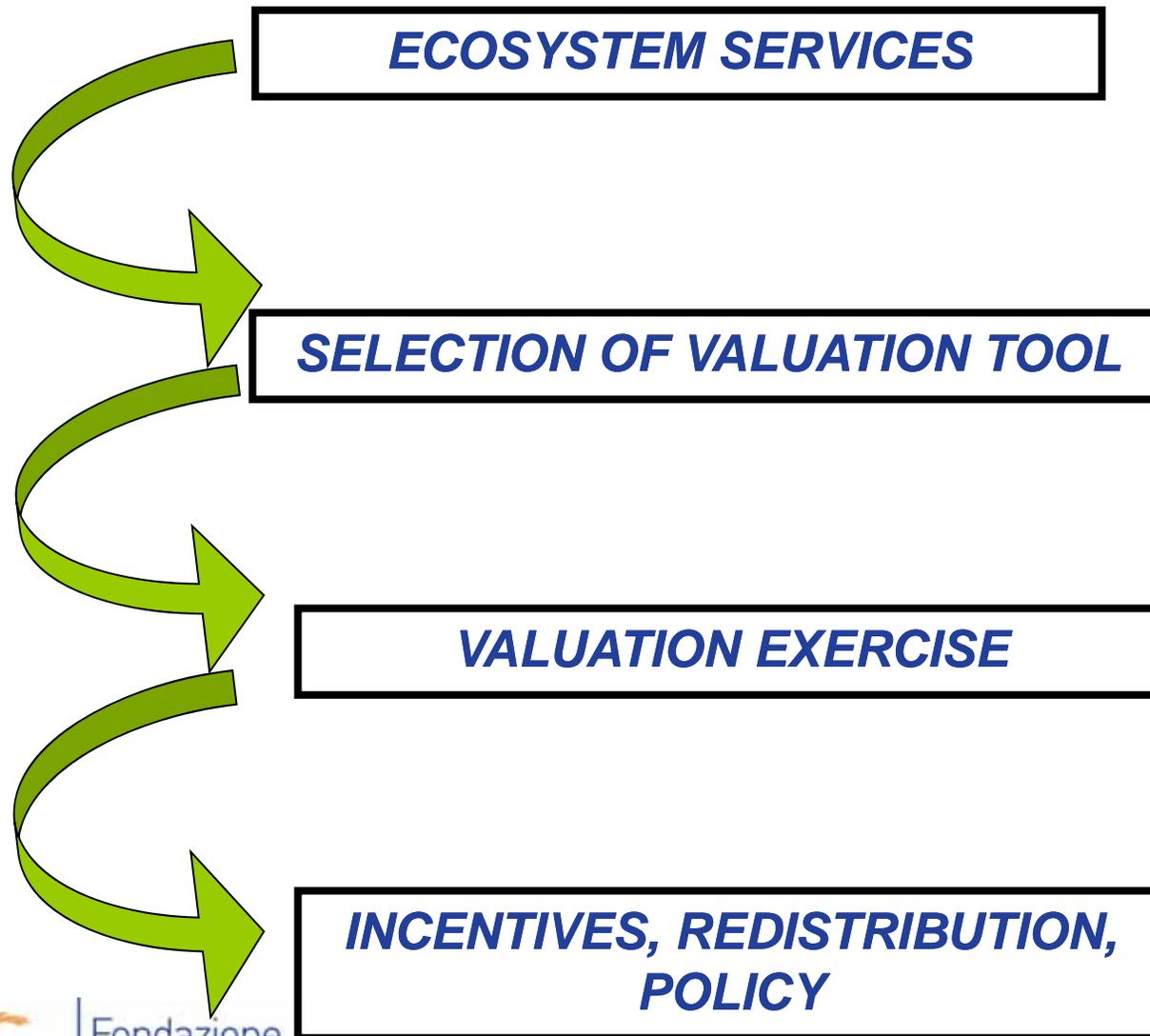
Eco-Tourism and other Services



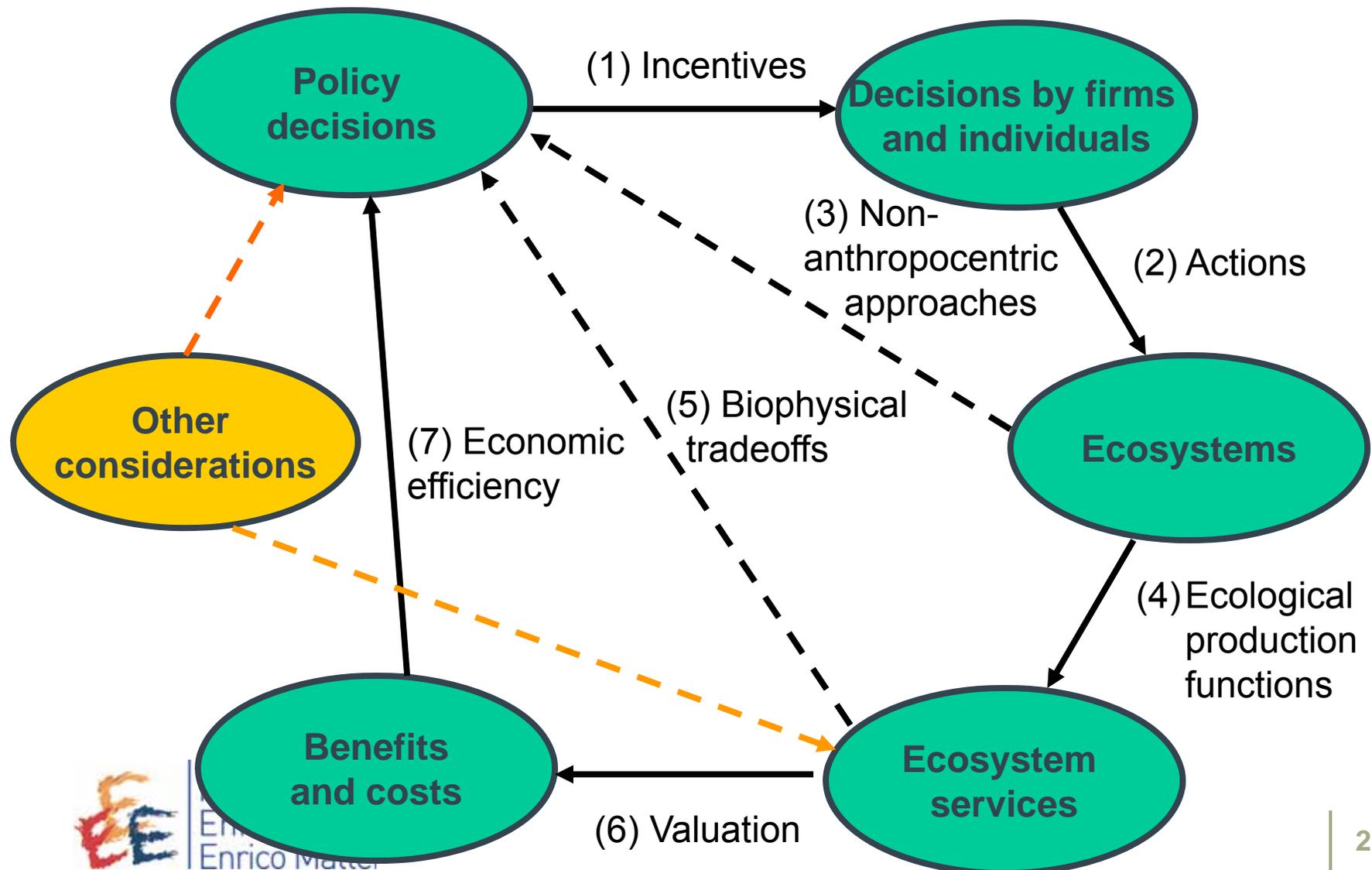
Valuation Methods

- Different valuation methods for the different types of services into which the species is an input
- Ecology and Economics can work together to estimate monetary values for each of these services
- Both the methods, and the values, can differ according to the scale of the analysis (community level, national level, regional level)
- Once values are estimated, we can build scenarios in two ways:
 - To see the effects of different exogenous “storylines” on the species (for example, climate change) and how this impacts human welfare
 - to see the cost of a range of conservation responses, from inaction to different policy options

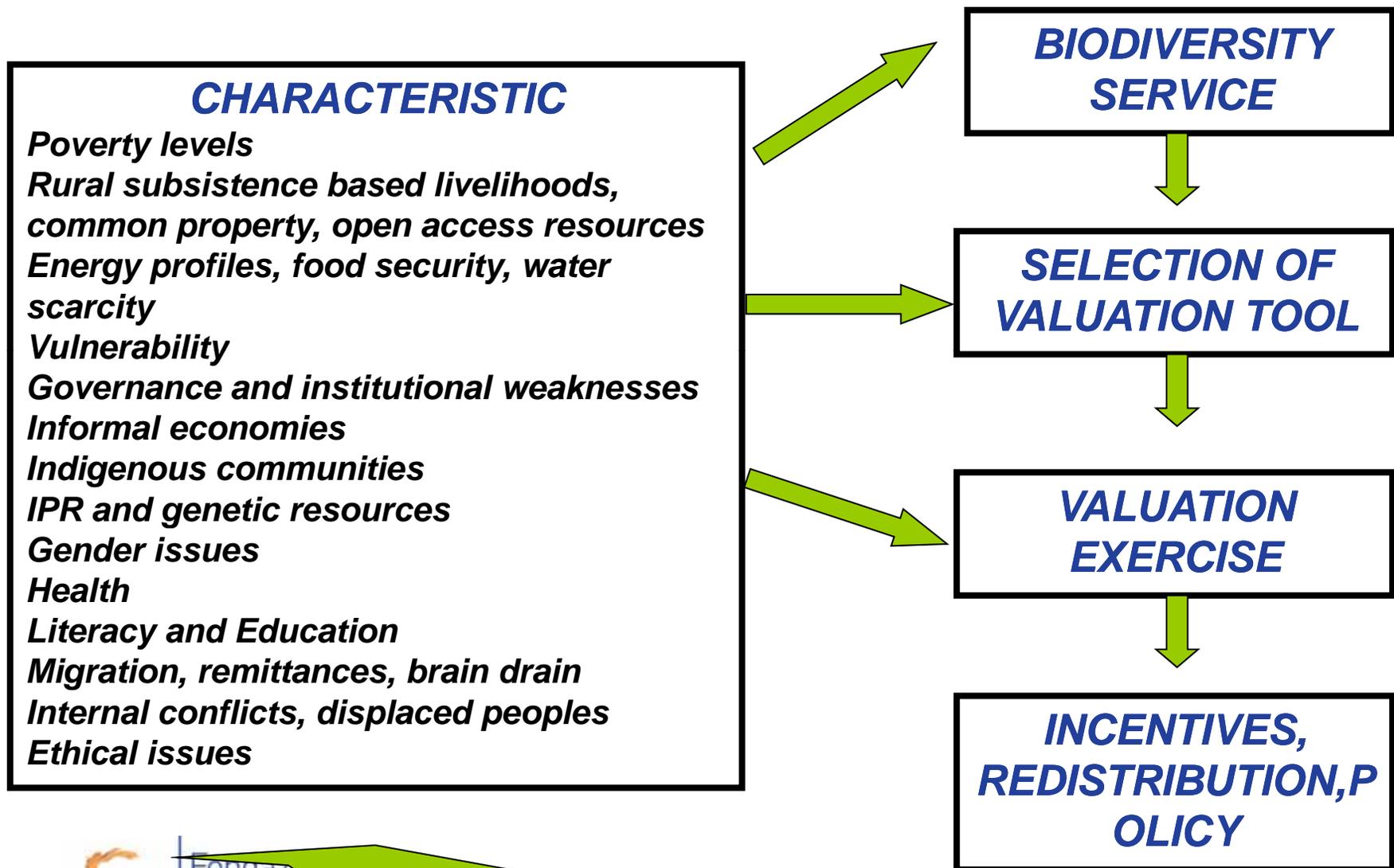
The Process of Environmental Valuation



Integrating ecology and economics: a research agenda for valuing ecosystem services



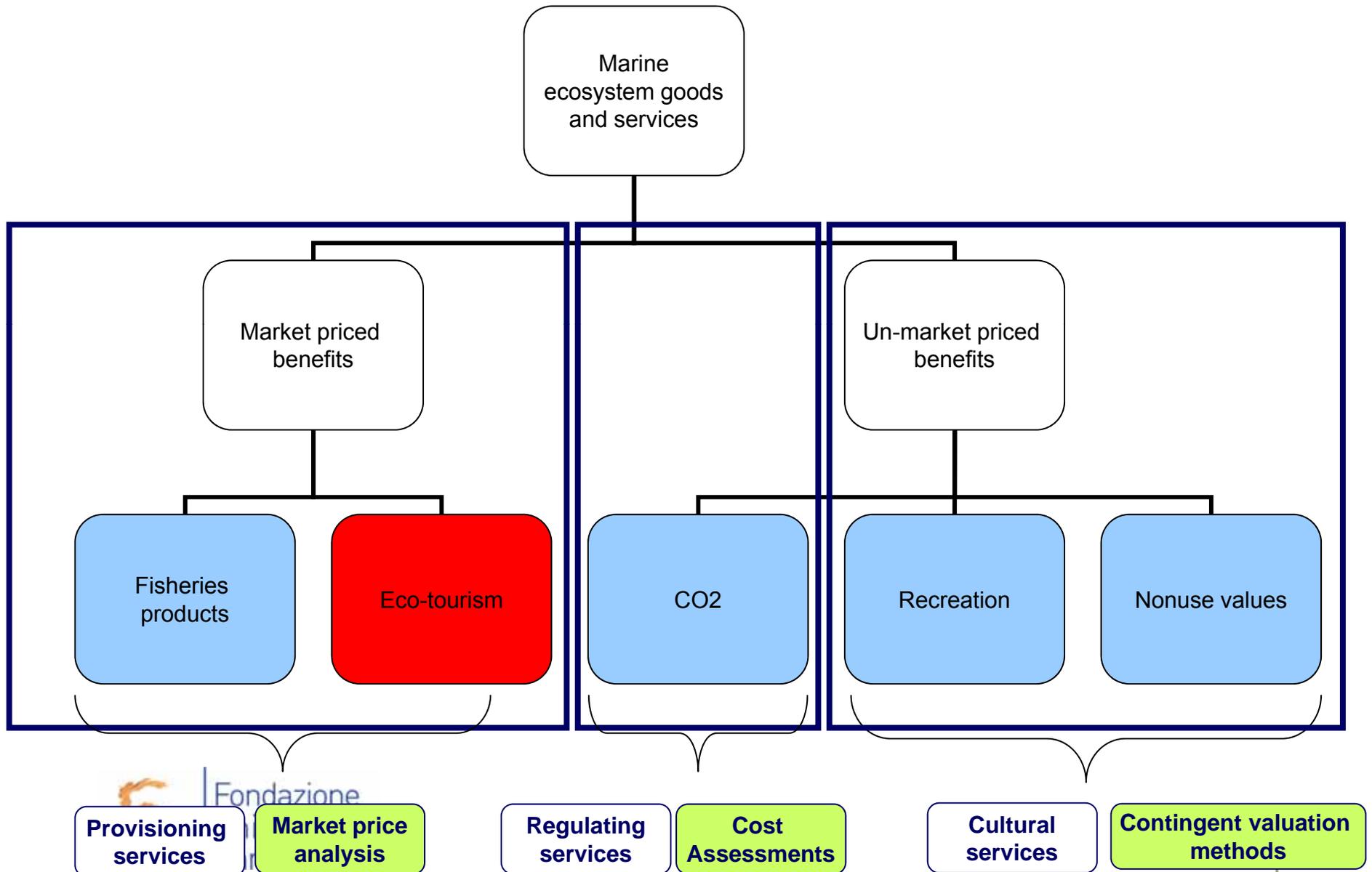
The Valuation Challenges in Developing Countries



What methods are best suited here?

- **The need to identify appropriate valuation methods for each type of the MEA services**
- **Adaption to local cases where necessary**
- **Most valuation done in the developed world, the need to adapt methods to developing country peculiarities**
- **To better capture the full of benefits, a hybrid valuation approach**
 - **Market-based methods for eco-tourism services**
 - **Contingent valuation methods for cultural services**

A Hybrid Valuation Approach



The Distribution of Ecosystem Benefits

- **Stakeholder participation in decision-making and resource management**
- **Who are the winners and the losers of the biodiversity changes?**
- **To whom accrues the benefits? Who pays the cost?**
- **Intra-generational versus inter-generational equity**
- **Spatial scale matters**

- **Communities (as present generation stakeholders and managers of the resource)**
- **Schools (future generations)**
- **The possibility to assess economic values of the turtle education programmes in the region**

The BIOLAC Project: Main Objectives

- **Define a valuation protocol**
- **Identify case studies**
- **Monetary and non-monetary values**
- **Design of incentive measures**
- **Co-participatory conservation frameworks: biodiversity matters but people matter!**

People Matter!



A Roadmap: the FEEM / WIDECAST Collaboration

- **Localised community studies (Trinidad as the first)**
- **Regional study (based on marine eco-regions of WIDECAST)**
- **Development of generic survey instruments (FEEM and WIDECAST)**
- **Execution at WIDECAST offices (with FEEM's support)**
- **Statistical and econometric data analyses and policy briefs (FEEM)**
- **Output available to communities, NGO's, governmental organisations**

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