

Use of economic valuation and design of policy instruments

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OVERVIEW

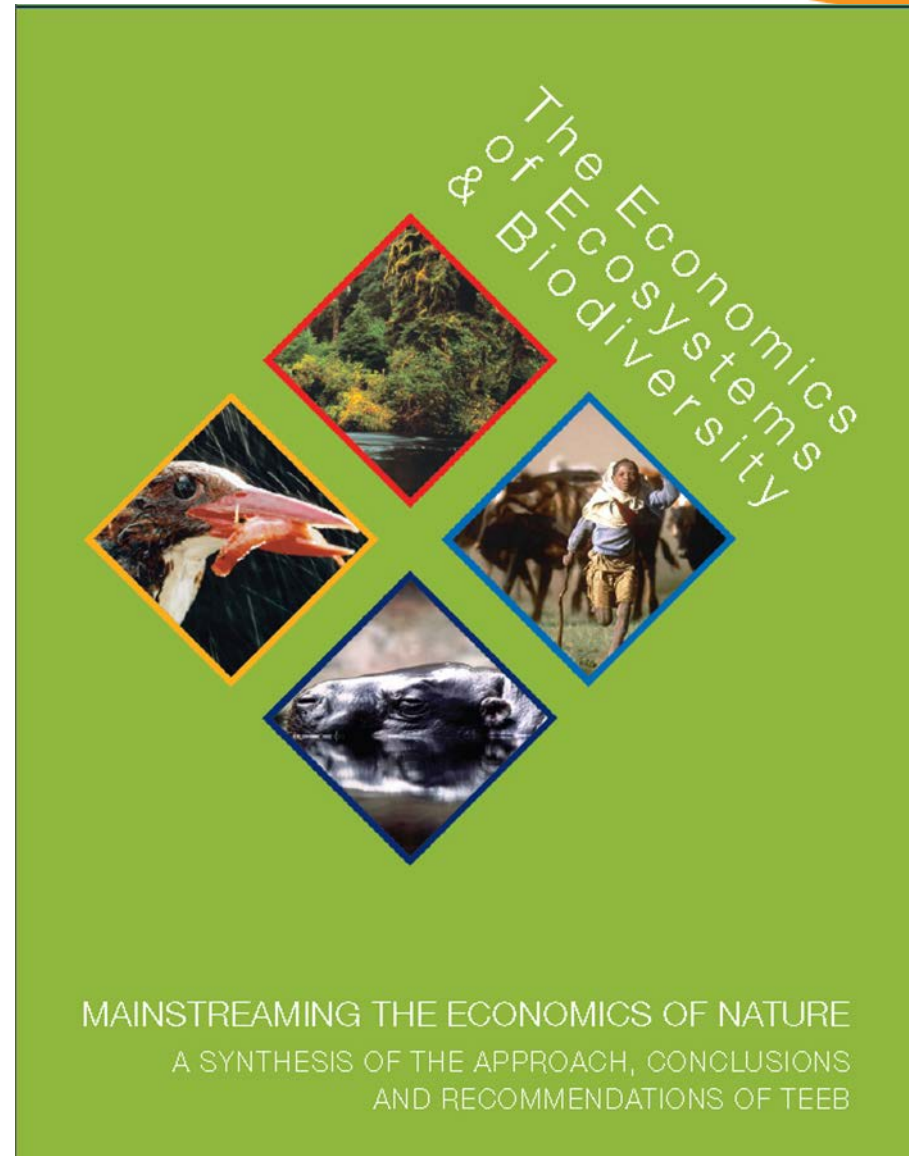
- TEEB
- Biodiversity and biodiversity loss
- Concepts of value
- Approaches to valuing biodiversity
- Ecosystem assessments

TEEB

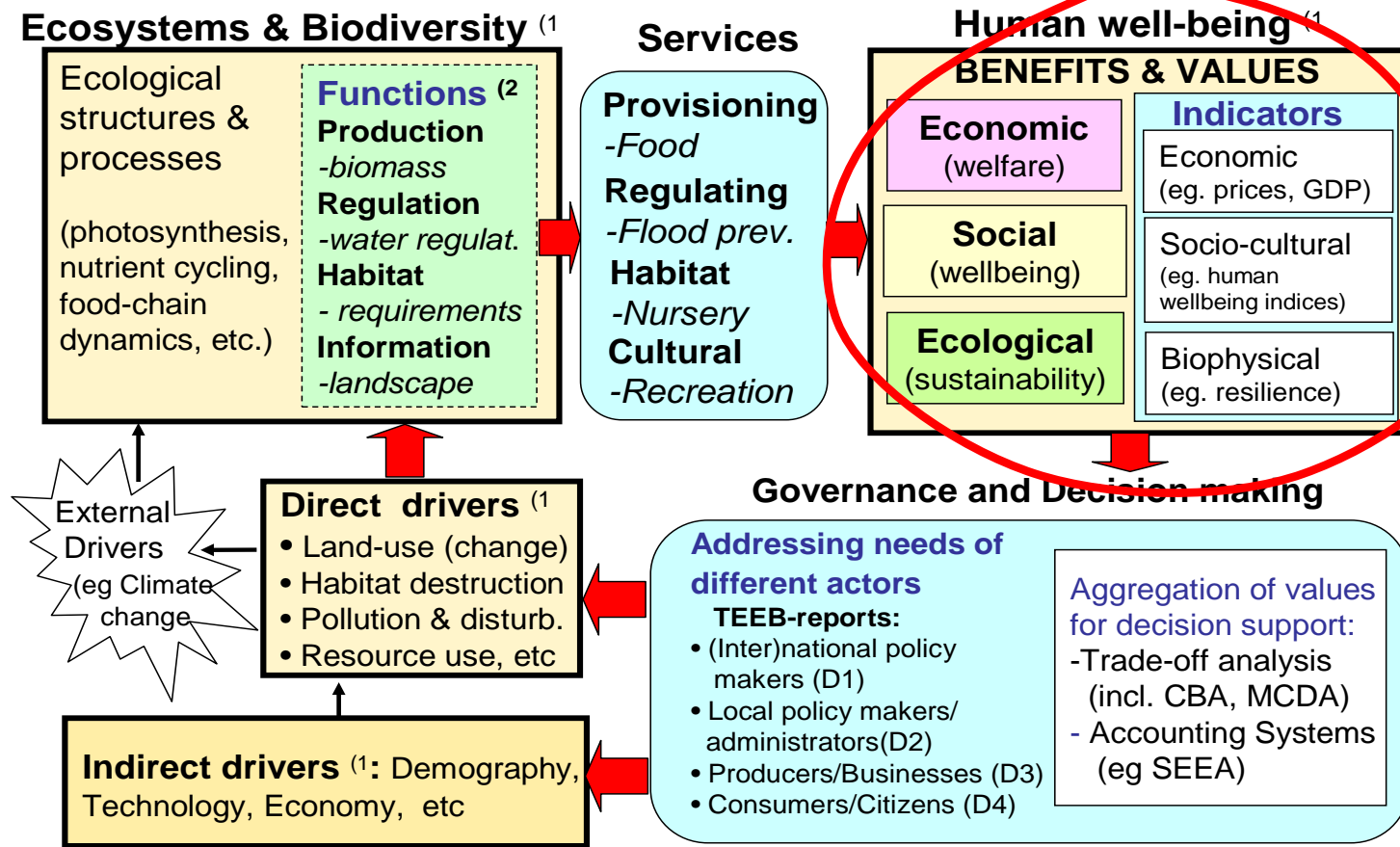
The Economics of Ecosystems and Biodiversity

Biodiversity
contributes to
human welfare
through the delivery of
ecosystem services.

TEEB (2010):
Annual global economic
impact of biodiversity loss
= \$2 - 4.5 trillion / yr



TEEB conceptual framework

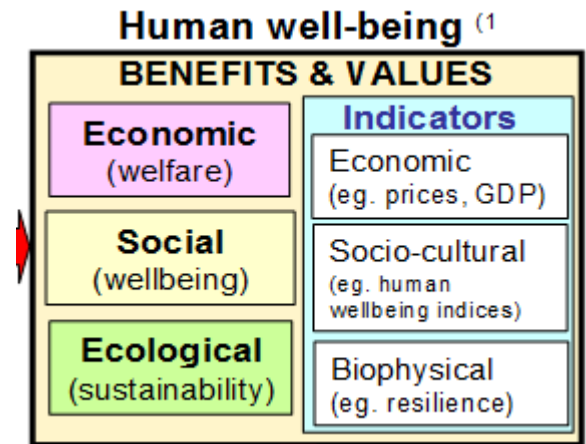


¹⁾ The four bold-lined, brown filled boxes coincide with the overall MA-Framework

²⁾ subset of ecosystem processes & components that is directly involved in providing the service

Benefits and values

- Economic benefits:
 - Captures ‘total economic value’.
 - Use values: e.g. Direct use values and Indirect use
 - Non-use values: Option, bequest, existence
 - There are a ranges of economic methods to capture these values
- Social-cultural benefits:
 - Includes mental health, historical, ethical, religious and spiritual values.
- Ecological values:
 - Ecological measures such as integrity, ‘health’ or resilience indicators
 - Important to determine critical thresholds and minimum requirements for ESS provision



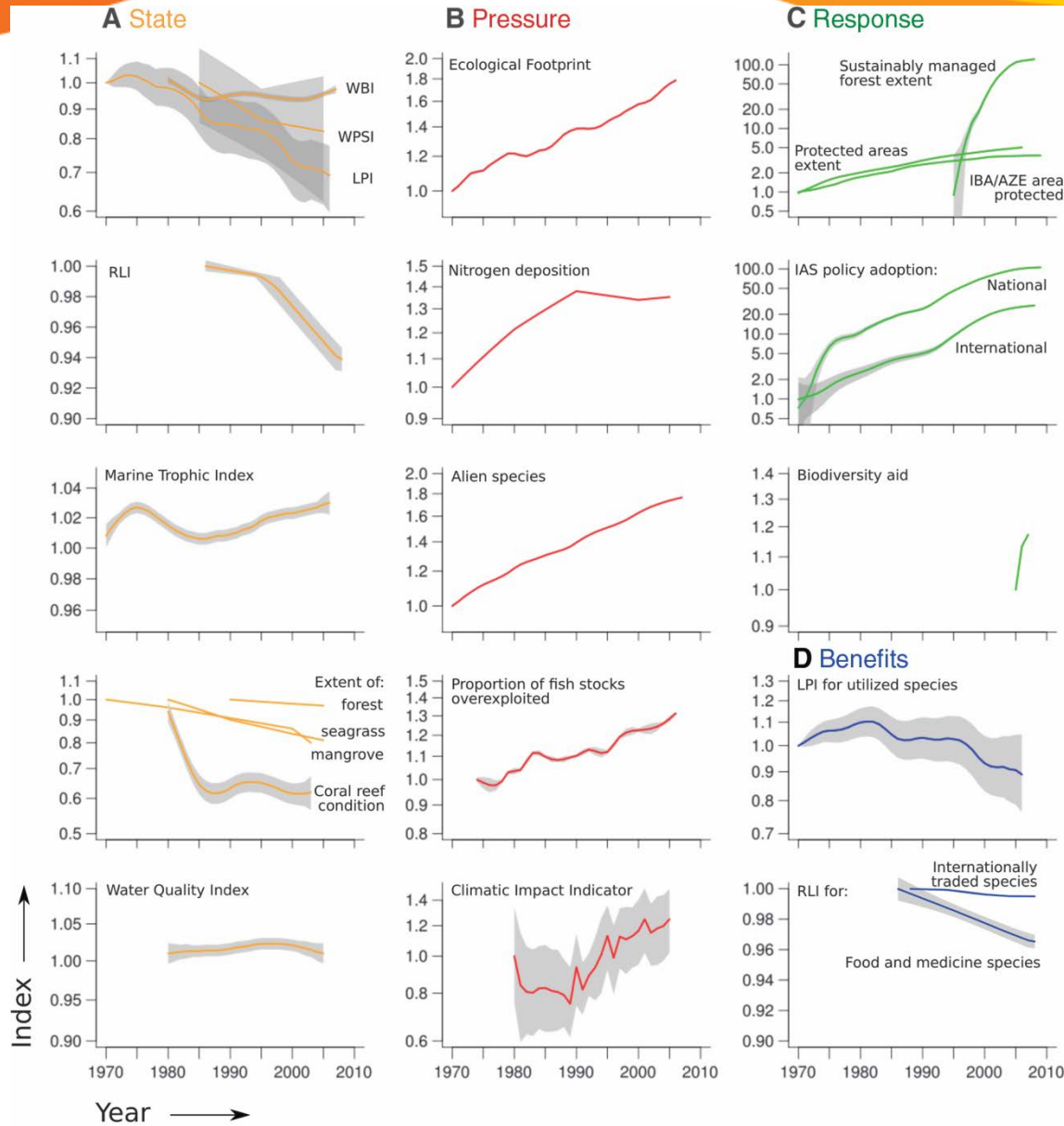
Biodiversity, biodiversity loss and policy

Biodiversity Trends

- A. the state of biodiversity
- B. pressures upon it
- C. responses to address its loss
- D. the benefits humans derive from it.

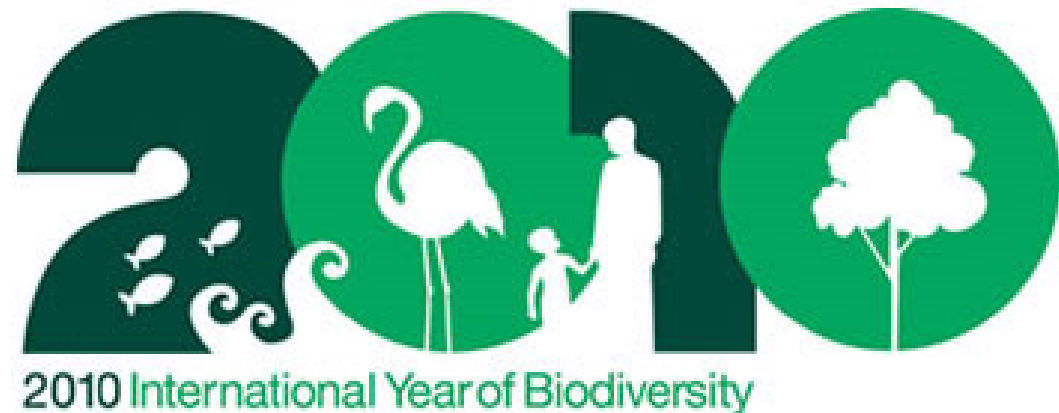
WBI, Wild Bird Index;
 WPSI, Waterbird Population Status Index;
 LPI, Living Planet Index;
 RLI, Red List Index;
 IBA, Important Bird Area;
 AZE, Alliance for Zero Extinction site;
 IAS, invasive alien species.

Source: Butchart et al. (2010) *Science*



In 2002, Governments set 2010 as a deadline to achieve a significant reduction in the rate of loss of biodiversity for reducing poverty.

All assessments of progress indicate that we are far from reaching this goal.



2010 Biodiversity Targets

- Reducing the rate of loss of the components of biodiversity
- Promoting **sustainable use** of biodiversity;
- Addressing the major threats to biodiversity;
- Maintaining ecosystem integrity, and **the provision of goods and services provided by biodiversity in ecosystems, in support of human well-being;**
- **Protecting traditional knowledge, innovations and practices;**
- **Ensuring the fair and equitable sharing of benefits** arising out of the use of genetic resources;
- Mobilizing financial and technical resources for implementing the Convention and the Strategic Plan.



**Biodiversity
targets
are very
much
linked to
human
use!**

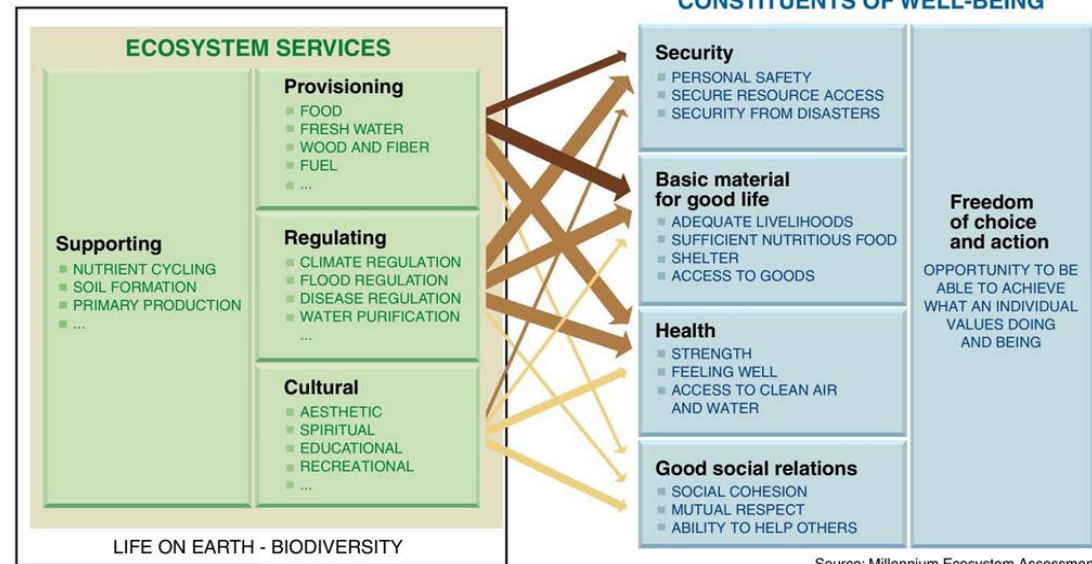


Concepts of value



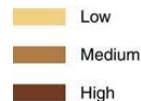
Why value biodiversity and ecosystem services?

- People attain a wide range of social, economic, cultural, spiritual and health benefits from biodiversity – often termed ‘ecosystem services’
- These benefits are often ‘un-priced’ and therefore risk being ignored in decision making.
- Governments need to deliver ‘value for money’ on nature conservation policies.
- Ecosystem service assessments can provide evidence of the value of ecosystem services delivered by biodiversity

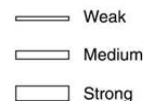


Source: Millennium Ecosystem Assessment

ARROW'S COLOR
Potential for mediation by socioeconomic factors

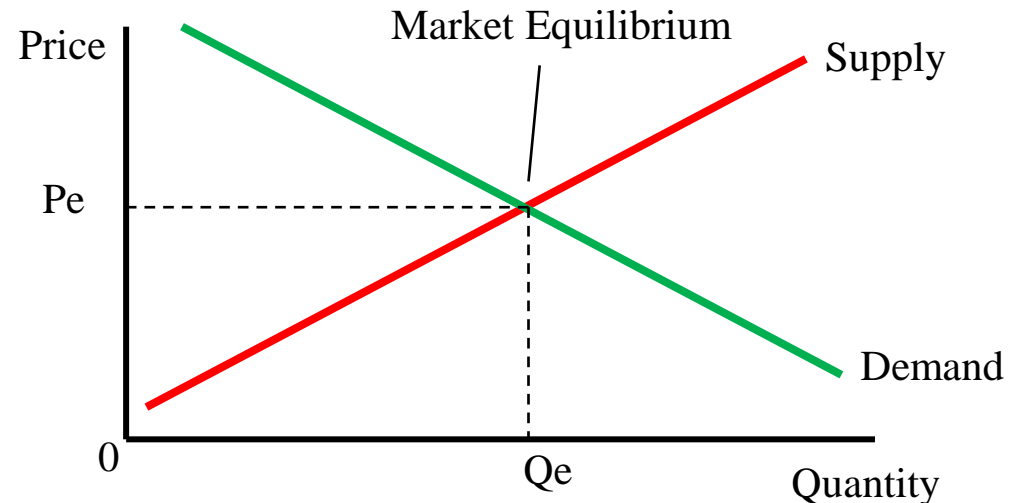


ARROW'S WIDTH
Intensity of linkages between ecosystem services and human well-being



How 'conventional' goods and services are valued?

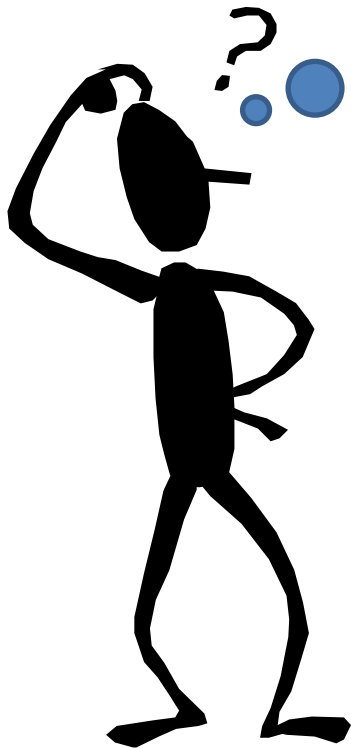
- Economic desires are expressed through a market where supply of and demand for a good interact.
- The market price provides an indication of the value of the good.
- Competitive markets (in the absence of distortions) will allocate resources to achieve the Pareto optimum efficient allocation of those resources.



Market failure

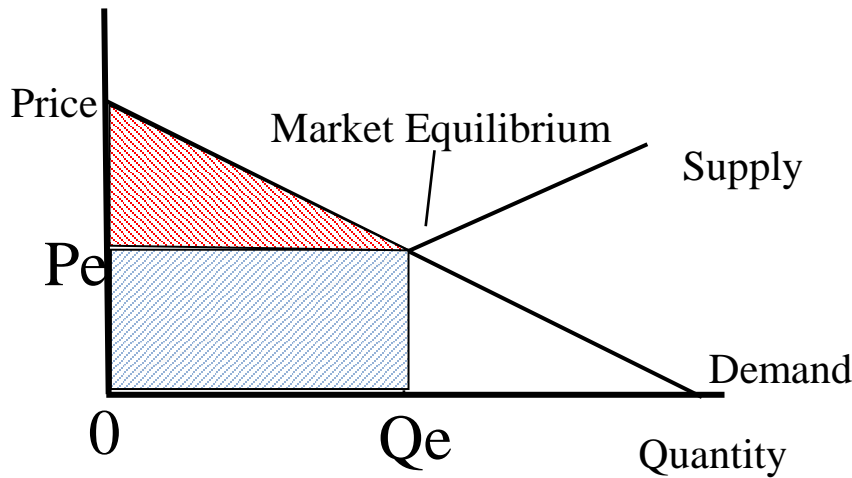
- Markets often fail to deliver biodiversity and ecosystem services:
 - Public good
 - Externality
 - Property rights
- Biodiversity and ESS have thus largely been ignored in decision making by policy makers, businesses and the public.
- Recently, attempts have been made to incorporate biodiversity and ESS into decision making

So if there is no market price for biodiversity and ecosystem services, how can we value it?

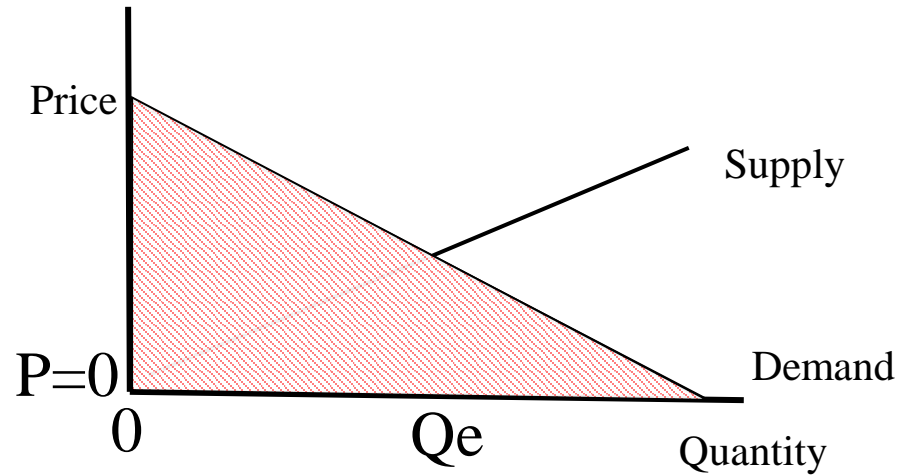


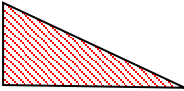

Alternative measures used to indicate 'value' of environmental goods

Normal market goods



Non-market environmental goods

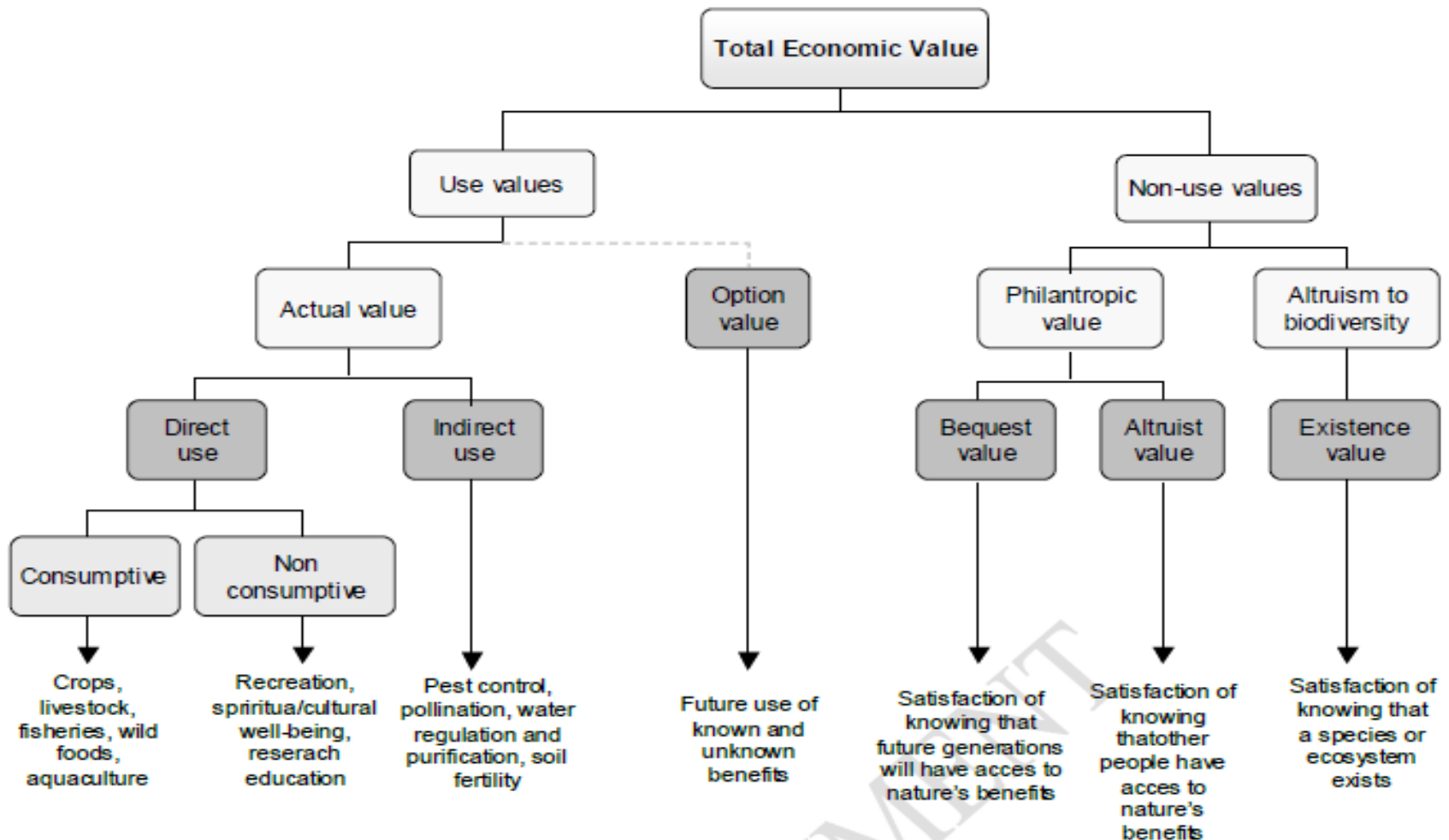


Consumer surplus = 
 Market price = 

Consumer surplus indicates people's max WTP.

For an environmental good, it is the area under the demand curve above the price ($p = 0$).

Value Types within the TEV Approach



TEV and ecosystem services

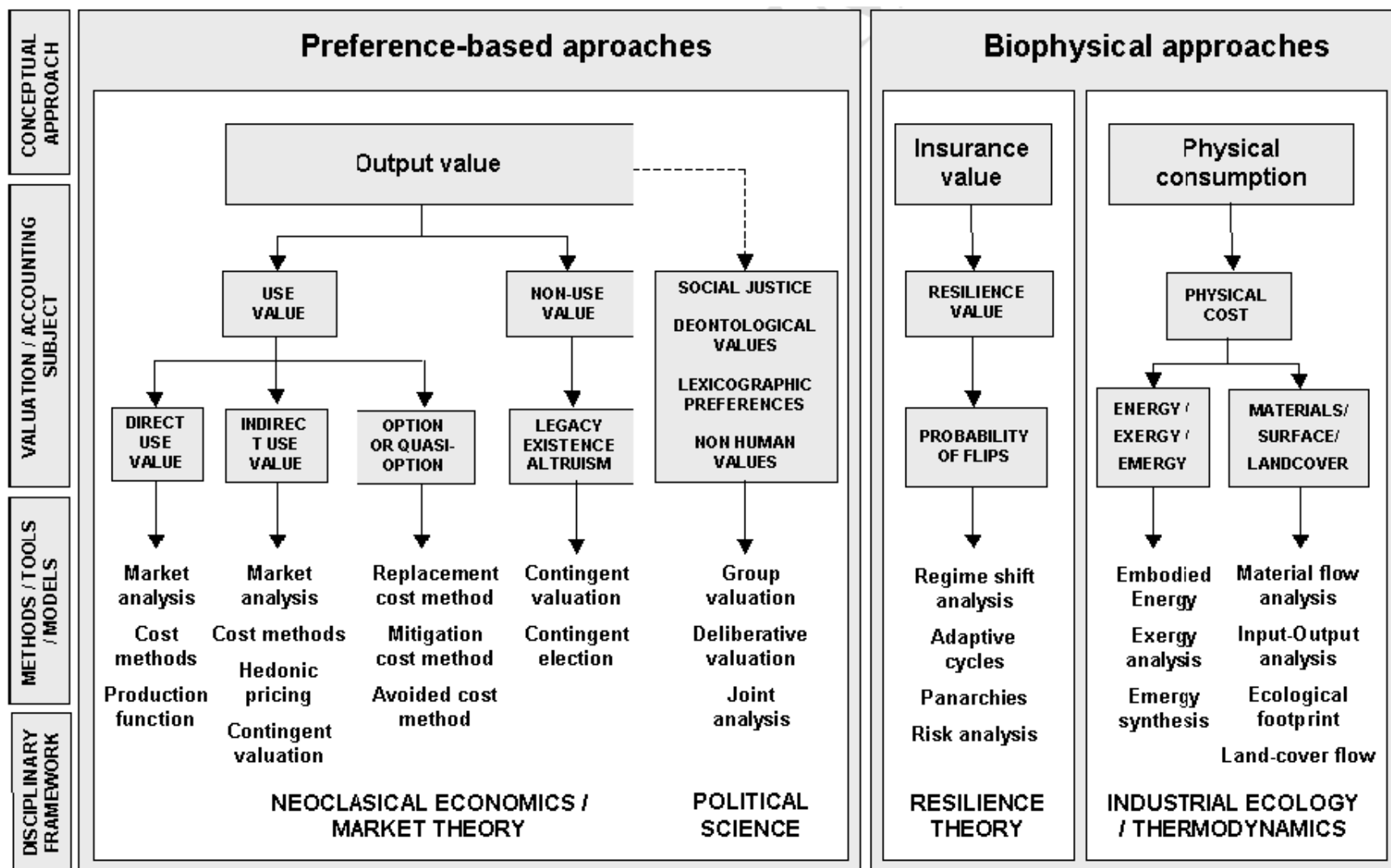
Group	Service	Direct Use	Indirect Use	Option Value	Non-use Value
Provisioning	Food; fibre; fuel; bio chemicals; natural medicines; pharmaceuticals; fresh water supply	✓	NA	✓	NA
Regulating	Air-quality; climate; water; natural hazard; carbon storage; nutrient cycling; micro-climate functions	NA	✓	✓	NA
Cultural	Cultural heritage; recreation and tourism; aesthetic values	✓	NA	✓	✓
Habitat/ supporting	Primary production; nutrient cycling; soil formation	Valued through other ES categories			

Approaches to valuing biodiversity

Approaches to Valuing Ecosystem Services

- **Direct market valuation approaches:** use data from actual markets
 - market price-based approaches
 - cost-based approaches
 - approaches based on production functions
- **Revealed preference approaches:** economic agents “reveal” their preferences through their choices
 - Travel cost method
 - Hedonic pricing approach
- **Stated preferences approaches:** simulate a market and demand for ecosystem services by means of surveys on hypothetical (policy-induced) changes in the provision of ecosystem services
 - Contingent valuation method
 - Choice modelling
- **Value transfer:** transfers values from existing studies to a new policy context

Linking methods to values



Approaches to valuing biodiversity

- Early valuation studies largely focused on individual species or habitat, e.g. White et al. (1997) used CV to value:



£11.91

(£6.4 million)



£7.44

(£4.0 million)

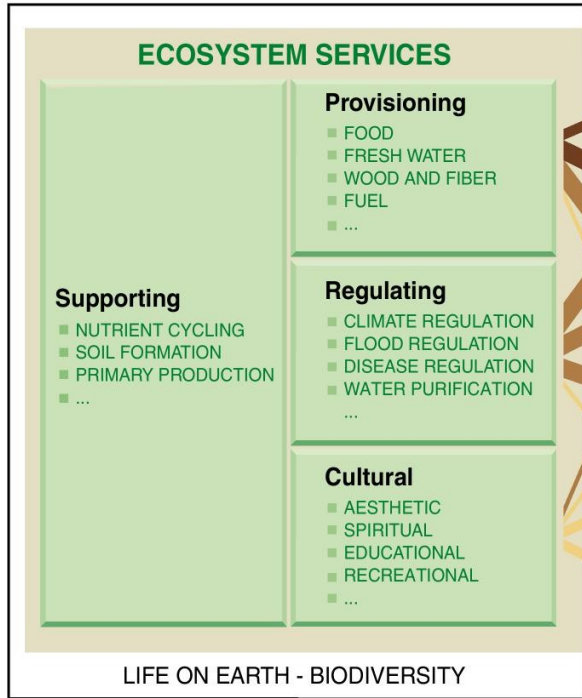
- New 'Ecosystems approach' to valuation aims to identify and value the wide range of 'ecosystem service' benefits from biodiversity

Ecosystem Assessments

Ecosystem approach to valuation

‘An ecosystems approach to valuation provides a framework for looking at **whole ecosystems** in decision making, and for **valuing the ecosystem services they provide**, to ensure that we can maintain a healthy and resilient natural environment now and for future generations.’

(Defra, 2007)



CONSTITUENTS OF WELL-BEING



MEA:
Linking
Biodiversity to
Ecosystem
Services

Source: Millennium Ecosystem Assessment

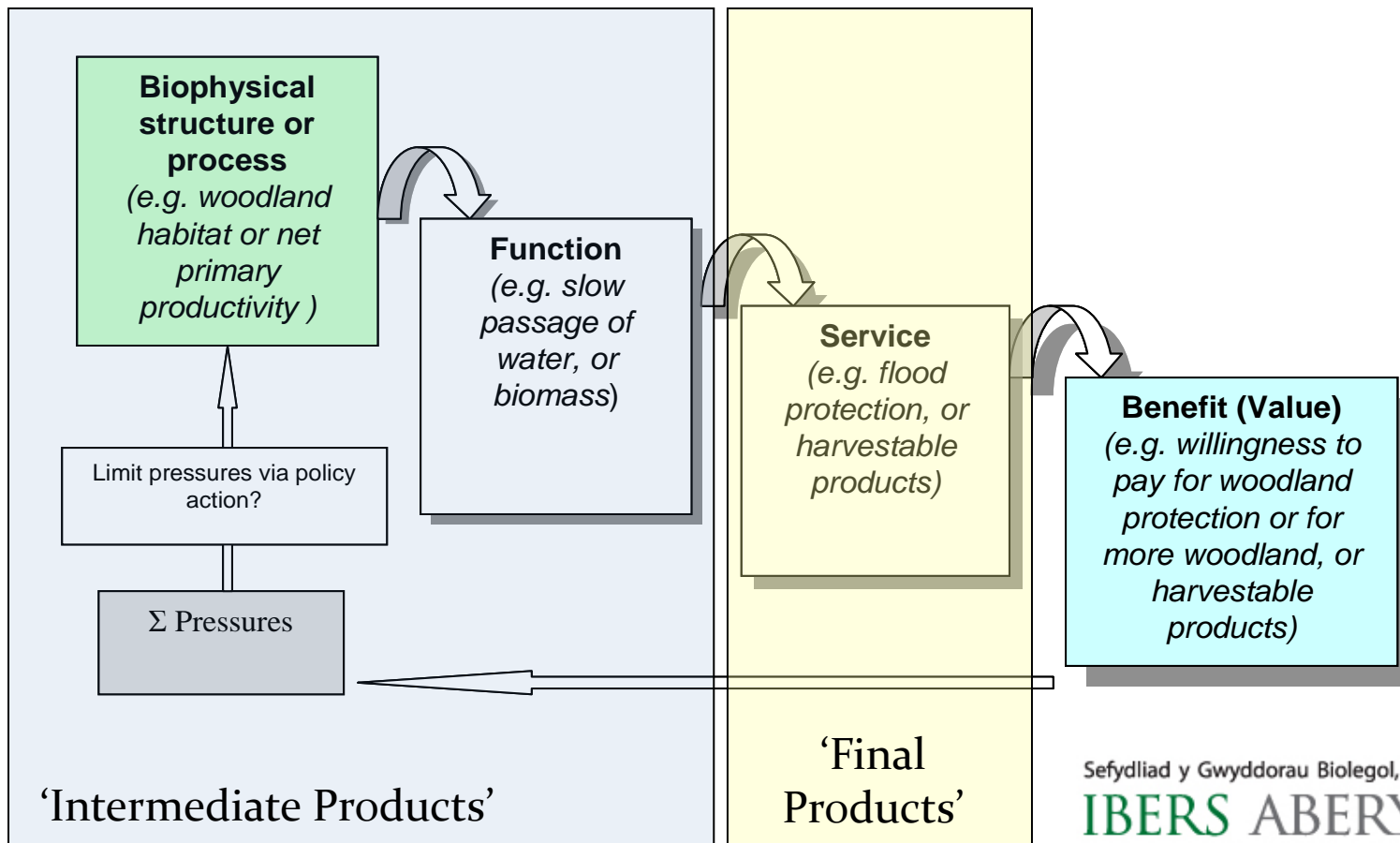
ARROW'S COLOR
Potential for mediation by socioeconomic factors

- Low
- Medium
- High

ARROW'S WIDTH
Intensity of linkages between ecosystem services and human well-being

- Weak
- Medium
- Strong

An 'Ecosystems Approach' to biodiversity valuation



Source: Haines-Young *et al.*, (2006)

Ecosystems

- ... a functioning interdependent grouping of living things existing in equilibrium with their physical environment.
- In ecosystems (such as those in deserts, forests, wetlands, mountains, lakes, rivers, and agricultural landscapes), living creatures, including humans, form a community, interacting with one another and with the air, water, and soil around them. If one part is damaged or disappears, it can have an impact on everything else.

Ecosystems services

- Ecosystems provide valuable *services* for people; ‘ecosystem services’.
- There is no single way of categorising ecosystem services, but include the provision of :
 - Resources for basic survival, such as clean air and water;
 - A contribution to good physical and mental health, for example through access to green spaces, both urban and rural, and genetic resources for medicines;
 - Natural processes, such as climate regulation and crop pollination;
 - Support for a strong and healthy economy, through raw materials for industry and agriculture, or through tourism and recreation; and
 - Social, cultural and educational benefits, and well-being and inspiration from interaction with nature.

MEA categories

Provisioning

Regulating

Cultural

Supporting

Category	Examples of ecosystem services provided
Provisioning services i.e. products obtained from ecosystems	<ul style="list-style-type: none">• Food e.g. crops, fruit, fish• Fibre and fuel e.g. timber, wool• Biochemicals, natural medicines and pharmaceuticals• Genetic resources: genes and genetic information used for animal/plant breeding and biotechnology• Ornamental resources e.g. shells, flowers
Regulating services i.e. benefits obtained from the regulation of ecosystem processes	<ul style="list-style-type: none">• Air-quality maintenance: ecosystems contribute chemicals to and extract chemicals from the atmosphere• Climate regulation e.g. land cover can affect local temperature and precipitation; globally ecosystems affect greenhouse gas sequestration and emissions• Water regulation: ecosystems affect e.g. the timing and magnitude of runoff, flooding etc.• Erosion control: vegetative cover plays an important role in soil retention/prevention of land/asset erosion• Water purification/detoxification: ecosystems can be a source of water impurities but can also help to filter out/decompose organic waste• Natural hazard protection e.g. storms, floods, landslides• Bioremediation of waste i.e. removal of pollutants through storage, dilution, transformation and burial
Cultural services i.e. non-material benefits that people obtain through spiritual enrichment, cognitive development, recreation etc	<ul style="list-style-type: none">• Spiritual and religious value: many religions attach spiritual and religious values to ecosystems• Inspiration for art, folklore, architecture etc• Social relations: ecosystems affect the types of social relations that are established e.g. fishing societies• Aesthetic values: many people find beauty in various aspects of ecosystems• Cultural heritage values: many societies place high value on the maintenance of important landscapes or species• Recreation and ecotourism
Supporting services, necessary for the production of all other ecosystem services	<ul style="list-style-type: none">• Soil formation and retention• Nutrient cycling• Primary production• Water cycling• Production of atmospheric oxygen• Provision of habitat

Source: MEA (2005)

Ecosystem Assessments: Why are they important

- Economic assessments of changes to biodiversity and ecosystem services is important as it:
 - Helps us recognise our impact on natural capital resources.
 - Help us develop actions to reduce our impacts
 - Help ensure the future sustainability of our planet and the well-being of people who depend on it's resources.

Incorporating ESS values into economic decision making

- CBA of policies and programmes
- Greening macro-economic indicators
 - Green GDP
 - Ecological footprints
 - Genuine savings
- Payment for Ecosystem Services

Summary

- Economic markets have generally failed to emerge for environmental goods and services
- However, people do attain benefits from these goods and services
- Environmental economists have developed a suite of methods in which to capture these benefits.
- We will further explore these methods in Day 2.