

An Introduction to Ecosystem Services (ESS) and ESS Valuation

Part 1: What are ecosystem services?

Natural capital and ecosystem services



- Natural capital are elements of nature that directly or indirectly produce value
- Natural capital consists of *stocks* (sustained capital assets such as minerals and ecosystems) and *flows* (which are services derived from stocks)
- Flows from stocks can be subdivided into *abiotic services* (e.g. oil formation from geological processes) and *ecosystem services* (the other benefits that humans obtain from nature)
- Hence, simply, ecosystem services are **the benefits people obtain from ecosystems**
- The services of ecological systems and the natural capital stocks that produce them are critical to the functioning of Earth's life support system

The Millennium Ecosystem Assessment (MEA) gives 4 categories of ecosystem services (ESS)

1. Provisioning ecosystem services

- Provisioning ecosystem services are goods and materials the ecosystem provides for us directly
- This includes food, freshwater, wood, fuel etc.

2. Regulating ecosystem services

- Regulating ecosystem services are the benefits obtained from the regulation of ecosystem processes
- For example, natural water purification, climate regulation etc.

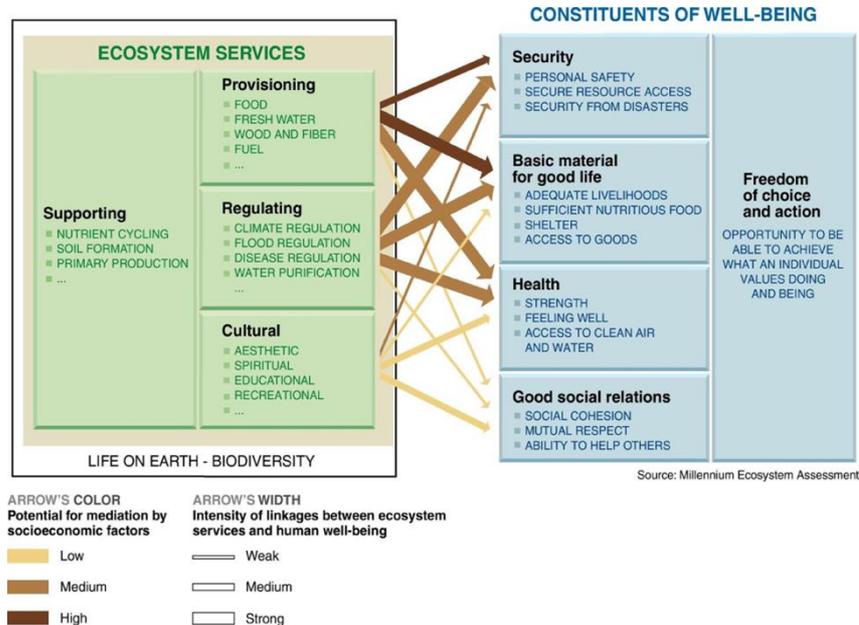
3. Cultural ecosystem services

- Cultural ecosystem services include the non-material benefits obtained from ecosystems
- For example, cultural ecosystem services include aesthetic, spiritual, educational and recreational benefits obtained from ecosystems

4. Supporting ecosystem services

- Supporting ecosystem services are the processes that are necessary for the production of other services (e.g. nutrient cycling, soil formation, primary production and photosynthesis etc.)

Ecosystem services contribute to human well-being



- The Millennium Ecosystem Assessment (MEA) concluded that ecosystem services produce benefits by contributing to human well-being
- For example, security (which is a component of human well-being) is intrinsically linked to resource access and security from disasters (both of which are a benefit from ecosystem services)
- Human well-being is also linked to having basic materials and goods, and ecosystem services enable us to secure these goods (i.e. ecosystem services provide access to sufficient nutritious food)
- Health, another constituent of human well-being, also is linked to ecosystem services as access to clean air and water are both products of ecosystem services
- Without ecosystem services, we would have more dirty water, less material for shelters, and poorer health – altogether, this means that ESS are intrinsically linked to human well-being constituents

Changing ecosystem services and drivers of change

- The Millennium Ecosystem Assessment (MEA) found that approximately 60% of ecosystems were being degraded or used unsustainably
- Because of this, the MEA argued that ecosystem service provision was declining due to the following factors:

Direct drivers of change

- Changes in land-use (i.e. urbanization)
- Technology advancement and use
- Resource consumption
- Climate change

Indirect drivers of change

- Demographic – increasing populations drive direct drivers of change
- Economic – globalization and capitalism are exacerbating the direct drivers of change

Part 2: An Introduction to ESS Valuation

Valuation of ecosystem services (ESS): why should we do it?

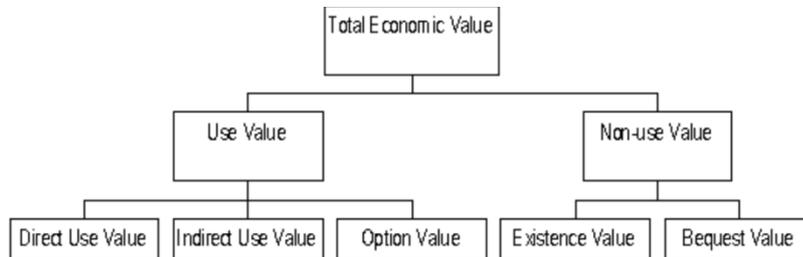
- 1) Because ecosystem services *are* valuable
 - ESS contribute to human welfare and therefore represent part of the total economic value of the planet
 - Costanza (1997) argues that the entire biosphere is worth \$16-54 trillion per year (average \$33 trillion per year) – compare this to global GNP which is about \$18 trillion
 - Indeed, the economies of Earth would grind to a halt without ESS, so ESS could be thought of as priceless and necessary
 - The effect on human welfare, environmental aesthetics, culture, and long-term ecological benefits is also considered to be priceless and worth saving
- 2) Because valuation saves nature
 - ESS are not fully accounted for in commercial markets – as a result, they are often given too little weight in policy decisions and are neglected – this may lead to degradation
 - As such, degradation often leads to the loss of *non-marketed* aspects of ecosystems, even if the economic value of *non-marketed* benefits is high
 - Putting a price on nature ensures that ecosystems will be managed through systems that aim to protect ESS, making for a more sustainable model of development
 - It can also justify the need to provide financial resources to sustain, restore or enhance ESS
 - It also incentivizes continued service provision, governance, and ecosystem protection
- 3) Because valuation helps policy makers
 - ESS valuation helps to determine whether a policy intervention is justified through losses or gains in ESS costs (i.e. weighing up and comparing the costs)
 - Also, valuation helps policy makers discern between the relative importance of an ESS, which can be useful in complex ecosystem management
 - Valuation also helps to rationalize, quantify, and analyze something that would otherwise be very complicated (i.e. makes ecosystems *legible* to policy makers)

What are the disadvantages of valuing ESS?

- 1) ESS valuation is very difficult
 - Valuing ecosystem services is difficult, and methods are always imprecise and flawed
 - Most methods systematically under-estimate the full value of ESS, especially considering that most ecosystem services are essential for life itself (priceless)
- 2) We cannot place a value on something that is effectively priceless
 - ESS are fundamental for life itself, and it would cost trillions to replicate natural processes through human invention – how could we possibly value this?
- 3) Value is subjective and relative to one's positionality
 - Valuation of ESS is highly context specific and is normally guided by the perspectives and requirements of the beneficiaries

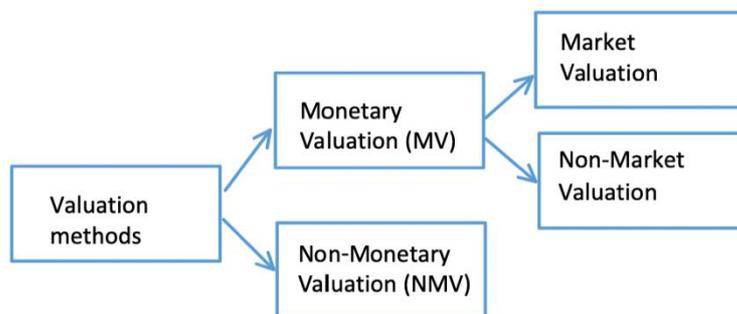
- Different groups may place different values on nature – as scientists often do the valuation, there could be a slight bias towards them

Using Total Economic Value (TEV) to find ESS value



- Total Economic Value (TEV) is a framework used to value ecosystem services
- TEV views ecosystem goods and services as flows of benefits to humans
- TEV is subdivided into **use values** (ESS that support consumption) and **non-use values** (ESS that provide human benefits)
- Use values are then subdivided into **direct use values** (values from direct use of ESS – e.g. timber) and **indirect use values** (values from regulatory processes that support or protect humanity – e.g. flood protection)
- Estimates of the use value and non-use value are then added together to give the total economic value of a particular ESS

How are values estimated for the components of TEV?



- A range of valuation methods are used to calculate the use and non-use values for the TEV calculation
- Valuation methods can be subdivided into **monetary valuation** and **non-monetary valuation**

Monetary valuation (MV)

- Monetary valuation can be further subdivided into two types: **market valuation** and **non-market valuation**

Market valuation

- **Market price** – willingness to pay (WTP) for a particular good on the formal market
- **Productivity method** – estimates economic activity values for ESS products and services that contribute to the production of commercially marketable goods

Non-market valuation

- **Avoided damage and replacement costs** – how much would it cost to replicate the role of an ESS with a manufactured replacement? For example, how much would it cost to replace natural mangroves with flood engineering?
- **Revealed preference methods** – these include the ***travelling and access costs*** people are willing to pay for recreational purposes. This includes the impact of natural scenery on house prices (hedonic valuation)
- **Stated preference methods** – these include asking people to monetarily quantify their willingness to pay (WTP) for an ESS. This could include the **willingness to pay (WTP) to keep an ESS**, or the **willingness to accept (WTA) to give up the ESS**

Non-monetary valuation (NMV)

- Non-monetary valuation (NMV) often is similar to revealed and stated preference methods and focuses on social preferences
- However, unlike their monetary counterpart, these often focus on qualitative and quantitative methods, rather than monetary methods
- NMV includes **deliberative and participatory valuation** – this is the use of focus groups and citizen juries to assess the preference order of ecosystem services