

# 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.

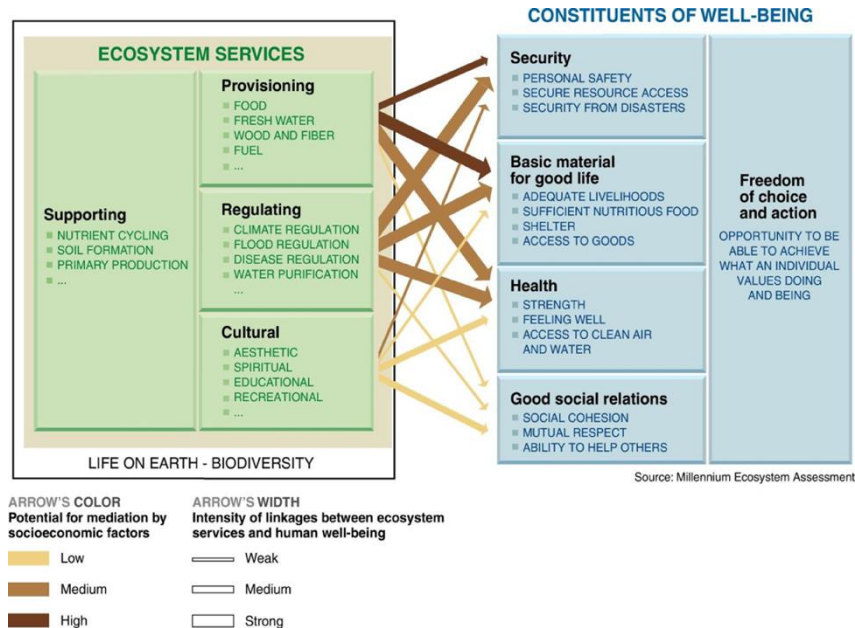
#### 3. Cultural ecosystem services

- 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?

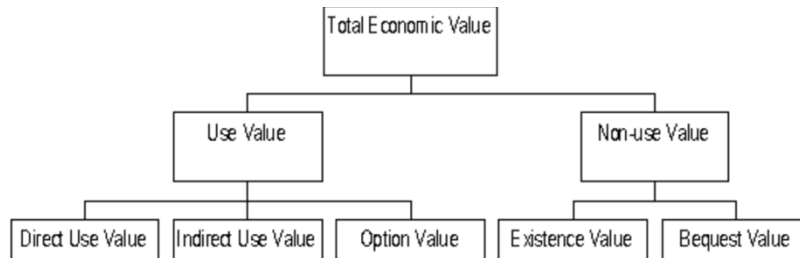
- 1) Because ecosystem services *are* valuable
  - ESS contribute to human welfare and therefore represent part of the total economic value of the planet
  - Costanza (1997) argues that the entire biosphere is worth \$16-54 trillion per year (average \$33 trillion per year) – compare this to global GNP 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

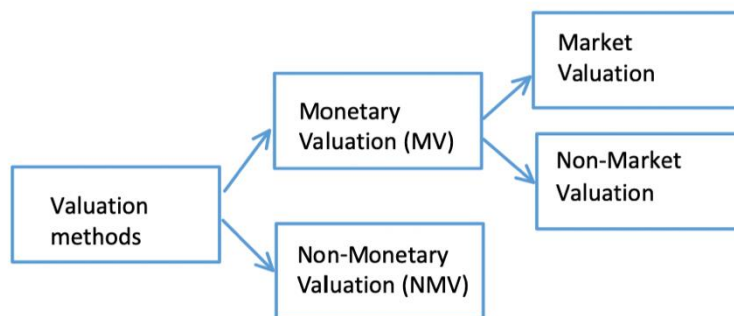
- Different groups may place different values on nature – as scientists often do the valuation, there could be a slight bias towards them

### 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