



System of
Environmental
Economic
Accounting

Discussion paper on valuation 3: List of key Ecosystem Services from a valuation perspective

*for the Forum of Experts in SEEA Experimental Ecosystem
Accounting 2018 – breakout 3, area 4*

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1 Introduction

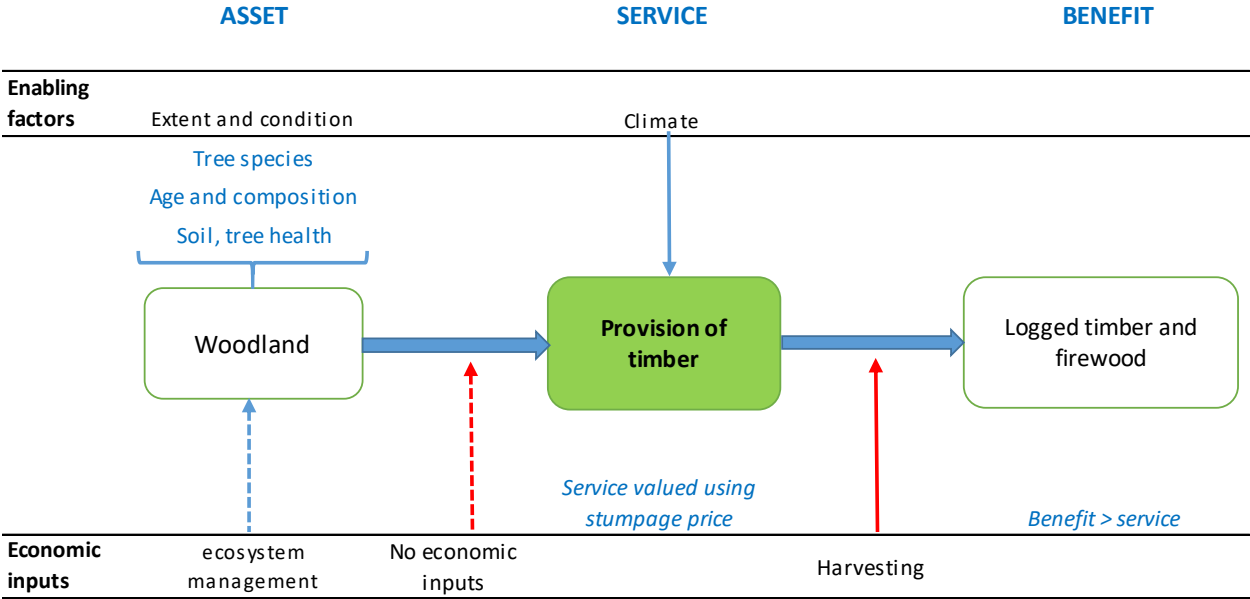
The intention of this Working Paper is to stimulate discussion on the definition and delineation of ecosystems services from a valuation perspective. No attempt has been made to include all possible services or all possible valuation methods and in some cases it may be necessary to group some of the services together for the purposes of valuation, or to separate them out further. The ultimate objective is to identify those key services on which there is broad consensus on the nature of the service and the options for valuation, and those services on which further work is needed as a matter of priority.

The paper is intended to support discussion in the Forum Break Out session #3 on 19 June 2018 for the valuation group (Group 4). The discussion will build on discussions on valuation methods in the Forum Break Out session #1 on 18 June 2018. There will then be a further opportunity to discuss consistency with the work on the classification of services in Break Out session #4 on 20 June 2018.

The following tables provide, separately for provisioning, regulating and cultural services, some tentative suggestions for indicators of the physical nature of the service, for the benefit and for the monetary value. The tables are each preceded by an illustrative logic chain for a particular service, as this can be a useful way of clarifying the relationships between the three types of indicators.

1.1 Provisioning services

Figure 1. Illustrative logic chain for timber provisioning services from (semi-) natural woodland



NB there may be some economic inputs to ‘managed’ semi-natural woodland such as thinning, access provision etc., in which case they would need to be netted off the stumpage price.

Table 1. Relationship between **provisioning** services and benefits. Note: for provisioning services the users are the beneficiaries

Description of ecosystem service	Potential indicator for physical value of service	Benefit	Indicator for the benefit	Potential indicator for monetary value of service	Comments
Contribution to growth, such as substrate, nutrients for the growth of crops	Amount of harvested crop produced	Crops (for food, energy, materials)	Amount of crops produced	Resource rent generated by crop production	Need to explore other options if rents are low or negative
Animal feed for grazing animals	Amount of animal feed consumed by animals	Animal husbandry	Animal feed, animal production	Value of replacing animal feed with other sources	Resource rents an alternative option
Contribution to the growing of plantation timber and other biomass	Amount of timber or other material accumulated in accounting period	Timber and biomass produced in plantations	Amount of timber or other material accumulated in accounting period	The resource rent generated by timber or other material production	Stumpage price net of economic inputs and overheads is an alternative
Contribution to the growing of timber and other biomass	Amount of timber or other material harvested	Timber and biomass from (semi-) natural woodland or other habitats	Amount of timber or other material produced	The resource rent generated by timber or other material production	Stumpage price net of economic inputs and overheads is an alternative
Contribution to the growing of non-timber forest biomass	Amount of other material harvested	Non-timber biomass from (semi-) natural woodland	Amount of non-timber biomass produced	The resource rent generated by timber or other material production	Stumpage price net of economic inputs and overheads is an alternative
Providing a habitat and other contributions to aquaculture	Amount of aquaculture produce harvested	Aquaculture production of animals such as fish and shellfish	Amount of aquatic animals produced	The resource rent generated by harvesting reared aquatic animals	The parallel with husbandry of grazing animals suggests we should try to measure the replacement cost of the 'feed' provided by the ecosystem, some of which may be fishmeal

Provision of (clean) water	Amount of water abstracted	Water for drinking or other purposes	Amount of water abstracted	Resource rent generated by water abstraction	Water for many purposes is an intermediate service, and very prone to double counting. May be better to recognise that water is provided by the atmosphere as an abiotic flow, and ecosystems simply regulate its flow and quality
Harvestable stocks of wild animals	Amount of harvested animals	Hunting of animals	Amount of hunted animals, expressed in numbers of animals or tonnes of meat	Resource rent of production	
Genetic materials from animals, plants, algae, fungi	Amount of genetic materials from animals, plants, algae, fungi. (e.g. number of specimens/samples)	Genetic materials from animals, plants, algae, fungi	Amount of genetic materials from animals, plants, algae, fungi. (e.g. number of specimens/samples)	Potentially quantifiable on the basis of the commercial value of the samples and the resource rent generated	Risk of double counting if the service is used by the agriculture or aquaculture sectors

Note: Recreational fishing and hunting, possibly gathering of berries and mushrooms, are seen as cultural services, although a separate value may still be attributed to the produce; abiotic flows (such as clay and sand) are not included.

1.2 Regulating services

Figure 2. Illustrative logic chain for air filtration services

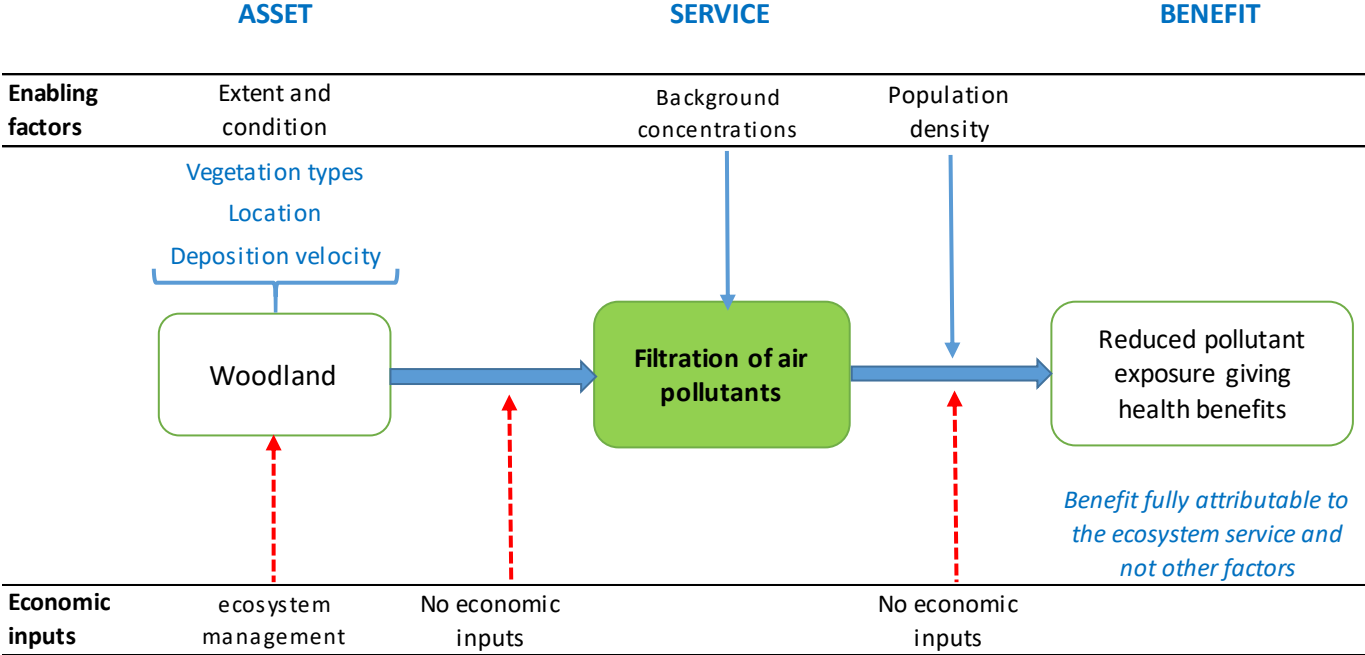


Table 2. Relationship between **regulating** services and benefits

Description of ecosystem service	Potential indicator for physical value of service	Benefit	Indicator for the benefit	Potential indicator for monetary value of service	Comments
Carbon sequestration and regulation of emissions of other greenhouse gases	Quantity of carbon sequestered	Reduction in net GHG emissions / contribution to CC targets	Quantity of carbon (and other GHG) sequestered	Carbon price	Which carbon price? Welfare value may only be possible if benefit is defined as contribution to CC targets. Need clarity over who beneficiary is (e.g. Government, commercial buyers of credits). Has implications for how the market is hypothesised NB carbon storage seen as a liability?
Mediation through breakdown, filtering or storage of air pollutants	Quantity of pollutant mediated	Reduced impact of pollutant concentrations on human activities and health	Reduced hospital admissions and / or increased longevity (as measured by expected life years) (compliance with air quality suitability requirements for different airshed exposure/activity)	Avoided treatment costs Government valuation of a life year or Quality of Life Year saved (if available)	Clarify the beneficiary. May need to account for a range of benefits; and distinguish between use of ecosystem as a sink service and actual mediation of wastes
Mediation through breakdown, filtering or storage of water pollutants	Quantity of pollutant mediated	Reduced impact of pollutant concentrations on human activities and health	Aquatic activity specific water quality indicators (compliance with sanitation suitability requirements for different aquatic exposures/uses)	Water treatment costs avoided Avoidance costs (use of less fertilizer and opportunity costs of other land use practices upstream) Increased riparian land value	Various benefits / beneficiaries? E.g. water companies, anglers, other abstractors – which suggests more than one indicator? May be an intermediate service for some other services

Description of ecosystem service	Potential indicator for physical value of service	Benefit	Indicator for the benefit	Potential indicator for monetary value of service	Comments
Mediation through breakdown, filtering or storage of other wastes	Quantity of pollutant mediated	Reduced impact of pollutant concentrations on human activities and health	Soil quality (compliance with sanitation suitability requirements for different land uses)	Cost of alternative methods of waste disposal Increased land value at potential disposal sites	Disposal of manure on agricultural land could come here?
Noise reduction	Reduction in decibels from absorption or deflection of noise by vegetation	Enhancing environment in which people live	Population numbers benefiting from the noise attenuation above health standards for different types of exposure	(A proportion of) damage costs avoided Defensive expenditures Avoided treatment costs Government valuation of a life year or Quality of Life Year saved (if available)	Distinction between exchange and welfare values (latter would be full damage cost avoided)
Water and wind erosion control	Top soil depth reduction avoided	Reduced loss of fertile soil; reduced sedimentation in ecosystems	Crop yield Depends on the final beneficiary of intermediate services	Crop price Preventive expenditures - cost of erosion control measures. Cost of sediment removal	Offsite disservice for downstream cropland in alluvial soils. Offsite service for water infrastructure owners (irrigation, hydropower, water supply). Attribution / counterfactual challenge for downstream / downwind impacts

Description of ecosystem service	Potential indicator for physical value of service	Benefit	Indicator for the benefit	Potential indicator for monetary value of service	Comments
Water regulation	Volumes of flood water retained (through water use by vegetation, infiltration of soils, hydraulic roughness and interruption of delivery of sediment run-off); maintenance of low flows for regulated supply downstream	Reduced flood risks and enhanced opportunities to use water in the dry season	Numbers of properties benefiting from reduced flood risk (if this can be estimated) Reduced combined sewage treatment in urban areas	Replacement flood storage costs that would be necessary without the service Reduced combined sewage treatment costs Replacement storage necessary to maintain supply	Storage and gradual release of water by upstream forests thereby maintaining baseline flows and reducing peak flow Damage costs avoided would tend to a welfare value Need to clarify counterfactual land-use Service can be final or intermediate/inter-ecosystem
Coastal protection by coastal ecosystems such as mangroves, dunes, coral reefs	Reduced storm surge depths, wind speeds Avoided coastline erosion	Coastal protection	Numbers of properties benefiting from reduced flood risk or coastline erosion	Replacement cost (subject to usual caveats) Avoided damage costs Change in expected annual losses	Need to clarify counterfactual land-use
Pollination: provision of insect pollinators	Pollinator habitat suitability	Pollination	Pollinator density on crop	Cost of honeybee pollination services rental, or other replacement cost	Pollination of wild flowers is a supporting service; pollination of crops is an intermediate service
Pest and disease control	Pest predator habitat suitability	Reduction of pests	Pest predator density on crops	Cost of alternative measures	Include 'Pest control for Agriculture' with 'Pollination for Agriculture'? It's not always practicable to separate the two. Then separate out 'Control of pests etc. for humans'.

Description of ecosystem service	Potential indicator for physical value of service	Benefit	Indicator for the benefit	Potential indicator for monetary value of service	Comments
Nursery service	Depends on species?	Reproductive success of species	Smolt survival (salmon example)	Habitat restoration costs (salmon example: removal of physical barriers, artificial substrate, opportunity cost of foregone hydropower production)	Providing a habitat for nesting, spawning. Need to clarify counterfactual habitat quality. Intermediate service for recreational and commercial fishing
Regulation of rainfall patterns				Avoided productivity and other economic losses?	By maintaining hydrological cycles including by regulating local humidity, evaporation rates and temperatures. Difficulty in attributing land cover to patterns, given that weather systems cross accounting boundaries
Regulating micro-level temperatures through heat absorption and shading	Reduction of air temperature by vegetation on hot days; windbreak on winter days	Enhancing environment in which people live	Reduced productivity losses, avoided heatwave related deaths, and avoided energy costs (summer and winter)	Avoided loss in construction GVA, energy costs, health treatment costs	Clarity needed on counterfactual and how much adaptive behaviour this assumes

Figure 3. Illustrative logic chain for urban green space recreation services

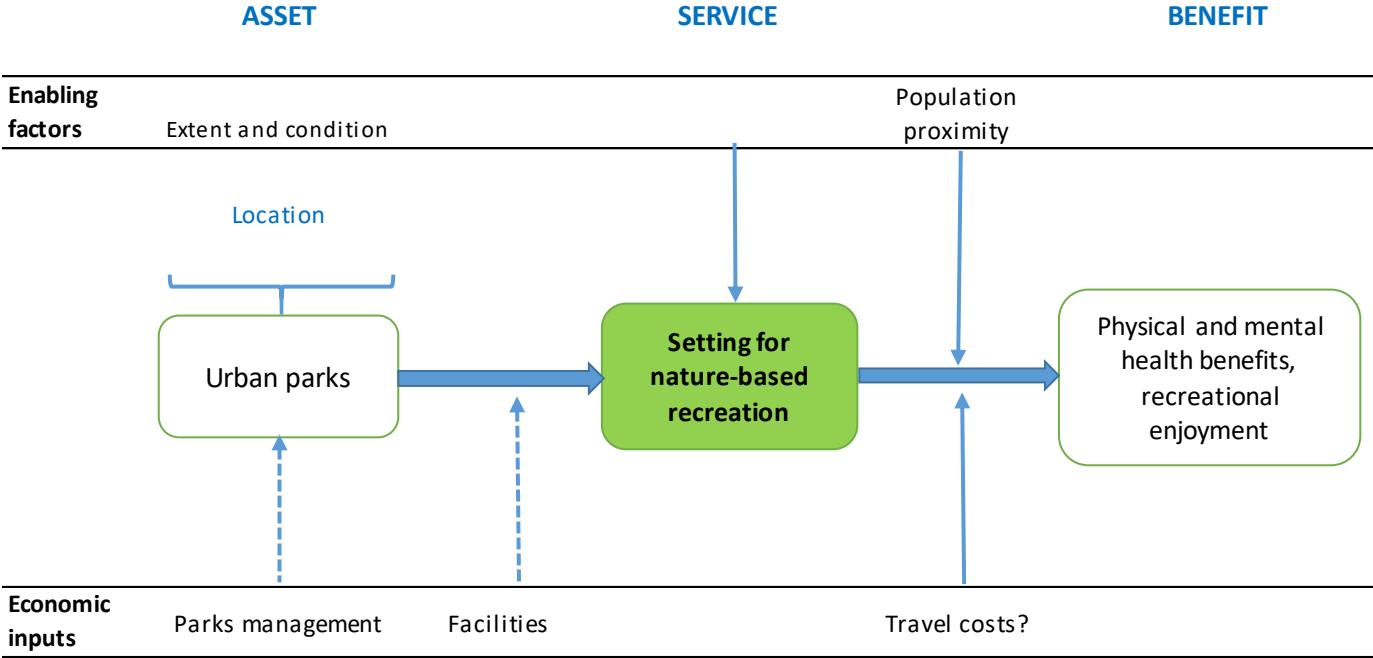


Table 3. Relationship between cultural services and benefits

Description of ecosystem service	Potential indicator for physical value of service	Benefit	Indicator for the benefit	Potential indicator for monetary value of service	Comments
Enabling activities promoting health, recuperation or enjoyment through active or immersive interactions with the natural environment	Number of visitors to a site; time spent at site; number of visitors using the site for significant levels of physical activity	Recreational enjoyment; mental and physical health; tourism	Two channels of benefit: (i) as an input to tourist and certain leisure production activities; (ii) directly to visitors / users, especially for local outdoor recreation not covered above	Travel costs, Willingness to Pay; Resource rent generated through tourism; admission fees net of other inputs	Service covers a range of distinctive activities and mutually exclusive benefits, and requires unpacking Care is required to avoid overlap of benefits and double counting
Enabling activities promoting health, recuperation or enjoyment through passive or observational interactions with the natural environment			Property prices (e.g. value of views); documentaries etc.	Hedonic pricing	Need to draw a clear distinction between active/passive and immersive/observational activities and the extent to which amenity values can isolate different aspects
Enabling scientific investigation and/or the creation of traditional ecological knowledge	Number of scientific research projects / visiting scientists.	Science and innovation, traditional knowledge		Research expenditure; government subsidies for publications etc.	
Enabling educational activities, training and learning experiences	Number of schoolchildren visiting a site / hours spent	Education	Educational activity / output	Valuation of teachers' time (a form of replacement cost); admission fees	Benefit will take different forms according to habitat e.g. nature trails, farm visits, outdoor activity centres, forest schools, general benefits to learning
Conservation of landscapes of ecological or cultural/religious significance	Numbers of conservation volunteers or time spent volunteering might be relevant indicators	Landscape and cultural heritage conservation		Valued at costs spent to maintain area, including value of volunteers time	Active enjoyment is captured in services specified above; passive enjoyment difficult to quantify