Valuation of environmental assets

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Lets start with some definitions

* (Economic) Asset is a store of value representing an economic benefit or series of **economic benefits** accruing to the **economic owner** by holding or using the item over a period of time. It is a means of carrying forward value from one accounting period to another. (SNA 2025)

SNA View of non-financial assets

Classification of Non-Financial Assets in the SNA
Produced non-financial assets (excluding produced natural resources)
Fixed assets (Dwellings, Machinery, etc.)
Inventories (Materials and supplies etc.)
Valuables (Precious metals, art etc.)
Non-produced non-financial assets (excluding non-produced natural resources)
Contracts, leases and licenses
Crypto assets
Purchased goodwill and marketing assets
Natural resources—more on this later

Some more definitions

* (Recall) Environmental assets are the naturally occurring living and non-living components of the Earth, together constituting the biophysical environment, which may provide benefits to humanity. (SEEA CF 2012 and SNA 2025)
* Ecosystem assets are contiguous spaces of a specific ecosystem type characterized by a distinct set of biotic and abiotic components and their interactions. (SEEA EA 2021 and SNA 2025)

The SNA View (continued)

* Natural Capital = Natural Resources + Ecosystem Assets

* Natural resources are assets that naturally occur, such as land, mineral and energy resources, water resources, and animal, tree, crop and plant resources, that have an economic value and over which ownership may be enforced and transferred.

* Ecosystem assets not explicitly recognized as an economic asset

SNA classification of natural resources

Classification of Natural Resources in the SNA
Land
Mineral and energy resources
Non-renewable mineral and energy resources (e.g., coal, oil)
Renewable energy resources (e.g., solar)
Biological resources
Water resources
Other natural resources

SEEA Classification of Environmental Assets

1	**Mineral and energy resources**
1.1	Oil resources
1.2	Natural gas resources
1.3	Coal and peat resources
1.4	Non-metallic mineral resources (excluding coal and peat resources)
1.5	Metallic mineral resources
2	**Land**
3	**Soil resources**
4	**Timber resources**
4.1	Cultivated timber resources
4.2	Natural timber resources
5	**Aquatic resources**
5.1	Cultivated aquatic resources
5.2	Natural aquatic resources
6	**Other biological resources** (excluding timber resources and aquatic resources)
7	**Water resources**
7.1	Surface water
7.2	Groundwater
7.3	Soil water

Measuring environmental assets in monetary terms

Some reasons for doing valuation of environmental assets

* Inform policies and decisions around the management of the assets
* Integration with National Accounts
* Measuring of natural capital

Valuation Principles & Methods

* Value at balance sheet date (e.g. end of financial year
* Value using market prices
  * Market prices are amounts of money that willing buyers pay to willing sellers
  * Exchange prices/value or transaction prices – generally observable
* If prices not observable need to determine a price that would be applicable if a market had existed

Methods for Estimating Market Prices

* Market price equivalents
  * Prices for similar products or assets
* Written down replacement costs
  * Used for buildings and machines equal to the original purchase price adjusted for depreciation and the current replacement cost
* Net present value (NPV)
  * Assess the value of the future flow of benefits (income) from using or owning the asset

Logic of NPV

1. Estimate past Resource Rent (RR) from sale of resources
2. Estimate the physical stock and remaining asset life assuming a rate of extraction
3. Estimate future annual flows of RR over the asset life
4. Discount each future annual estimate of RR
5. Sum the discounted estimates => NPV

Measures of Resource Rent

* Residual value method
  * Generally obtained from national accounts and related data
* Appropriation method
  * Based on payments made by extractors of resources to owners of resources – e.g. royalties paid to government for mining
* Access price method
  * Based on payments made by extractors for access rights and licences – e.g. quotas in fishing
* In theory all provide the same estimate but in practice all can be quite different

Residual Value Method

Relationships between different flows and income components

Output (sales of extracted environmental assets at basic prices, includes all subsidies on products, excludes taxes on products)
Less Operating costs
Intermediate consumption (input costs of goods and services at purchasers' prices, including taxes on products)
Compensation of employees (input costs for labour)
Other taxes on production plus other subsidies on production
Equals **Gross operating surplus—SNA basis**[a]
Less Specific subsidies on extraction
Plus Specific taxes on extraction
Equals **Gross operating surplus—for the derivation of resource rent**
Less **User costs of produced assets**
Consumption of fixed capital (depreciation) + return to produced assets
Equals **Resource rent**
Depletion + net return to environmental assets[b]

Asset life

* The asset life is the expected time over which an asset can be used in production or the expected time over which extraction from a natural resources can take place
* In a very simple case

  Asset life = closing physical stock/expected annual extraction over expected annual growth

  Different for some assets

Valuation — Net present value

* Net present value (NPV) is the discounted value of future economic benefits from a given asset

$$NPV = \sum_{t=1}^{T} \frac{RR_1}{(1+r_i)^t}$$

where:
RR=resource rent
T= reserve life, i.e. Closing stock ÷ extraction
r_i*= discount rate*

Natural resources in the 2025 SNA

First some details about GDP and NDP calculation

One way to calculate GDP

$GDP=C+I+G+(X-M)$

C=Consumption
I=Investment
G=Government Spending
X=Exports
M=Imports

Energy, for example, can be a big component of GDP

(2008 SNA) Net domestic product=GDP-Depreciation

(2025 SNA) Net domestic product=GDP-Depreciation-Depletion

Definition of depletion in SNA and SEEA (from yesterday)

* Depletion in physical terms, represents the decrease in the quantity of the stock of a non-produced natural resource over an accounting period that is due to the extraction of the natural resource by economic units occurring at a level greater than that of its growth.

Definition of depletion in SNA and SEEA

* In monetary terms, it corresponds with the decline in future economic benefits, due to extraction in excess of its growth, that can be earned from a resource, the value of which is based on the physical flows of depletion using the price of the natural resource in situ

Main changes

* Recording depletion as a cost of production (more details next)
* Explicit recognition of renewable energy resources such as solar, hydro, wind, geothermal as economic assets requiring valuation

Main changes

* Split ownership of natural resources between Government and private sector
* Various changes in the classifications pertaining to natural capital (as discussed already)

Depletion as cost of production

* Depletion, in monetary terms, corresponds with the decline in future income, due to extraction, that can be earned from a resource, the value of which is based on the physical flows of depletion using the price of the natural resource in situ.
* Net measures are conceptually preferred as they are more reflective of the actual costs borne in production

Depletion as cost of production

* Cost of depletion will be partitioned between extractor and legal owner (government)
* The attribution of depletion costs will be as follows:
  * Depletion in full recorded in production/ generation of income account of extractor
  * Depletion borne by government recorded via distribution of income account (through a negative rent which offsets the rent payment)

Depletion as cost of production

Production account
Expenditures

Code		S11 Non-financial corporations	S12 Financial corporations	S13 General government	S14 Households	S15 NPISHs	S1 Total economy	S2 Rest of the world	Goods and services	Total
P7	Imports of goods and services								499	499
P71	Imports of goods								392	392
P72	Imports of services								107	107
P6	Exports of goods and services							540		540
P61	Exports of goods							462		462
P62	Exports of services							78		78
P1	Output								3 617	3 617
P11	Market output								3 075	3 075
P12	Output for own final use								147	147
P13	Non-market output								395	395
P2	Intermediate consumption	1 477	52	220	115	17	1 881			1 881
D21	Taxes on products								141	141
D31	Subsidies on products (-)								- 8	- 8
B1g	Value added, gross / Gross domestic product	1 331	94	138	155	18	1 869			1 869
P51d	Depreciation	157	12	27	23	3	222			222
P8	Depletion	30			0		30			30
B1n	*Value added, net / Net domestic product*	1 144	82	111	132	15	1 617			1 617
B11	*External balance of international trade in goods and services*							- 41		- 41

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Thank you


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