

NSCASE(23)11

NSCASE Introduction to Natural Capital Depletion and Consultation on Guidance Note WS.6

Cover Note

It is our intention to submit for the Committee's consideration a series of papers on issues around natural resources raised through upcoming changes to the System of National Accounts. To facilitate optimal discussion around this complicated topic, a stage-by-stage approach has been adopted: we initially offer a paper 'for information' with no specific ONS recommendation at this stage. We ask the Committee to guide us on the areas of this topic they are comfortable with and those which need greater explanation. As this paper is an informational paper, external stakeholders have not been consulted.

1. Introduction

1.1. This paper covers a summary of the System of National Accounts (SNA) Guidance Note WS.6 on Accounting for the Economic Ownership and Depletion of Natural Resources ([Source](#)) alongside contextual information on natural capital depletion and informational resources. This is the first step in a multi-stage process of the ONS determining whether, and if so which and how natural resources will be recorded within the national accounts. The focus of this work is to ensure NSCASE have enough information to discuss the merits of:

A split asset approach for the economic ownership of natural capital; and the recording of depletion as a cost of production while also extending the range of production recorded from the natural environment.

While not the focus of this paper, we also lay the foundations for a discussion in a later NSCASE meeting, on the introduction and use of net measures accounting for depletion.

2. Recommendations Made Within the Guidance Note

2.1. This guidance note on accounting for the economic ownership and depletion of natural resources looks at the improvements that can be made from the 2008 SNA to incorporate environmental costs into the national accounts.

2.2. The recommendations are listed below:

2.3. In the SNA 2025, it is recommended to move natural resources to the current SNA principles of economic ownership. And where it is necessary to use a split asset approach to assign economic ownership to the institutional sector split by resource rent and risk.

2.4. For the SNA 2025, it is recommended that natural resource depletion is recorded as the cost of production, as the SEEA (System of Environmental Economic Accounting) currently does. This also removes anomalies in the existing balance sheet recording.

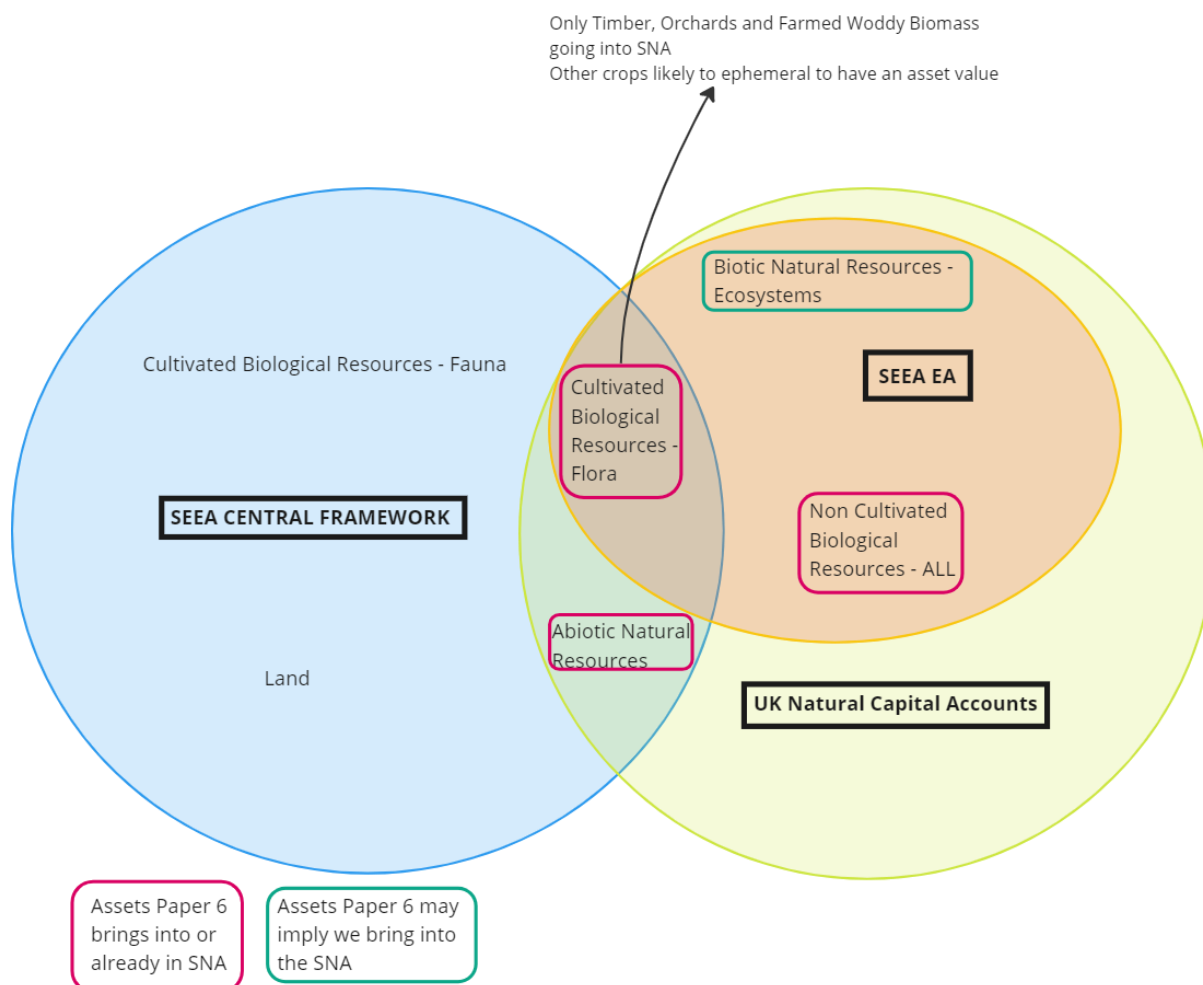
2.5. What is recorded as being depleted will be extended in the SNA 2025 to include non-cultivated biological resources.

- 2.6. The SNA 2025 is proposing that there should be an effort to put more emphasis on net measures rather than gross measures due to the recording of depletion.
- 2.7. ONS comes to NSCASE for discretionary advice on this topic and to draw on the expertise of the panel. When looking at the implementation, ONS will decide when, and if, it is feasible to implement these changes. The feasibility depends on resourcing constraints, external stakeholders, and ONS's vision. Though it should be noted that ONS should be able to measure all the assets introduced but doing so would require a multiyear research project to source, quality assure and publish the data required.

3. Natural Capital – General Background

- 3.1. When measuring the benefits derived from natural resources, there are three statistical sets of services: provisioning services, regulating services and cultural services. They enable us to separate the ways in which the natural world benefits society. This is a standard framework that is in the SEEA Ecosystem Accounting (EA). The 2008 SNA only records the monetary value of natural resources which have ownership rights enforced and accrue economic benefits to the owner within the accounting period. The SEEA CF uses these principles for monetary recording. However, in quantity terms, SEEA CF records all natural resources within a country and its economic zone. There are a few definitions for “natural resources” captured by the statistical guidance which are listed in Appendix 1. The overlaps and different treatments can be confusing.
- 3.2. Figure 1, an ONS produced diagram, shows resources included in the SEEA CF and SEEA EA. Also figure 1 highlights if the resources are in scope to be brought into the SNA 2025 as a result of guidance note WS.6 (referenced as paper 6 in figure 1), to be impacted by the recording of depletion. It also shows whether these resources are included in the UK's Natural Capital Accounts, as the accounts straddle both SEEA guidance packages.

Figure 1 – Diagram showing how resources fit with the SEEA EA and SEEA CF and the UK Natural Capital Accounts



3.3. We have the ability to control and influence the environment, even if a resource is not directly managed there will be evidence of human control. An example of this is non-farmed fish. Humans are not actively controlling the fish stock in the wild yet we are harvesting from the fish stock. This stock is therefore determined by its reproductive rate, the current quantity of fish stock and our own fishing effort. Even without a fishing effort, humans are making a choice to not use the natural resource. Instead, we decide to let nature take over managing the stock, which could allow for non-farmed fish to be treated as a managed asset. This implies that we are managing the asset due to choosing whether to use the resource or not. Fish in high seas which are subject to international agreements, however, do fall within the asset boundary (2008 SNA, para 10.169). Theoretically, every natural resource could be included in the production boundary. However, this does not occur in practice and a theoretical revision to the production boundary is not in scope for this SNA revision but some additional natural resources are being brought into the asset boundary.

4. Split Asset Approach

- 4.1. The guidance note argues that there is a conceptual misalignment between the allocation of the asset and the income generated from the asset when recorded in line with 2008 SNA guidance (WS.6 Guidance Note, para 4). This is due to the legal owner typically not receiving all the income from the activity. The split asset approach does lead to increased methodological complexity and data availability concerns. However, the value of assets should be reflected more accurately.
- 4.2. *“So far the accounting practice in several countries has shown that the default option offered by the 2008 SNA to assign ownership of natural resources to the legal owner, in most countries government, is not satisfactory, particularly not when breaking down the natural resource accounts by institutional sector. In practice the risk and rewards of natural resource ownership are often shared between private and public parties.”* (Advisory Expert Group, 2020)
- 4.3. The above quote, taken from a paper presented to the Advisory Expert Group (AEG) illustrates a legitimate difference between the 2008 SNA and the SEEA CF. Contrary to the 2008 SNA view, the System for Environmental Economic Accounting Central Framework 2012 (SEEA CF) favours a partitioning of relevant assets.
- 4.4. The AEG assists the Inter-Secretariat Working Group on National Accounts in the review and update of the SNA implementation program. The AEG is comprised of national accounting experts from across the global community.
- 4.5. The SEEA CF is an international statistical standard for measuring the environment and its relationship with the economy. The Central Framework covers measurement in three principal areas: environmental flows, stocks of environmental assets and economic activity related to the environment.
- 4.6. A detailed comparison of the 2008 SNA guidance and SEEA CF over how environmental assets are currently defined and recorded is provided in Table 1 in Appendix 2.
- 4.7. The issue of partitioning natural resource assets has gained further importance as it is also being considered in guidance notes on accounting for biological resources (WS.8) and treatment of renewable energy resources (WS.11). Full copies of these can be found in the reading pack.

5. Recording Depletion

- 5.1. The allocation of assets is patently linked to the recording of depletion. See Appendix 1 for the definitions of depletion. The depletion cost, if recorded as a cost of production, as recommended by the guidance note as well as by SEEA CF, must be allocated correctly. This opposes the current recording in line with the 2008 SNA of depletion being recorded as “other changes in the volume of assets”. The SEEA CF recommends that depletion costs are allocated in line with the expected incomes generated by economic activity.
- 5.2. *“One would like to allocate the costs of depletion to the sector that receives the relevant (gross) income.”* (WS.6 Guidance Note, para 5)
- 5.3. The guidance note also recommends that the notion of depletion be extended to non-cultivated biological resources, as opposed to only mineral and energy

resources as is currently within the 2008 SNA (WS.6 Guidance Note, para 3). This recommendation would bring the SNA closer to the guidance from SEEA CF.

6. Issues raised in WS.6 and the Current Guidance

6.1. 2008 SNA

- 6.1.1. In Table 1 the current general guidance of the 2008 SNA is described. The paragraphs below detail the key issues of the 2008 SNA guidance discussed in the guidance note.
- 6.1.2. The 2008 SNA recognises that there is a conceptual change in ownership when granting extractors, a license to extract a resource (2008 SNA, para 13.5). The extractor is contractually obligated to provide the legal owner with a stream of rents. The extractor is then free to determine the rate of extraction and thus the rate of depletion. The licence holder may not directly sell the resource to the extractor by ceding all rights to the resource. However, the extractor could deplete the resource within the duration of the contract. Despite this, the legal owner is allocated the full asset, raising an important question. Should the natural resource appear as an asset on the legal owner's books despite the extractor receiving most of the risks and rewards?
- 6.1.3. The default recommendation in the 2008 SNA is to assign the legal ownership of natural resources to the government (WS.6 Guidance Note, pg.2). The owner then sells leases to extractors for extraction rights to a given resource. The leases are accounted for elsewhere in the accounts. For non-renewable resources, any extraction is depletion, meaning a decrease in stock. This then reduces the net present value (NPV) of the resource. With current guidance from 2008 SNA, the income generated from these activities represents a liquidation of their assets. The rent then mirrors the loss of the NPV of the resource. We record the actual quantity loss as an "other change in the volume of assets" (2008 SNA, para A4.51). Obscuring the connection between the extraction of a resource and its loss of value removes the ability to allocate the reductions of resource quantity and value to individual industries. This recording method can also influence the government's net worth figures (Statistics Canada, 2015).
- 6.1.4. In practice, the extractor and the government share the risks and rewards associated with the extraction of a natural resource. The SEEA CF recommends a partitioning approach by splitting the asset between the extractor and owner (WS.6 Guidance Note, pg.2). The focus is to reflect the risks and rewards more accurately. This provides added complexity to any further calculations. The 2008 SNA has argued that it is unusual to share the risks of a resource between two units at the same point in time (2008 SNA, para 17.347). Yet, the 2008 SNA supports the partitioning approach when the resource is a non-cultivated biological resource and the contract gives rights to exploit a natural resource, such as a fishing quota.

6.2. SEEA

- 6.2.1. The SEEA is an internationally agreed framework which combines environmental and economic data to show the interaction between the economy and the environment and vice versa. The SEEA accounts for both the monetary value and physical quantity of environmental resources.
- 6.2.2. The SEEA has two handbooks: the Central Framework (SEEA CF) and Ecosystem Accounting (SEEA EA). The SEEA CF records:
- 6.2.3. *“(a) supply and use tables in physical and monetary terms showing flows of natural inputs, products and residuals; (b) asset accounts for individual environmental assets in physical and monetary terms showing the stock of environmental assets at the beginning and the end of each accounting period and the changes in the stock; (c) a sequence of economic accounts highlighting depletion-adjusted economic aggregates; and (d) functional accounts recording transactions and other information about economic activities undertaken for environmental purposes”* (SEEA CF 2012, para 2.26)
- 6.2.4. The SEEA EA complements the SEEA CF and focuses on ecosystems as opposed to individual environmental assets such as timber. The SEEA EA’s objective to encompass the wide range of environmental services provided by the ecosystem for economic and other human uses. Ecosystem assets are environmental assets viewed from a systems perspective. Both the SEEA CF and SEEA EA together provide a complete accounting for the environment.

6.3. SEEA CF

- 6.3.1. In Table 1 the current general guidance of the SEEA CF is described. The paragraphs below detail the key issues of the SEEA CF guidance discussed in the guidance note.
- 6.3.2. The SEEA CF recommends recording depletion as a cost of production. Accounting for costs of depletion as a cost of production does not align with allocating ownership to the legal owner (WS.6 Guidance Note, para 5). The SEEA CF aims to allocate the costs of depletion between the relevant units in line with the expected incomes from extraction (SEEA CF 2012, para 5.218). The SEEA CF recommends recording the cost of depletion in the production and generation of income accounts of the extractor as deductions from value-added and operating surplus. This allows the analysis of extraction activity and economy-wide aggregates of operating surplus and value added to fully account for depletion. As the government has no operating surplus, not recording depletion in the production account means government outputs are not inflated when using the inputs equals outputs method. The guidance note recommends recording the extractor’s payment of rent in the allocation of the primary income account, and includes an item titled “Depletion borne of government”. This item reflects the rent earned by the government is depletion adjusted by the government’s share of the total depletion (SEEA CF 2012, para 5.220). For a visual representation of this see Example D in (WS.6 Guidance Note, pg.24).

6.3.3. The guidance note separates the two types of value change for a natural resource, one borne of depletion where the physical stocks have reduced, then multiplying the new quantity by the “price in situ”. Revaluation is the other, where the “price in situ” has changed and is then multiplied by the average stock. The resulting depletion of adjusted values could lead to negative prices in times of low commodity prices. However, this is just the same as a negative net operating surplus for other economic activities during a downturn (WS.6 Guidance Note, para 27).

6.4. AEG Recommendations

6.4.1. In 2016, the AEG presented a paper, on the classification and valuation of natural resources (2016a). In this paper the AEG provided a set of recommendations for both the 2008 SNA and SEEA CF. It was determined that SEEA CF guidance is suitable for use in the national accounts (AEG 2016b, pg.5). The AEG chose to focus on commercially recoverable resources (e.g., class A, see 2016b, pg.5).

6.4.2. When valuing mineral and energy resources, the AEG emphasised the importance of the discount rate, the heterogeneity of costs, the production constraints imposed by initial investments and commodity price volatility (AEG 2016b, pg.5). This demonstrated the benefit of having the SEEA CF’s more specific guidance. It was agreed that the high volatility of commodity prices should not feed into the valuation of underlying assets.

6.4.3. Typically, the resource rents have been applied one-on-one as an indicator of the future pattern of resource rents. However, this leads to volatile asset prices and could well lead to negative prices. Despite these pitfalls, because market prices were used, the method was advocated for. The guidance note puts forward a method in which a forecast based on the past trend of commodity price development or long-term average resource rents would provide a more accurate expectation and hence a more accurate market price of the asset. It must be noted that the method of valuation also affects the valuation of depletion (WS.6 Guidance Note, para 25).

7. Conclusion

7.1. The SNA 2025 could substantially gain from precise recommendations on these issues by referencing or introducing text from the SEEA CF. The split asset approach in theory should increase the value of the assets but there may be challenges around the method and the data. Depletion will also be challenging to implement in some areas as well, however, the ONS should be able to overcome them.

7.2. We invite NSCASE to guide us on what areas of this topic they are comfortable with from this initial introduction, with a view that this paper provides the foundation to go into further depth in a second paper. On an additional note, Committee knowledge on the political implications around fishing and technical issues related to this topic would be greatly appreciated.

8. References

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9. Appendix 1

Definitions

Environmental Assets

2008 SNA - Environmental assets are mineral and energy resources, land, timber, aquatic and other biological resources, and water resources. They contain both cultivated and uncultivated resources.

SEEA CF – Environmental assets are those included by the 2008 SNA as well as soil.

Natural Resources

2008 SNA – Natural resources are environmental assets which are non-cultivated, they include: natural biological resources, mineral and energy resources, water resources and land.

SEEA CF – Natural resources are environmental assets which are non-cultivated, they include: natural biological resources, mineral and energy resources, water resources and soil.

Depreciation

Decreases in inventories or as consumption of fixed capital. For example, cultivated biological resources are considered produced assets and are recorded as changes in inventories or as fixed assets. The run-down of cultivated biological resources are accounted for as decreases in inventories or as consumption of fixed capital.

Depletion

2008 SNA – “the reduction in the value of deposits of subsoil assets as a result of the physical removal and using up of assets”. In the 2008 SNA this is recorded as an “other change in the volume of assets” – (SNA 2008, para 12.26).

SEEA CF – in physical terms “the decrease in the quantity of the stock of a 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 regeneration”. This goes above SNA into including decreases in non-renewable natural biological resources, where depletion is defined as the extraction above the level of regeneration – (SEEA CF 2012, para 5.76)

When working out the value of depletion you should look at the cost against income, this is treated the same way as consumption of fixed capital is. Another thing to note is that depletion occurs when the rate of extraction is greater than the rate of regeneration. If the loss is non-anthropogenic this is considered a catastrophic loss rather than depletion.

Degradation

Non-sustainable use of non-cultivated assets (considered non-produced). In the 2008 SNA this is recorded as an “other change in the volume of assets”.

In paragraph 5.89 of the SEEA CF. The change in the ability of environmental assets to provide contributions known as ecosystem services and the amount to which that change in capacity is due to the actions of economic units.

It is difficult to identify whether the driver is the degradation of the individual asset or the entire ecosystem.

Provisioning Services

These are products from nature, some of the products are agricultural biomass, renewable energy generation and fish capture. (ONS, 2022)

Regulating Services

These services are about the maintenance of the environment the keep the same quality we rely on. Some examples of regulating services include sequestering and emissions of greenhouse gases and urban cooling e.g., parks and rivers. (ONS, 2022)

Cultural Services

Cultural services are the non-physical benefits we receive from natural capital, some of the services include tourism to the natural environment and house prices. (ONS, 2022)

10. Appendix 2

Table 1 – Current Guidance

2008 SNA	SEEA	Both
Records monetary values only	Records monetary and physical values	Record monetary values of environmental assets which are within the asset boundary.
Assets are recorded if ownership is effective and there are economic benefits which can accrue to the owner in the accounting period.	Assets are recorded in monetary values if they meet the SNA principles. However, recording in physical terms consists of any environmental asset within the bounds of the country’s territory.	
Environmental assets listed in the “Both” column.	Environmental assets listed in the “Both” column as well as including soil	Environmental assets are mineral and energy resources, land, timber, aquatic and other

	as a separate asset from land.	biological resources, and water resources. They contain both cultivated and uncultivated resources.
Natural resources are listed in “Both” column but includes land as well.	Natural resources are listed in “Both” column but includes soil as well.	Natural resources are uncultivated biological resources: natural biological resources, mineral and energy resources, water resources.
		Biological resources include timber and aquatic resources, and other animal and plant resources such as livestock, orchards, crops, and wild animals.
		Cultivated assets are within the production boundary and in monetary terms are recorded as fixed assets or inventories. Reduction of the quantity or quality of these is listed as depreciation or change in inventories respectively.
		Uncultivated assets are outside of the production boundary and in monetary terms, enter the balance sheet at the first point of commercial exploitation. Their value at present is the NPV of expected future rent from exploitation.
Depletion of uncultivated subsoil assets are recorded as an “other change in the volume of assets”. Depletion only refers to subsoil assets.	Depletion of uncultivated assets is a cost against income. Depletion also refers to the reduction in quantity of all natural resources.	
Degradation is the non-sustainable use of non-cultivated biological assets and is recorded as	Degradation is the reduction in the quality of services provided by ecosystems caused by economic activity.	Degradation is the non-sustainable use of non-cultivated biological assets.

an “other change in the volume of assets”.		
	In physical terms all environmental assets with potential for economic use are recorded – except for the sea and atmosphere – although emissions to the atmosphere and use of sea water are shown in the physical flow accounts.	
	There are some assets which have a physical entry, but no monetary record, these must be highlighted.	
Assign environmental resources which are within the asset boundary to the legal owner.	For mineral and energy resources it is recommended that the depletion and incomes are split across the relevant units.	Assign environmental resources which are within the asset boundary to the legal owner.
	SEEA CF Recording methods allow for an in-depth analysis of depletion and extraction activity, in combination with economic data.	
Valuation		
2008 SNA	SEEA CF	Both
The SNA records changes in the volume of natural resources as economic appearances or disappearances of non-produced assets within the other changes in the volume of assets account.	The SEEA CF records the opening and closing physical stocks of the asset in the physical asset account. The monetary account then is the market price of the physical account’s quantity. However, some environmental assets may only have quantity values (assets not classed as economic assets).	An environmental asset’s benefits are recorded in the form of 1) operating surplus from the sale of natural resources or cultivated biological resources 2) rent from the extractor 3) net receipts from when an asset is sold. Cultivated assets are recorded as fixed assets or inventories.

<p>20.47 - Suppose mining company knows the size of deposit being mined, the average rate of extraction and the costs of extraction of one unit. After the intermediate costs, labour, and cost of fixed assets used what is left must represent the economic rent of the natural resource. Applying this to future expected extractions a stream of future income can be estimated and a value for the resource at one time.</p>	<p>SEEA CF provides much more detailed guidance on the valuation (the depletion of) natural resources. There is guidance on using the NPV and the choice of discount rate.</p>	<p>Practical implementation in an internationally comparable way has raised concerns. The AEG on NA was consulted and provided a set of recommendations for the SNA and SEEA CF requiring changes.</p>
Allocation of ownership		
2008 SNA	SEEA CF	Both
<p>10.6 - legal and economic ownership are not always the same. 10.7 - government claiming legal ownership of an entity on behalf of community at large the benefits accrue to government on behalf of the community at large, so the government is regarded as both the legal and economic owner of these entities. - This is inconsistent with many cases of ownership of natural resources.</p>	<p>5.218 - For mineral and energy resources it is recommended that the depletion and incomes are split across the relevant units.</p>	<p>SNA and SEEA CF explain that economic ownership must be assigned to the entity bearing the risks and rewards associated with the asset's economic use. - often the actual practice sees risks and rewards shared.</p>
<p>10.191 - Implicitly supports split asset for non-cultivated biological resource. Fishing quota, which is directly connected to use of natural resources, rights or permits to exploit a resource are transferred to the exploiter.</p>		