

Remote Meeting  
July 10–13, 2023

SNA/M2.23/05

Issues Note C.2 Treatment of (services derived from) the atmosphere



## Issues Note C.2 Treatment of (services derived from) the atmosphere

Prepared by Peter Harper, with the support from Sarah Barahona, Carl Obst, Paul Schreyer, Herman Smith, Peter van de Ven, John Verrinder and Jorrit Zwijnenburg  
3 July 2023

At its October 2022 meeting, the Advisory Expert Group on National Accounts “requested the SNA update editorial team to prepare a holistic note to: (a) address other implications raised such as the recording the various services derived from the atmosphere; (b) develop appropriate terminology on the use of atmosphere-related services; and (c) reconcile the recording of radio spectrum and emission permits in the national accounts.”

This Issues Note starts off by considering the third point; that is, reconciling the recording of radio spectrum and emission permits in the national accounts. From this, it seeks to draw out general principles to assist in the recording of other services derived by the atmosphere and to develop appropriate terminology on the use of atmosphere-related services.

### Reconciling the recording of radio spectrum and emission permits in the national accounts

#### Treatment of radio spectrum

The radio spectrum involves the use of the atmosphere to transmit radio waves through part of the electromagnetic spectrum. The electromagnetic spectrum is a component of the atmosphere.

The 2008 SNA considers the radio spectrum to be a natural resource asset (and implicitly an economic asset), without providing an explanation for this position.

The 2008 SNA states that payments for mobile phone licenses – which is a use of the radio spectrum – constitute the sale of an asset when the licensees acquire effective ownership rights over the use of the spectrum. Para 17.318 of the 2008 SNA provides six criteria to determine whether ownership is effectively transferred or not.<sup>1</sup>

When a sale of an asset applies, and when the life span of the license is different from the life span of the spectrum, the payments for licences are treated as the sale of a non-produced intangible asset. When a sale of an asset applies, and when the life span of the license and the life span of the spectrum coincide, the payments for licences are treated as

---

<sup>1</sup> The ESA 2010, and its accompanying Manual on Government Deficit and Debt, discuss the issue of the radio spectrum in more detail. See Box 1 under section 6.1.3.4 - <https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/w/ks-gq-23-002>

the sale of the spectrum itself. the latter situation applies always when licenses are granted indefinitely.<sup>2</sup>

#### Treatment of emission permits

The 2008 SNA states “these permits do not involve the use of a natural asset (there is no value placed on the atmosphere so it cannot be considered an economic asset)” (para 17.363).

In the discussion on the treatment of emission permits at the October 2022 AEG meeting, the AEG supported option 4 (Emission Permits recorded as a financial asset with taxes on production recorded at surrender). Implicit in this conclusion is that the atmosphere is not an asset, at least as far as emissions are concerned.

#### Reconciling the recording

In seeking to reconcile the recording of radio spectrum licences and emission permits, it is worth looking at the similarities and differences in the two types of arrangements.

#### Similarities:

- Both involve the use of the atmosphere.
- Both involve ‘permissions’ granted by governments for such use.

#### Differences:

- The use of radio spectrum requires exclusivity. The radio spectrum is able to be apportioned into frequency bands. Two units cannot share the same part of the spectrum (ie a frequency band). No such exclusivity exists for emissions. Emissions can be made “anytime, anywhere” and one unit’s emissions does not restrict the ability of the atmosphere to allow another unit to make emissions.<sup>3</sup>
- The radio spectrum is a fundamental requirement for production. You cannot produce mobile phone services without using the spectrum. Emissions, however, may or may not occur as part of a production process. Certainly, in the case of a coal-fired power station, it is highly likely that there will be emissions into the atmosphere. But the product being produced – energy – is also able to be produced without emissions.

---

<sup>2</sup> Physically, the spectrum essentially has an infinite life (at least as long as the earth is here). However, one can distinguish between an infinite physical life and a finite economic life, as changes in technology may mean that parts of the spectrum lose their value.

<sup>3</sup> Of course, the whole point of emission permit schemes is to restrict emissions. However, this achieved by way of legal mechanisms and not from the carrying capacity of the atmosphere to absorb emissions.

- In the case of emissions, the atmosphere is being used as a sink; that is, as a storage space for environmental waste. In the case of the radio spectrum, the atmosphere is not being used as a sink.

The statements “the radio spectrum is a natural asset” and the “atmosphere ... cannot be considered as an economic asset” seem irreconcilable at first glance if the radio spectrum is considered to be an economic use of the atmosphere.<sup>4</sup>

There seem to be three possible ways to resolve this apparent inconsistency:

- Revisit the treatment of mobile phone licenses.
- Revisit the treatment of emission permits.
- Recognize that in some cases (e.g., mobile phone licenses) the atmosphere has characteristics of an economic asset and in other assets (eg emission permits) it does not.

The first option would involve re-opening a significant debate in national accounting that was settled in the development of the 2008 SNA; noting in particular that this issue is not on the research agenda for the update of the SNA.

The second option would undermine the recent process for determining the appropriate recording of emission permits in the national accounts.

The remainder of this note will focus on exploring the third option. If this option can be seen to be a viable option from a conceptual perspective, then it would obviate the need to revert to either the first or second options, which would not be desirable.

### [What is an economic asset?](#)

According to the 2008 SNA (para 3.30), an asset is “a store of value representing a benefit or series of benefits accruing to the economic owner by holding or using the entity over a period of time. It is a means of carrying forward value from one accounting period to another.”

A few observations are relevant:

- An asset must have an economic owner. An economic owner is an institutional unit entitled to claim the benefits associated with the use of the asset by virtue of

---

<sup>4</sup> Alternatively, the radio spectrum could be considered to be an asset that is distinct from the atmosphere. While this would obviate the need to reconcile the recording of radio spectrum and emission permits in the national accounts, it ignores the fact that the radio spectrum cannot exist independently from the atmosphere.

accepting the associated risks,<sup>5</sup> this suggests that the economic owner is able to control, in some way, the use of the asset.<sup>6</sup>

- An asset provides a benefit or series of benefits (in the context of the SNA, a 'benefit' should be considered as an 'economic benefit'.)
- An asset is a store of value that can be carried forward from one accounting period to another, which implies that an asset must be able to be valued.

Regarding the last point, the idea that an asset must be able to be valued, questions arise about how a value might be established, and how reliable that value would be. While it could be considered that these are empirical, rather than conceptual questions, the fact is that for an asset to be included in the national accounts a value needs to be attached to it. If there are significant doubts about the validity of measurement, it is questionable whether there is any good purpose in imposing a conceptual requirement in the SNA that is unable to be reasonably applied practically.<sup>7</sup>

### Is the atmosphere an economic asset?

Regarding the radio spectrum:

- There is an economic owner – the economic owner is the institutional unit that is able to control the use of the atmosphere for a particular electromagnetic spectrum. This is typically the holder of a license where the life span of the license and the life span of the spectrum coincide; otherwise, it is the government.
- The economic owner receives benefits. If the economic owner is the license holder these benefits relate to the use of the asset for the purpose of providing mobile phone services. If the economic owner is the government, the benefit is the ability to be able to issue licenses.
- The value of the asset can be reliably measured, as evidenced by the commercial sale of (exclusive) licenses to use the spectrum.

Therefore, the aspect of the atmosphere that relates to the radio spectrum satisfies the definition of an asset.

In the case of emission permits:

- First, there is a clearly identifiable economic owner, in this case the government, who has effective control over the use of the atmosphere by resident users as a sink for emissions.

---

<sup>5</sup> See SNA 2008 para 3.26.

<sup>6</sup> Importantly, the economic owner does not have to be the legal owner.

<sup>7</sup> This is recognized in commercial accounting, where assets are included on the balance only if they can be reliably measured.

- Second, the atmosphere provides a discernible economic benefit in so far as the government can generate revenue by requiring payment for it to be used for emissions.
- However, on the third criteria -- that the value of the asset can be determined -- it is questionable whether the value of the atmosphere as a sink for permits can be estimated reliably. It could be argued that its value could be established as the NPV of future payments for emission permits, but given the non-exclusive nature of these permits it would be hard to establish what this could be, as a government could issue as many or few permits as it chose. Furthermore, the value of future permits would be uncertain, due to the possibility of technological change that would impact on the demand for permits.<sup>8</sup>

So, in the case of emission permits, the atmosphere does not appear to satisfy the definition of an asset.

Typically, the atmosphere will be considered as an economic asset in those cases where (a) the use of a particular aspect of the atmosphere (such as an electromagnetic frequency) is exclusive AND (b) license or similar arrangements based on commercial arrangements is put into place to use the asset, both of which are required to enable a value to be put on the asset.

On the other hand, where the atmosphere is being used as a sink, or for the provision of services where there is no transfer of exclusive control to another institutional unit for the economic lifespan of the asset, then the atmosphere would not be considered as an economic asset.

This logic can be extended to include other uses of the atmosphere, such as for transportation services, or as a 'sink' in the case of air or noise pollution.

In the case of transportation services, a government can impose overflight fees for the use of airspace that it controls. However, governments do not typically transfer exclusive rights for overflight to other institutional units. This means that it is not possible to put a value on the atmosphere so it should not be considered an asset in these cases.

In the case of air or noise pollution, a government may require polluters to buy a permit to allow them to use the atmosphere as a sink for this pollution, or otherwise impose fines on polluters for these activities. Either way, because there is no transfer of exclusive rights to

---

<sup>8</sup> It may be, with further research, that possible ways of reliably measuring the value of the atmosphere as a sink could be established. However, it is highly unlikely that such research could be concluded satisfactorily in the remaining timeframe for the SNA update. But if it is considered that undertaking research in the medium-term would be useful, then this issue could be added to the research agenda; noting that the outcome of such research would have potential implications for the recording of emissions and other sinks.

for these activities to another institutional unit, it is not possible to put a value on the atmosphere so it should not be considered as an asset in these cases.

In those circumstances where the atmosphere is considered to be an asset, payments for licenses that do not constitute an asset would be treated as rent. In the circumstances where the atmosphere is not considered to be an asset, permits to use the atmosphere, either to enable the production of a service such as transportation services or as a sink, would typically be treated as taxes. Compulsory payments for unauthorised use of the atmosphere, such as noise pollution, would be treated as fines and penalties.

### The treatment of the atmosphere in the System of Environmental Economic Accounts (SEEA)

The SEEA Central Framework 2012 specifically mentions the atmosphere in para 5.16 where it states: “The volume of air in the atmosphere is also not in scope of environmental assets in the Central Framework”. However, it should be noted that this statement does not address the general issue of whether the atmosphere is an asset; rather it is restricted to where the volume of air should be considered an environmental asset.” The treatment of the atmosphere is not specifically mentioned anywhere else in the SEEA Central Framework.

The treatment of the atmosphere is elaborated in the para 3.15 of SEEA Ecosystem Accounting 2021, which states:

“While the atmosphere satisfies the general definition of an environmental asset in the SEEA Central Framework (para. 2.17)<sup>9</sup> and flows of emissions to the atmosphere can be recorded in physical supply and use tables, the volume of air in the atmosphere is not included in the measurement scope of environmental assets (SEEA Central Framework, para 5.16). Further discussion on a more complete accounting treatment for the atmosphere is part of the SEEA EA research agenda including the consideration of the atmosphere as a separate environmental asset.”

Evidently, for the purposes of SEEA, the atmosphere is considered to be an environmental asset, although recognizing that further work on the accounting treatment for the atmosphere is required. However, SEEA is silent on whether the atmosphere should be considered as an economic asset.

As noted above, the treatment of the atmosphere in SEEA is subject to further research. From a national accounting perspective, this research should be monitored to see whether

---

<sup>9</sup> SEEA Central Framework para 2.17: “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.”

there are any insights that would be helpful regarding the treatment of the atmosphere in the SNA.

## Conclusion

It is proposed that the 2025 SNA no longer use statements such that “there is no value placed on the atmosphere so it cannot be considered to be an economic asset”. Instead, the SNA should set out the circumstances when the atmosphere could be considered as an asset, and when it should not be considered as an asset. Specifically, the SNA should consider the atmosphere to be an asset in those cases where (a) the use of a particular aspect of the atmosphere is exclusive AND (b) licenses or similar arrangements based on commercial arrangements are put into place, which enables a reliable value to be put on the atmosphere.

In those circumstances where the atmosphere is considered to be an asset, payments for licenses that do not constitute an asset should be treated as rent. In the circumstances where the atmosphere is not considered to be an asset, permits to use the atmosphere, either to enable the production of a service such as transportation services or as a sink, would typically be treated as taxes. Compulsory payments for unauthorised use of the atmosphere, such as noise pollution, should be treated as fines and penalties.

This conclusion is considered relevant in the context of the current work on updating the SNA. As mentioned, there is the possibility of further research into this issue – which would extend beyond the timeframe for the current update – that could potentially have implications particularly regarding the use of the atmosphere (and other natural resources not currently regarded as assets) as sinks.

## Questions for the AEG

- 1 Does the AEG with the following conclusions?
  - a The SNA should consider the atmosphere to be an asset in those cases where (a) the use of a particular aspect of the atmosphere is exclusive AND (b) licenses or similar arrangements based on commercial arrangements are put into place, which enables a reliable value to be put on the atmosphere.
  - b In those circumstances where the atmosphere is considered to be an asset, payments for licenses that do not constitute an asset should be treated as rent.
  - c In the circumstances where the atmosphere is not considered to be an asset
    - i permits to use the atmosphere, either to enable the production of a service such as transportation services or as a sink, should be treated as taxes.

ii Compulsory payments for unauthorised use of the atmosphere, such as noise pollution, should be treated as fines and penalties.

2 Does the AEG consider that the treatment of eth atmosphere as a sink should be added to the post-2025 SNA research agenda?