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1. Introduction

The London Group on Environmental Accounting contributes as an expert group to the SEEA 2003 (System of Environmental and Economic Accounts) revision by advising the UN Committee of Experts on Environmental Accounting (UNCEEA) on a range of conceptual issues. One of these issues concerns the recording in the SEEA of emission permits and permits to use natural resources.

The SEEA is a satellite accounting system that takes the SNA as the starting point to account for environmental-economic relationships. The SEEA covers, among other things, accounts for physical flows (e.g. natural resource inputs and residual outputs), asset accounts for natural resources (and their depletion) and environmental expenditure accounts.

As a general principle the SEEA will closely follow SNA accounting concepts and classifications. However there are areas in which the revised SEEA will depart from the SNA. One important example is the depletion of natural resources. In the SEEA the depletion of natural resources will be accounted for as part of production costs. Like consumption of fixed capital, natural resource depletion will be excluded from the net balancing items (product, income and saving) in the current accounts of the SEEA. In the SNA 2008 natural resource depletion is recorded in the other changes in asset accounts and not in the current accounts.

Another important difference is that the SEEA follows a broader asset boundary by taking into consideration e.g. ecosystems, ecosystem functions (climate regulation) and natural resources not subject to ownership (fish stocks outside national territorial waters).

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Given the current global policy focus on climate change issues and greenhouse gas mitigation strategies, the recording of pollution permits and other related policy instruments is obviously high on the London Group's research agenda. The issue of tradable emission permits has been discussed in several London Group meetings (cf. Le Laidier & Olsen, 2009). The London Group does not only discuss the recording of permits in the monetary SEEA accounts but also the development of accounts representing the quantitative number of permits issued, traded (also internationally) and surrendered. The London Group is greatly interested in the SNA accounting guidelines the joined Eurostat/OECD taskforce on pollution permits is currently formulating.

2. Asset boundary

The SNA 2008 explains that pollution permits "do not involve the use of a natural asset (there is no value placed on the atmosphere so it cannot be considered to be an economic asset) and therefore classified as taxes even though the permitted activity is one of creating an externality" (§17.363). In the SNA the coverage of (non-financial) assets is mainly limited to those assets used in economy activity (i.e. production as defined in the SNA) and that are subject to ownership rights (§3.46).

The SEEA accounts for a much broader range of environmental assets than the SNA. This extended scope is predicated on a broader notion of environmental benefits and (future) losses therein as a consequence of environmental depletion and degradation (SEEA 2003, §7.31 and further). The use of the atmosphere as either carbon sink or climate stability regulator (which is prerequisite of a wide range of ecosystem services) is apparently competitive. Excessive accumulation of carbon dioxide and other greenhouse gasses in the atmosphere is expected to cause on a global scale higher average temperatures and climate instability. And this may have a variety of negative repercussions (just to name a few, increasing water scarcity, losses in agricultural production and the extinction of species). Therefore it is crucial to consider the atmosphere an asset in the SEEA context. In fact, atmospheric systems (EA.33) are represented in the SEEA 2003 asset classification. This does not imply that the atmosphere can be meaningfully represented in a nation's monetary SEEA balance sheet. It is unlikely that the new SEEA will provide recommendations to comprehensively value atmospheric assets. However, it is certainly expected that the new SEEA (particularly Volume II) will address the valuation of a range of specific atmospheric functions or services such as carbon sinks.

Given its broader asset boundary, a key question is whether the SEEA should follow the SNA accounting treatment of emission permits as a tax. The SNA claims that these permits do not involve the use of a natural asset. However from a SEEA perspective this viewpoint is less obvious.

3. Should the SEEA have two asset boundaries?

The SNA 2008 states that "all assets in the System are economic assets" (§3.31). The notion of an *economic* asset is in the SNA tied to *economic* ownership. The economic owner is the institutional unit entitled to claim the benefits associated with the use of the asset (§3.26).

The SEEA 2003 asset boundary is less precisely defined. The SEEA 2003 uses the concept *environmental* asset. Gravgård (2009) argues that the SEEA 2003 in fact distinguishes economic from environmental assets although this distinction is not addressed explicitly. For example the (environmental) asset classification in the SEEA 2003 also includes natural resources that are within the SNA asset boundary and thus economic assets from an SNA perspective. Gravgård's interpretation of this distinction is that the SEEA has in fact two asset boundaries, one for economic assets and a second broader one for environmental assets. He argues that the two classes of assets have different characteristics and a priori there seems to be no compelling reason why they need to be included in the exactly same way in the SEEA. For Gravgård this argumentation is sufficient to conclude that for the recording of pollution permits there is no reason why the revised SEEA should follow a different accounting treatment than the SNA 2008. One practical advantage of the SNA solution, put forward by Gravgård, is that the costs of pollution (the surrender of permits) show up as taxes on production in the production account. Another practical advantage is of course the maintained similarity between SNA and SEEA.

The apparent distinction between economic and environmental assets in the SEEA 2003 is very unfortunate and should be avoided in the revised SEEA. It wrongly suggests that environmental assets are non-economic. This idea is strengthened in the current SEEA (§7.92) by indicating that some of the SEEA assets have no economic value. The concept of environmental (non-economic) assets suggests, perhaps unintentionally, that these assets are therefore irrelevant from an economic perspective. Since the SEEA is supposed to deal with environmental-economic concerns this probably unintended proposition is highly unwelcome. The atmosphere would according to this line of reasoning be classified as non-economic. The Stern report convincingly illustrates that the atmosphere and its degradation has a lot to do with economics.

In many cases environmental-economic policy concerns are the result of lacking ownership rights, leading to suboptimal allocation of natural resources from the perspective of the entire society. In the SEEA it is not useful to define assets as non-economic as soon as ownership rights are absent. This would wrongly limit the scope of SEEA by excluding those asset service values which are supposed to be in the centre of the System, even if these are very hard to measure in monetary terms. Volume II of the revised SEEA will deal with putting economic values to specific ecosystem services or losses therein. In many cases services are derived from assets that are not subject to economic ownership.

4. Permits to use a natural resource

Harrison (2008) explores in a paper for the AEG three accounting options for emission permits issued under a cap and trade system: (1) permits as a tax, (2) permits as a non-produced asset similar to the mobile phone case and (3) permits as payment for a service. Harrison considers the third option directly as inappropriate since the permit values are out of all proportion to the service provided by governments by the distribution and monitoring of permits.

The tax option seems equally inappropriate in the context of SEEA. Taxes are compulsory, unrequited payments made by institutional units to government units (SNA 2008, §7.71 and §8.52). The SEEA considers the atmosphere as an asset with the purpose of identifying its variety of sometimes competing economic benefits. As a logical consequence, the surrender of a pollution permit cannot be considered to coincide with a tax payment as soon as one is prepared to accept that the permit grants its owner access (via government regulation) to use the atmosphere as a (carbon) sink. In other words, from the SEEA point of view there is an underlying asset and payments to use this asset should not be considered a tax.

Regarding the second (permit) option, it is important to acknowledge that, generally, pollution permits do not grant its owner access to the natural resource (the atmosphere) for longer periods of time. Each kiloton of carbon emitted has to be accompanied by the surrender of a pollution permit. An emission permit differs in this respect from a permit to use for example radio spectra, usually for a time period longer than one year. Under such circumstances the acquisition of a permit may constitute, depending on a range of criteria addressed in the SNA 2008 (Chapter 17, Part 5), either the actual purchase of the spectrum or an independent asset (from the spectrum) which is a sub-set of the general asset class of contracts, leases and licences.

Pollution permits under a cap and trade regime are in this respect more comparable to tradable fish quota. Like pollution permits, fish quota systems are installed by governments with the purpose of sustaining the resource's benefits over time. In the case of New Zealand fish quota are transferable and traded on well developed markets. Cap and trade systems are particularly similar to those fish quota systems based on tradable annual catch entitlements (Harkness & Bains, 2007). These entitlements represent the right to extract a specific amount of particular species of fish in one particular year and do not grant access to fishing grounds for a wider range of years. Like annual catch entitlements, carbon emission permits represent in the SEEA context the one-off use of a natural resource.

If authorities are managing carbon mitigation strategies according to society's preferences, one may argue that tradable carbon permit prices reasonably reflect the service value of using the atmosphere as a carbon sink, just like fish quota values may provide fairly good estimates of fish resource rent values.

The recommended treatment in the SNA 2008 is to consider fish quota as permits to use a natural resource that are transferable (SNA 2008, §17.334). This

recommendation seems to imply that the purchase of a permit from government is preceded by the appearance of this asset in the other changes in the volume of assets account of the government. In a subsequent stage the actual fish catch by the permit holder will lead to a decline of the permit value. This value loss will, again, show up in the other changes in the volume of assets account, probably of the government after surrendering of the catch entitlement.

This SNA accounting treatment of fish quota is for various reasons unsatisfying. One important reason is that intuitively one would expect the quota to represent somehow a rent payment of the extractor to the legal owner, being the government. The SNA 2008 (§17.335) acknowledges that, under alternative regimes, fish permits may be issued for a strictly limited period of time, for example less than one year. Under such circumstances, permits (licences) should be recorded as rent under a resource lease. According to the SNA 2008 (§17.310) a resource lease is an agreement whereby the legal owner of a natural resource that the SNA treats as having an infinite life makes it available to a lessee in return for a regular payment recorded as property income and described as rent.

In other words, when the permit is valid only for a restricted time period (one year or less) a permit should be regarded as a prepaid rent. This seems a much better reflection of economic reality. The government acts de facto as the owner of the asset who captures by way of issuing permits on a year-by-year basis the resource rent from the users of the natural resource. Like fish quota systems, the cap and trade system ought to maintain the sustainable utilization of the natural resource, leading to infinite service lives.

One complicating factor, not addressed in the SNA 2008, is of course the timing issue. Accrual accounting implies that the resource rent is recorded at the moment of resource use. Usually, the permit is issued before that time. And within this period of obtaining a permit and its surrender, the permit's value may have changed. In other words, similar complexities appear as in the SNA solution of recording an emission permit as a tax. Discrepancies in time and value need to be bridged in accounting terms.

The two main solutions (with a few deviations) to this timing problem, currently considered by the OECD/Eurostat task force, are:

a) Recording the permit as a financial asset representing a so-called tax settlement instrument;

b) The split asset option in which the prepaid tax is recorded under other account receivable/payable while the non-produced non-financial asset reflects all value changes over time (the second asset is created and terminated through other changes in volume).

From the SNA tax treatment perspective, the financial asset option has one important advantage. Following this option the issuing of permits does not create any wealth effects at macro level. This corresponds properly with the idea that taxes are unrequited. However, for permits that give access to natural resources this

wealth effect is not so disturbing. On the contrary, in this context the permit genuinely reflects a non-produced non-financial asset, a resource lease, which falls under the asset category contract, leases and licences.

ETS permits are issued by governments. When they are auctioned these permits first appear via other changes in volume in the government balance sheet. This wealth generated by governments, representing the economic benefits of using the atmosphere as a carbon sink, is bounded by the Kyoto agreements to restrict carbon emissions. All governments that are allowed to issue tradable emission permits signed the Kyoto protocol which puts a cap on the maximum allowable emissions and subsequently the maximum number of permits that can be issued. Since permits derived from CDM are not issued by governments (but instead directly granted by the UNFCCC) it seems quite logical to record the appearance of these permits in the other changes in volume of assets account of the beneficiaries.

Sales and purchases of emission permits are subsequently recorded in the capital account. Finally, the surrender of emission permits to government reflects a property income flow representing the use of the atmosphere as a carbon sink. The surrender is followed by the disappearance of the permit in the other changes in volume of assets account of the government.

The 'grandfathering' of permits or issuing of permits below market price represents a subsidy or capital transfer which bridges the gab between issue value and actual market value at issuing date.

One may conclude that the proposed SEEA treatment of emission permits is much simpler and easier to implement than any of the tax solutions in the SNA context that is currently being considered by the OECD-Eurostat taskforce.

5. Costs of using the environment

Another argument put forward by Gravgård in favour of following in the SEEA the tax solution is that in this way the pollution costs show up as a tax on production in the production account of the polluter. In this respect the property income proposal does not differ very much. When the production (or income generation) account in the SEEA explicitly shows all capital services of fixed and non-produced (environmental) assets, which is in itself highly recommendable also in the light of identifying resource rents more generally, the resource rents related to using the atmosphere for carbon storage would equally show up explicitly in the production account of the polluter. The SNA permit solution is indeed less satisfactory in this regard since their recording remains restricted to the other changes in volume of asset accounts.

6. Conclusions

Satellite accounts for the environment are being developed with the purpose of providing, one way or another, information and indicators dealing with environmental scarcity issues. This is why the asset boundary of the SEEA includes a broader range of environmental assets than the SNA. Governments introduce pollution permits with the purpose of regulating the use of the atmosphere as a carbon sink. In cap and trade systems governments are the only agents that can manifest themselves on behalf of society as the eventual owners of the atmosphere. In the SEEA context one can convincingly argue that the permit grants its owner the right to use the atmosphere for carbon storage. The existence of an underlying asset implies that the SEEA should follow a different accounting treatment. In the SNA the atmosphere is explicitly not considered an asset and the pollution permit can therefore only be considered to represent a tax payment. In the SEEA context, however, the atmosphere is recognised as the underlying asset and, as a consequence, the permit should represent a (prepaid) resource rent.

Also from a policy perspective the tax solution seems in the SEEA context less appropriate. In pollution abatement policy strategies cap and trade systems are often explicitly distinguished from pollution taxes. Taxes fix the price polluters have to pay while the eventual pollution loads may vary. Cap and trade systems fix the maximum allowable pollution load while the price of pollution is deliberately kept flexible. In cap and trade systems it is not the government but eventually the interaction between supply and demand that determines the price of pollution. In the SEEA it seems quite relevant to accentuate this important distinction from pollution taxes.

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