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The Valuation of Renewable Energy Resources[1]

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[1] This outcome paper has been prepared by the SEEA Editor. It is based on papers presented to the London Group of Experts on Environmental Accounting and discussions among those experts. Investigation and research for this outcome paper was led by Maarten van Rossum, Sjoerd Schenau and Mark de Haan of Statistics Netherlands.

A. Introduction

1. Renewable energy is a substitute for non-renewable energy. Renewable energy can be produced in various ways, including but not limited to wind energy, hydropower energy, solar energy and geothermal energy. The problems related to scarcity of fossil fuels and emissions are expected to increase over time, especially for countries that are highly dependent upon non-renewable energy resources. In response to this, governments are trying to initiate policies to reduce air emissions and to reduce the use of fossil energy resources. A lot of countries are in the process of transforming their energy supply to a more sustainable situation.
2. In the System of National Accounts (SNA), reserves of fossil energy are recorded as non-produced assets in the national balance sheet. In order to comply with the general definition of an economic asset, environmental assets must not only be owned, but must also be capable of bringing economic benefits to their owners, given the technology, scientific knowledge, economic infrastructure, available resources and set of relative prices prevailing on the dates to which the balance sheet relates or expected to do so in the near future (2008 SNA, §10.168). These requirements are generally met for non-renewable energy resources such as coal, natural gas and oil. An increasing number of countries publish statistics on the public and private ownership of these resources.
3. However, renewable energy resources are generally not recorded as assets on the national balance sheet. This seems to be a serious omission since their share in total energy production is increasing and fostering the exploitation of renewable energy resources is undoubtedly an important part of sustainable energy policy strategies around the world. Balance sheets that are restricted to non-renewable energy resources could lead to a serious underestimation of a country's available energy resources.
4. This outcome paper reflects both the London Group's conclusions reached at its 15th meeting in Wiesbaden, based on the discussion paper "On the valuation of renewable energy resources" by Maarten van Rossum and Sjoerd Schenau and the conclusions reached at its 14th meeting in Canberra, based on the issue paper "Renewable energy resources in the SEEA" by Maarten van Rossum, Mark de Haan and Sjoerd Schenau.
5. The paper discusses issues related to valuation of renewable energy resources from a conceptual accounting viewpoint. More generally, the list of issues, agreed by the UN Statistical Commission, considers the accounting for renewable energy sources as highly policy relevant and considers that the energy flows and economic transactions related to renewable energy production and use are not covered in sufficient detail in the current System of Environmental and Economic Accounts (SEEA) and that this detail should be expanded in the revised SEEA. It is noted however that to date, the accounting experiences in this area seem quite limited.

B. The scope of renewable energy resources in the SEEA

6. The first issue to consider is the extent to which renewable energy resources should be considered within the SEEA. Given the nature of these resources, it may be reasonable to seek answers to how large the potential renewable energy resource might be and hence determine required levels of investment in capture technology, etc. Discussion at the London Group concluded that, while important, these matters were beyond the scope of the current SEEA revision. Consequently, the notion of a stock of renewable energy resources in the sense of potential energy available for future capture is not a notion that is developed in the SEEA.

Recommendation: That the scope of measurement of renewable energy in the SEEA include only energy that has been captured from existing renewable resources.

C. The identification of renewable energy resources as assets in the SEEA

7. While potential renewable energy resources are considered out of scope of the SEEA there remains the question as to how to best account for those renewable energy resources that are currently being used. Discussion within the London Group considered two issues: (i) classification of renewable energy resources and (ii) the extent to which the value of renewable energy resources could be separately identified and hence whether renewable energy resources should be classified as a distinct group of assets in the SEEA.

Classification of renewable energy resources

8. On classification, it was agreed that there is a range of renewable energy resources and it would be beneficial for these to be classified in some way. Importantly it would be useful to contrast renewable and non-renewable energy resources such that analysis of the total energy resources can be undertaken without gaps and overlaps. It is noted that renewable energy products are not indentified in the Standard International Energy Classification but energy products can be presented under an alternative view according to whether they are used for renewable energy.

Valuation of renewable energy resources

9.With regard to valuation, the London Group concluded that the value of renewable energy resources was incorporated into the price of the land on which mechanisms to capture the energy are based. For example, the land in a particularly windy area would be priced more highly than similar land in a non-windy area if investment is made to construct windmills to capture the energy from the wind source. Thus, as such, energy production opportunities based on natural resources like wind, solar radiation and geothermal energy are expected to be reflected in the price of land.

10. Ideally, it would be useful to decompose the value of the land into a value for the renewable energy resource and the value of the physical land itself. However, isolating the resource rent that accrues to the investment in energy capture as distinct from other resource rent is very complicated. Specifically there may be various forms of government intervention and information asymmetry that hide the true value of the income that should be attributable to the renewable energy resource as distinct from the land itself.

11. It was also observed that there is a strong link between produced assets, such as windmills, and the renewable energy resource since the energy potential and hence income source must be captured in some way. This link can be interpreted as a reflection of the proper market reaction of the producers. Producers react to better market conditions by investing more in relevant produced assets. In other words, they are investing more in order to pick up more of the resource rents created by favourable market conditions. This is a specific characteristic of the renewable energy resource. It emerges when benefits are present and it disappears when benefits vanish.

12. Overall, a separate resource rent estimate for the services provided by renewable energy resources in SEEA Volume 1 is not considered desirable due to the measurement difficulties involved. Consequently, in SEEA Volume 1 the asset accounts should not be expanded to separately identify an additional asset of renewable energy resources.

Recommendation: That the value of all renewable energy resources is embodied in changing values for any underlying environmental assets (primarily land and water) that are used in the capture of the energy resource and because of measurement difficulties no separate estimate of the value of these resources should be made.

Recommendation: That renewable energy resources should not be separately identified in the SEEA classification of assets.

D. Treatment for specific renewable energy sources

(i) Water reservoirs as renewable energy assets

13. The production of hydropower usually requires the building of a dam and the creation of artificial water basins. This may reduce the downstream water flow of rivers. Hydropower production may therefore negatively affect use options downstream such as water for other energy production, agriculture or water supply. Water resources are within the SNA asset boundary and therefore also within the SEEA boundary of assets. Further, the natural resource (the water reservoir) should be identified as a different asset from the related fixed assets (e.g. the dam).

Recommendation: That, notwithstanding the general recommendation regarding the recognition of renewable energy resources in the SEEA classification of assets, water reservoirs which are specifically used for hydropower generation should be classified as renewable energy assets.

(ii) Treatment for tidal stream and geothermal energy

14. Resource rent related to tidal stream and geothermal energy can be treated in the same way as resource rent related to wind energy and solar radiation. Energy production by geothermal energy and tidal stream does not seem to lead to ownership of these energy resources or the prevention of other use options. It does not affect future consumption options in the way the consumption of fossil resources does. For both tidal stream and geothermal energy it is the case that the characteristics of the landscape and its surroundings are essential in creating the potential resource rents. The characteristics of the landscape are already valued and incorporated into the value of land and associated surface water.

(iii) Run of river power production

15. Hydro power can also be generated through so-called run of river power production where the energy is derived by capturing the energy potential embodied in the falling or running water. It is recommended to treat such power production in the same way as wind and solar radiation (which are also flows of potential energy). In other words the value of this resource is considered to be embodied in the changing values of underlying environmental assets that are used in the capture of this energy source.

D. Subsidies for renewable energy

16. Through the work on this topic it has become clear that there is a range of policies and schemes in place to support the development of renewable energy resources and at the same time reduce the reliance on non-renewable energy resources. In this process a range of positive and negative externalities are likely to arise. Within the SNA there is no explicit accounting for these externalities and indeed accounting for these externalities is a complex task. Nonetheless there are some techniques that may be applied to advance the understanding of this issue.

17. For the SEEA, having the ambition to monitor and measure other phenomena than the SNA, it is advocated to at least monitor subsidies on products as well as “implicit” subsidies (such as tax reductions related to investments) related to the production of energy from renewable energy resources. This is because such subsidies are an important financing item for renewable energy projects. Taking into account renewable energy subsidies in determining the resource rent will start to take into account relevant externalities in relation to the production of energy from renewable energy resources.

18. Nonetheless, given the measurement difficulties and need for further research, it is suggested that these approaches to valuation be included in the revised SEEA Volume 2 as part of a presentation on the valuation of ecosystem services. Further, alternative approaches taking into account implicit subsidies could be presented as analytical items. This work in

SEEA Volume 2 may also be accompanied by a discussion on the potential policy applications (such as scenario modelling) in the revised SEEA Volume 3.