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SEEA Experimental Ecosystem Accounts: A Proposed Outline and Road Map

Paper prepared by UNSD EEA and the World Bank

(for discussion)

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A. Background

1. At its fifth meeting in June 2010, the UNCEEA requested the World Bank, the European Environment Agency (EEA) and the UN Statistics Division (UNSD) to develop a broad outline and road map for a volume on ecosystem accounting in the SEEA. This partnership has made progress during the past year towards a conceptual framework for experimental ecosystem accounts in the SEEA.

2. Coordination among the partners was initiated through several informal meetings in 2010, including in Santiago, Chile in September and at the UN Headquarters in New York in November. In 2011, so far two key meetings were organized that brought together the experts and practitioners from some of the leading institutions in this field. The first was a meeting in March hosted by the World Bank in Washington D.C. to kick-off the Global Partnership for Wealth Accounting and the Valuation of Ecosystem Services (WAVES). From 11-13 May, the EEA hosted a meeting of experts with the intent to further a consensus on the conceptual framework for ecosystem accounts and the strategy for its development within the context of the revision process of the SEEA. A convergence emerged in both of these recent meetings on the general principles and elements of the conceptual framework for ecosystem accounting, the proposed outline and road map. This paper reflects the outcomes of the discussions of those meetings.

3. Work in putting the conceptual accounting framework for ecosystem accounting to practice in the context of national accounting is still relatively new and therefore labelled as experimental. Therefore, the conceptual framework for ecosystem accounts will not be presented to the UN Statistical Commission as part of a proposed central framework for the SEEA. It is proposed to present the final draft of this framework in Part II of the SEEA, along with the proposed Part III on the extensions and applications, to the UN Statistical Commission at its 44th Session in 2013. Part II of the SEEA will be a high-level description of the framework based on recommendations on a set of core issues, which will be discussed broadly. The conceptual framework will be relatively brief (approximately 30-50 pages) and may be followed later on with a separate manual on land and ecosystem accounts that would provide more detailed elaborations based on practical experiences with compiling experimental ecosystem accounts.

4. Given the state of play, Part II of the SEEA should have a limited ambition to produce a conceptual framework for simplified ecosystem accounts. Processes are currently ongoing to produce and evaluate a set of ecosystem capital accounts for Europe led by EEA and on economic valuation of ecosystem services led by the

World Bank, which together with the coordination efforts of UNSD under the aegis of UNCEEA should provide the support for a broad consultation of statisticians, economists and scientists on the content of the experimental ecosystem accounts in the SEEA.

B. Policy Demand

5. The proposal is that the part of the SEEA on ecosystem accounting will encompass a broad description of the conceptual framework, which will include the scope and purpose of the accounts along with the proposed accounts, the classification of ecosystem services, the definition and measurement for the ecosystem accounting units and the valuation and recording methods of physical and monetary flows and stocks.

6. The motivation for development of ecosystem accounts comes from a wide range of emerging demands for integrating information on the environmental aspects of sustainability and for information on the links between ecosystems and human well-being. The international initiatives driving this demand for environmental-economic accounting from an ecosystem perspective are many. They include the Millennium Ecosystem Assessment, The Economics of Ecosystems and Biodiversity (TEEB), the "Stiglitz Report" on Measurement of Economic Performance and Social Progress, the World Bank-led WAVES Global Partnership and a number of emerging regional projects like Europe's "GDP and Beyond". The UN, OECD and EU activities on making the transition to a green economy all recognise the importance of maintaining ecosystem health and the flow of ecosystem services that are essential for well-being. Increasingly, an ecosystems perspective is incorporated into the frameworks used by groups like the World Water Forum and for projects like the UN REDD+ initiative launched by Norway and now steered by FAO, UNEP and UNDP. An integrated response to these new demands on environmental and economic statistics requires a new attention to the roles and functions of ecosystems.

7. The Millennium Ecosystem Assessment (MA) began from a call by former United Nations Secretary-General Kofi Annan in 2000 in his report to the UN General Assembly titled: *We the Peoples: The Role of the United Nations in the 21st Century*. The MA received widespread support from governments and a long list of international agencies and NGOs and the MA reports are extensively cited in the vast literature on ecosystem assessments. The MA concepts have been adopted in literally hundreds of local and regional pilot studies, as well as national projects like the UK National Ecosystem Assessment (NEA) published this month.

8. The MA, and subsequently TEEB and other related publications, established a new conceptual framework for monitoring and evaluating the state of the environment and its relationship to the economy, namely in terms of ecosystem

services, or the benefits people obtain from ecosystems. The MA and TEEB classified these flows of value as provisioning services (including food and water), regulating services (e.g. natural protections against flood, drought, degradation and disease), supporting services (such as nutrients cycling and pollination), and cultural services (including the recreational, spiritual, and religious benefits from nature).

9. The MA, TEEB and related initiatives respond to the growing requests from international conventions like the United Nations Convention to Combat Desertification, the Ramsar Convention on Wetlands, the Convention on Migratory Species, and the UN Framework Convention on Climate Change; requests that, increasingly, demand the attention of the official statistics community. For example, in October 2010 in Nagoya, Japan, the 193 member states of the Convention on Biological Diversity agreed to a new strategic plan (Decision X/2) in which a call is made to incorporate the values of biodiversity into national accounting and reporting systems. These demands create new challenges, but also new opportunities for environmental-economic accounting.

10. The central policy question underlying these new developments is the appeal to maintain (or improve) the capacity of ecosystems for delivering services to present and future generations. This implies a policy need for a better understanding of what ecosystems provide in terms of both market and non-market goods and services and what 'assets' or attributes of ecosystems are necessary for maintaining these flows of value.

11. This need for a better understanding on what ecosystems provide should be addressed through explicit measures of the contributions of these services to society and the impacts of our activities on them. As argued in a recent report by the Australian Government:

> *Many ecosystem services have not been easy to observe until they cease to flow, hence they have not been formally counted in economic systems, or the effects of their loss have been counted as 'externalities.' However, when these externalities become a significant cost burden to society, such as restoring degraded river systems, it becomes a priority to understand and value ecosystem services and to integrate them into economic frameworks.*
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> - Excerpt from *Ecosystem Services: Key Concepts and Applications,* Department of the Environment, Water, Heritage and the Arts, Australian Government (2010)

12. An important element in the measurement of the ecosystem services and the impact of the economy on the capacity of ecosystems to generate these services also draws out the need for geospatial data and their integration with data on production, consumption and accumulation from institutional units undertaking economic activities. Remote sensing and satellite images can be used to produce a wealth of new information when converted into statistics. This conversion into statistics requires tools and skills familiar to official statistics - particularly the use

of common classifications - for which best practices have emerged. By combining with data derived from remote sensing and satellites new utility can be derived from existing official statistics, including improvements in policy relevance at multiple scales (local, regional, national, and global). Such data should be produced regularly and consistently through an agreed conceptual framework for ecosystem accounting.

C. Annotated Outline

13. The annotated outline set out below is a reflection of the emerging conceptual framework for ecosystem accounting, including its purpose and scope. Further research will have to continue to resolve the outstanding issues, for which issue papers have to be prepared and consultations will have to be organised for their resolution (see Road map below).

14. The emerging consensus is that the purpose of ecosystem accounts should be to provide information for assessing the capacity of ecosystems for delivering services to present and future generations and to monitor and value the flows of services. The scope of the ecosystem accounts, in principle, should comprise all ecosystems including oceans and atmosphere, and all areas of land including urban or built-up environments. Moreover, the ecosystem accounts should describe three fundamental aspects of the ecosystems and their interactions with the economy: (a) the assets, (b) the flows of services, and (c) the overall health of ecosystems.

15. At this stage of development, the proposal is to organize the description of the conceptual framework for ecosystem accounting in the SEEA in four brief chapters:

(i) Overview of the conceptual framework
(ii) Physical asset accounts for ecosystems and measures of environmental health
(iii) Physical flow accounts for ecosystem
(iv) Monetary valuation

C 1. Overview of the framework

16. It is expected that this Chapter will set out the purpose, the scope, the principles and the elements of the conceptual framework. These aspects can be broadly described to cover:

The perspective of ecosystem accounts as compared to the SEEA Central Framework and describing how the systems relate to each other

17. The ecosystem perspective is explained in the context of using official statistics to inform land and environmental resource management policies designed to protect

and maintain ecosystem services and health. This perspective can be broadly summarized in terms of measures of the health or capacity of ecosystems to provide services. This means looking at the functioning of the ecosystems as a complementary point of view to the economic perspective for assessing sustainable use of natural resources and resource efficiency.

18. By way of example, the ecosystem accounts for terrestrial ecosystems incorporate information not only on land in economically productive use, but all land cover. From the ecosystem perspective, a forest is an asset not only in terms of its potential flows of timber and other resource inputs, but for all of the market and non-market services it provides as a naturally regenerating system.

The concepts and methods for identifying the statistical units of the accounts

19. The fundamental statistical unit is an ecosystem as a functional unit that has the capacity, in its own right, to provide services. These units are identified as spatial areas. Whereas the SEEA Central Framework takes mainly the national administrative perspective, information derived from ecosystem accounts can be assessed at the level of a functional ecosystem unit and at any geographic aggregation relevant for policy management, including river basins or regional administrative units.

20. The starting point for the identification of those functional units is land cover data derived from satellite images and remote sensing. From this basis, and in combination with additional dimensions such as the river basins and topography, elevation, and climate, a set of homogeneous functional landscape units that are mutually exclusive in terms of spatial area and can be derived for compiling and linking statistics obtained from the satellite images and from other data sources.

21. In the SNA, the statistical units are institutional units of the economy. These units utilize assets for production resulting in products that are classified according to the CPC. In the ecosystem accounts, the relevant units are ecosystems, which have the capacity to provide services, for which there is a draft classification called CICES.

The classifications for ecosystem services and assets

22. CICES, a draft classification for ecosystem services for the purpose of SEEA has been prepared and presented to the UNCEEA at its 5th meeting in 2010. CICES contains three categories of services: provisioning, regulation and maintenance, and cultural. Though there are some slight technical differences, in general CICES is derived directly from the predecessor framework of the MA and consistent with its successor in TEEB. As an additional dimension, there is a general agreement among experts to incorporate a scale attribute to this classification scheme.

The issue of scale

23. Statistics on ecosystems as derived from the accounts will have representation at different levels of geographical scale in order to address scale dependent services and policy questions. The issue of scale is addressed in the ecosystem accounts framework by compiling the accounts by geographic location or area. This means, in some cases, re-scaling existing socio-economic data and presenting information spatially in ways that are logical and useful for policy complementing the national aggregates and indicators. The ecosystem accounts provide the framework for representing existing social and economic data alongside statistics on the health of ecosystems and the flows of ecosystem services.

C 2. Physical asset accounts for ecosystems and measures of health

24. Ecosystem assets function through complex interactions between biotic and abiotic resources and it is through a sustained balance in these interactions that services are provided to humanity. A clear analogy to the SNA follows: the statistical units of ecosystem accounts utilize their 'assets' for production of goods and services. The assets in ecosystems are assets from the economic perspective to the extent that they can be owned and generate monetary benefits for institutional units. On the hand, they are also assets from the ecosystem perspective in the sense that they are necessary components that create capacity for delivering services and for the continuous regeneration of that capacity. Asset accounts will therefore connect economic sectors and ecosystems.

25. The natural capital of ecosystems is unique in that when managed sustainably, it is not consumed or depleted because it is self-regenerative. Thus, degradation to the health of ecosystems is not inevitable from the ecosystem perspective, but can result either directly or indirectly from unsustainable use. Most of the negative externalities from economic production, consumption and accumulation become the immediate burden of ecosystems. But there are limits to an ecosystem's capacity for generating services and absorbing the outputs of materials and pollution from the economy. Exceeding the limits affects the capacity of the ecosystem to continue to provide services. Thus, there is a direct policy need for the measurement of the capacity of ecosystems to continue functioning and, where possible, to link this capacity to economic activity.

26. The approach for physical asset accounts is to identify simple yet agreed proxies for the assessments of health of ecosystems and their assets. Ecosystem health is assessed in terms of observing changes in the assets and proxies of the general capacity of the systems for delivering the services; a dashboard or health check-list of indicators derived from the accounts. Essentially, the idea is to carry over ecosystem health diagnoses based on observable symptoms.

27. The measures used as the proxy signals, or symptoms, of ecosystem health include the changes in stocks of organic carbon sequestered by soil (growth, as

measured by net primary production, less the removals through agricultural harvests, forestry, and grazing), measures derived from the land cover, protection of natural areas and fragmentation, indicators of availability or of stress derived from water accounts by ecosystems, and indices of biodiversity. The carbon accounts, representing the beginning and end of period changes in carbon fixed in vegetation, provide a general indication of health and sustainability over time because all terrestrial ecosystems rely on the carbon cycle for the primary source of food and energy for all forms of life and growth. Statistics on the attributes of land use and land cover are also useful given some basic assumptions of the typical factors correlated to ecosystem health related to the size of unbroken areas of natural vegetation and the degree of its protection. The combination of quantity and quality of water is a central factor to the health of all ecosystems and data are available globally for monitoring relevant changes over time to individual systems. Biodiversity is a critical attribute of ecosystem resilience and therefore an important item on the health check-list and a powerful proxy indicator for assessing changes and risks over time. Disease prevalence of human, animal and vegetal populations is an indirect indicator of ecosystem health correlated to high environmental stress such as excessive waste dumping, lack of wastewater treatment or use of chemicals.

C 3. Physical flow accounts for ecosystems

28. In concept, all relevant flows of services from all ecosystems within the territory of reference are recorded in the physical flow accounts. However, in practice, it is clear that identifying and measuring all services is a significant challenge and there are not yet sufficiently robust methodologies for all ecosystem services in the classification. Therefore, the strategy for the experimental accounts will be to begin by selecting a small number of services of high relevance to the particular context. For services that can be identified, the objective is to record in each account the relevant physical flow measures for the purposes of assessing them over time.

29. In addition, ecosystem service flows cannot always be separately attributed to individual ecosystem units, but instead need to be identified at different scales as relevant for the particular type of service (note: the relevant scales will be indicated as a dimension within the classification of ecosystem services so that there is consistency in interpretation across accounts). For example, the filtration and assimilation services provided by a river or watershed may be more reasonably attributed to an entire river basin rather than to individual adjacent ecosystem units. Another example is services involving climate regulatory services that may not respect the boundaries of the ecosystem units. The ecosystem accounts framework should allow for these services to be attributed to the appropriate scale or spatial area.

C 4. Monetary valuation

30. The calculation of prices or monetary valuations for stocks and flows otherwise not explicitly identified through the market has become one of the most active areas of research in environmental economics. The key question is what is needed for integrating into policies and what can be achieved at different geographical scales. Some ecosystem services are already valued implicitly in the market, and thus in the national accounts, but they are embedded in the valuation of economic assets and production. Provisioning services, for example, such as food and timber, are ultimately market goods and thus market price information can be used to calculate values for these types of services individually. But for other types of ecosystem services, such as the regulating functions, there are no individually observed market prices to indicate the value in monetary terms. Therefore, to incorporate these services into a monetary accounting framework, it is necessary to conduct valuations of the flows of benefits at a scale which is feasible, credible and policy relevant. In order for these valuations to be consistent with the SNA, they will need to approximate prices, and not attempt to represent a holistic or social identity of value.

31. Experience thus far with monetary valuation of ecosystem services consistent with the SNA shows that there are significant challenges. Hence, a combination of methods is needed (with different types of services subject to different and sometimes non-market valuation methodologies). Therefore, the proposal is to focus initially on a few key services for which reliable valuations can be produced for the purpose of regular accounts. In principle, in order to derive new aggregate measures of wealth, all services should be valued so that these measures can be used to calculate and aggregate the value of ecosystems and their assets. However, in practice the current approach for ecosystem accounts is to focus on a few selected services for which reliable and consistent valuations are most feasible.

32. Therefore, no comprehensive valuation of the ecosystem capital is foreseen at this stage beyond the valuation of those assets which are at the same time economic assets and recorded in the SNA. However, the possibility of collecting data from existing statistics and administrative reports on the benefits of the services and costs necessary to restore ecosystem capital from degradation will be explored.

D. Road map

33. It is proposed that UNCEEA will request the UNSD, the EEA and the World Bank to continue their joint collaboration in providing the substantive methodological inputs for the drafting of Part II of SEEA on experimental ecosystem accounts. To ensure a broad consultation process consisting of members from the statistical, economic and scientific communities, the three collaborating institutions should be encouraged to constitute a technical sub-committee under the UNCEEA to be approved by its Bureau.

34. Following the establishment of the technical sub-committee, the issue list and the list of authors for the drafting of issue papers for the experimental ecosystem accounts should be determined. Progress made should be reported to the scheduled London Group meeting in September hosted by Statistics Sweden in Stockholm. Subsequently, a workshop should be organized with a broad representation of experts from the concerned communities to review the issue papers and to determine the resolution for the issues. Following the workshop, the outcome papers for the issues need to be drafted for further peer or global review, as appropriate.

35. Proposed timeline of outputs and activities

- **June, 2011** – Agreement on proposed outline and road map for the drafting of SEEA Part II for experimental ecosystem accounts based on paper tabled for UNCEEA meeting in June 2011
- **July, 2011** – Creation of technical sub group consisting of scientists, statisticians and economists with responsibility to review and draft issue papers on concepts and methods for ecosystem accounts
- **July, 2011** – Establishment of agreed list of key technical issues along with the identification of experts to prepare proposals on issues
- **September, 2011 –** Discussion on progress on experimental ecosystem accounts at London Group meeting, Stockholm
- **November, 2011** – Workshop on SEEA experimental ecosystem accounts jointly organized by EEA, UNSD and the World Bank. The meeting will review the methodological notes and issue papers prepared by experts (in particular the issues related to the physical asset and flow accounts and valuation). The workshop will also function as a forum for peer review of current work by experts.
- **February 2012** - Report on progress on Ecosystem Accounts to the UNSC in the paper prepared by the UNCEEA (in December 2011)
- **March, 2012** – Finalisation of methodological notes and issues papers on SEEA ecosystem accounts. SEEA Editor commences drafting of the SEEA Part II for ecosystem accounting
- **Quarter 4 of 2012** – Worldwide consultation on draft conceptual framework on ecosystem accounts in the SEEA
- **February, 2013** – Final version of SEEA Part II on ecosystem accounts presented to the UN Statistical Commission

E. Questions to the UNCEEA

Does the UNCEEA agree UNSD, EEA and World Bank to continue their collaboration in providing the substantive inputs for the drafting of the SEEA Part II Experimental Ecosystem Accounts based on the proposed annotated outline and roadmap?