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**INTEGRATING THE ECONOMIC AND THE ECOSYSTEM APPROACHES
TO THE ENVIRONMENT IN THE REVISED SEEA**

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(for discussion)

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Integrating the economic and the ecosystem approaches to the environment in the revised SEEA

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A. Introduction

1. There are two systems that interact in the SEEA, the economy and the environment, both represented by stocks and flows that inter-relate. The economy, its entities, transactions and boundaries are defined in the System of National Accounts (SNA 2008). In general, an economy is the sum of economic activities of production, consumption and accumulation undertaken by entities within an economic territory. The entities include the economic units that can engage in economic transactions and are capable of owning assets and incurring liabilities on their own behalf. The total economy of a country is defined as the entire set of resident economic units¹.

2. The environment is represented by ecosystems. An ecosystem is defined as a dynamic complex of plant, animal, and micro-organism communities and the nonliving environment interacting as a functional unit. A dynamic interaction between people and ecosystems exists. Changes in ecosystems are driven by human activities directly and indirectly. At the same time natural forces influence ecosystems.²

3. The SEEA2003 has until present been perceived as the statistical framework to measure the interaction between the economy and the environment. It has taken the perspective of the economy and measures the material inputs from the environment, throughput within the economy and return flows to the environment.

4. This perception reflects the practice in the implementation rather than the conceptual coverage of the SEA. The SEEA-2003 in fact has a very broad asset boundary to include all assets that provide use and non-use benefits now and in the future. It encompasses natural resources, land and ecosystems. The asset accounts cover stocks and changes in stocks due to economic activities and natural causes. The asset accounts implicitly encompass the ecosystem approach. This approach however is not thoroughly elaborated probably because ecosystems and their services came to forefront of the national and international debate after the release of the Millennium Ecosystem Assessment (MA) in 2005, after the SEEA-2003 was released.

5. The ecosystem approach to the environment, developed by the scientific community, provides a change in perspective. The environment is seen as a system in its own right. It provides services to humanity and it encompasses natural processes that can

¹ System of National Accounts 2008.

² Millennium Ecosystem Assessment *Ecosystem and human well being synthesis*
<http://www.millenniumassessment.org/documents/document.356.aspx.pdf>

affect its capacity to provide services. This is the perspective taken by the Economics of Ecosystem and Biodiversity (TEEB) and the Millennium Ecosystem Assessment (MA).

6. The paper argues that the revised SEEA should thoroughly cover both the economic and the ecosystem perspective to the environment. In particular, it argues that Volume 1, the standard should describe the economic approach to the environment considering that there is widespread experience in implementation in countries. Volume 2 could elaborate in greater detail the ecosystem approach based on the increasing number of existing experiences in countries. Chapter 2, the Chapter on the framework should describe both framework and explain both perspectives.

7. The paper also raises the question of whether the SEEA should continue to be perceived as a satellite account of the SNA or there should be a change in portraying the SEEA as the system approach to the environment encompassing both the economic and the ecosystem perspectives to the environment. Since both perspectives are already included in the SEEA-2003, the change would be more on the how the revised SEEA is portrayed rather than a fundamental conceptual change.

B. The economic approach to the environment – the SEEA-2003

8. The stated objective of the SEEA as outlined in the SEEA-2003 and its predecessor SEEA-1993 is to measure the contribution of the environment to the economy and the impact of the economy on the environment. To do so, the SEEA brings economic and environmental information together in a common framework using concepts, classifications, tables and accounts consistent as much as possible with the SNA. Deviations from the SNA only occur in limited number of cases. A notable case is the expansion of the asset boundaries to take a very broad scope.

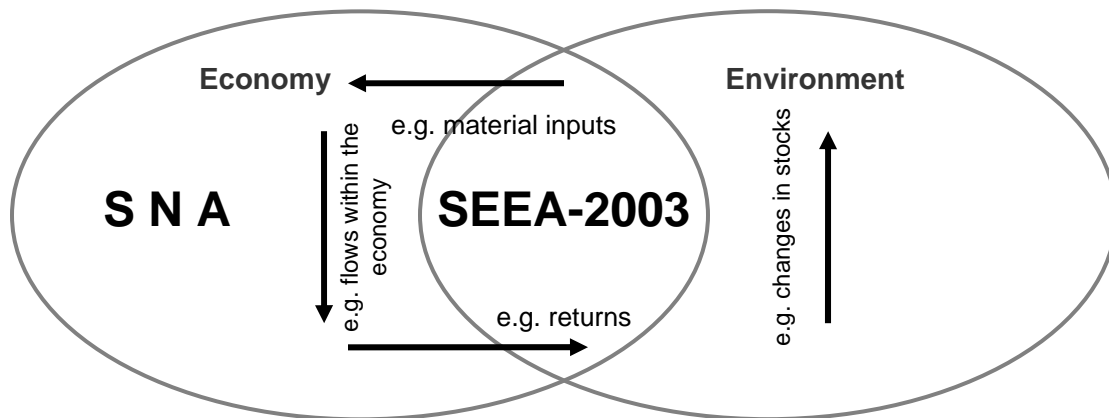
9. The SEEA-2003 mostly considers the environment from the perspective of the economy. This implies that the environment is not seen as a system in its own right but only insofar as it provides services to the economy. These services include material inputs, space and sink. The classification of assets reflects this perception. Its building blocks include natural resources, land and ecosystems as they provide the above services respectively.

10. Because of this perspective, the SEEA has been viewed as a satellite system of the system of national accounts that complements and extends the SNA accounts. Figure 1 illustrates the economic perspective of the environment through a diagram. The economy and the environment, representing two systems, are shown as two circles. The two systems interact and therefore the two circles overlap. The SNA is the system approach used to measure the economy. The SEEA-2003, being a satellite system of the SNA, lies at the intersection of the two systems. It uses the same production and consumption boundary as the SNA. In particular, it measures the environment related flows and transactions within the economy (e.g. supply of water industry and use of water by industries and households as well as fees and permits to access the resources); flows that

the economy receives from the environment, mostly material inputs; and flows from the economy back to the environment (e.g. emissions, waste and return flows).

11. The SEEA-2003 asset accounts measure the stocks and changes in stocks of natural resources, land and “ecosystems”. Considering the broad asset boundary adopted in the SEEA-2003, covering all environmental assets providing use and non-use benefits now and in the future, they come very close to measuring the environment in its own right. Although this is true from a conceptual point of view, it has been implemented in practice in a very limited sense. The SEEA-2003 reflected the current thinking considering that the concept of ecosystem and ecosystem accounting has evolved in the years after the SEEA-2003 was written (see below).

Figure 1. The economic approach to the environment



12. National statistical offices have long term experience in collecting, compiling and disseminating socio-economic data mostly through surveys or administrative sources. The statistical units, that is the units about which information is collected, are establishments or enterprises and households.

13. The SEEA has been until present an exercise driven out of national statistical offices. It is of no surprise that the SEEA modules where most country practices exist are the flow accounts (in physical and monetary terms). Information to compile the flow accounts is collected using the same sources and methods used for socio-economic data. It rests within the domain of NSOs.

14. If we take the example of water accounts, the physical flow accounts include abstraction from surface and ground water, water supplied to industries and households, wastewater generated and either delivered for treatment or returned back to the environment as return flows as well as emission of pollutants added to water as a result of production and consumption. The monetary flow accounts include current and capital cost for abstraction and treatment of water, fees paid for water as well as permits to have

access to the resource for abstraction of water or discharge of wastewater. These data are collected from industries and households through business or household surveys.

15. In the case of the asset accounts, on the other hand, information on water resources or hydrological cycle such as precipitation, evaporation, inflows and outflows of water from and to other territories or the sea and exchanges of water between surface and ground water are the domain of science, namely hydrology, hydrogeology, meteorology, etc. Although this information is usually collected in countries, it is rarely integrated within country accounting systems.

16. The SEEA-Water tries to bring these sets of information together to develop a multi-purpose integrated data system for water, a more efficient way of collecting and compiling the data, foster dialogue among the various communities and respond to policy needs. These policy needs include not only water management (mostly addressed through hydrological cycle type of information) but also macro-economic decisions related to the water sector and beyond, including the evaluation of trade-offs among various economic policies and impacts of these policies on the water sector. On the policy side, the accounts can be used by water managers as well as decision makers in finance ministries evaluating the broader impacts of economic and fiscal policies on the water sector.

17. The SEEA-2003, as the SNA, uses a system approach consisting of stocks and flows to measure the interaction between the economy and the environment. Using the system approach characteristic to the SNA has been the strength of the SEEA. It allows integration of different statistics bringing rigor to the development of those parts of environment statistics which relate to the economy through the development of coherent sets of classifications, definitions and data collection practices borrowed from economic statistics.

C. The ecosystem approach to the environment

18. The ecosystem approach to the environment has emerged and received widespread recognition with the Millennium Ecosystem Assessment (MA). It was then elaborated with The Economics of Ecosystems and Biodiversity (TEEB). The ecosystem approach focuses on the health and quality of ecosystems to ensure that the capacity to providing services to humanity is maintained.

19. The Convention on Biological Diversity (CBD) defines an ecosystem as "...a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit"³ and ecosystem services are defined as "...the benefits people obtain from ecosystems."⁴. As indicated in TEEB D0 Chapter 1⁵,

³ Convention on Biological Diversity <http://www.cbd.int/convention/articles.shtml?a=cbd-02>

⁴ Page 16 The Ecosystems Approach [Online 23/03/2010: <http://www.cbd.int/doc/publications/ea-text-en.pdf>]

the capacity of the ecosystems to generate the services is of great importance to the economy. There is a need to better understand and systematically account for (a) how different ecosystem services are interlinked with each other and to the various components of ecosystem functioning and the role of biodiversity; (b) how different human actions that impact upon the ecosystem change the provision of ecosystem services; (c) the potential trade offs among services; (d) the influence of differences in temporal and spatial scales in demand and supply of services.

20. The focus on ecosystems represents a move away from viewing the environment by its components such as timber, minerals, fish or soil. Instead the environment is being viewed as systems, consisting of interdependent components, which make up the environment. It is from these systems that ecological services are “produced”.

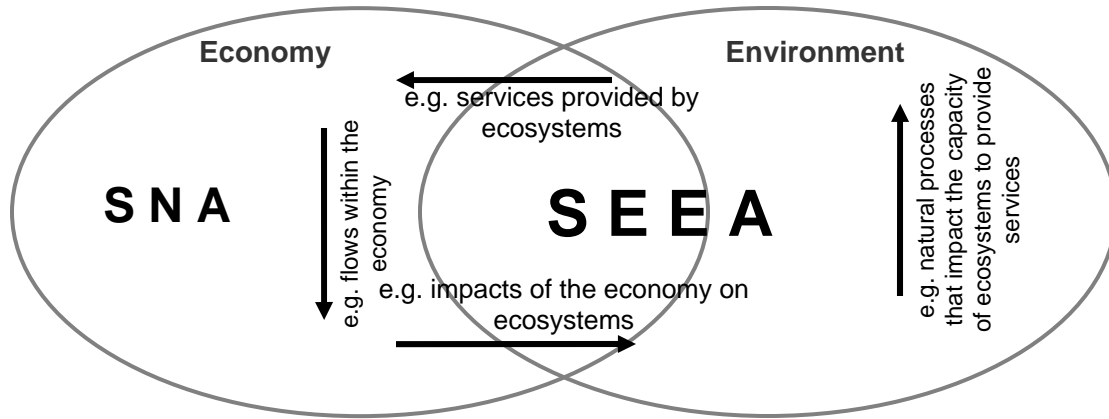
21. Services are conceptualizations of the useful things the ecosystems provide to people directly and indirectly. Properties of ecological systems that people regard as useful may change over time even though the ecological system may not.

22. Science studies the factors that drive the production of the services and how these are affected by the actions put in place. Human decisions lead to actions that impact on ecosystems causing changes in ecosystem structure and function. These changes in turn lead to changes in the provision of ecosystem services. Changes in ecosystem services have impacts on human welfare. There is a need to understand these linkages.

23. Using a similar representation to Figure 1, it is possible to illustrate in the form of a diagram the ecosystem approach to the environment. We are still in presence of two systems, the economy and the environment, and the two systems interact. The perspective is different in this case: it is no longer the economy that takes “goods” from the environment and returns “bads” to it. It is the environment that supplies services to the economy which in turn impacts the ecosystems directly and indirectly. Figure 2 illustrates the change in perspective.

Figure 2. The ecosystem approach to the environment

⁵ *Integrating the ecological and economic dimensions in biodiversity and ecosystem services valuation* <http://www.teebweb.org/EcologicalandEconomicFoundation/tabid/1018/language/en-US/Default.aspx>



24. Because of the change in perspective, the units of measurement in the ecosystem approach are no longer establishments/enterprises and households but are the ecosystems (e.g. a forest, savannah, river or lake). The data items that are collected about the units, concern the types of services that ecosystems provide to people and the economy. These services have been classified in the MA and TEEB into four broad categories consisting of:

- Provisioning services (such as food, fibre and water)
- Regulating services (such as regulation of floods, drought, climate, land degradation, and disease)
- Cultural services (such as recreational, tourism, spiritual, religious and other nonmaterial benefits)
- Supporting services (such as soil formation and nutrient cycling)

25. Both the MA and TEEB further provide a detailed classification of ecosystem services.

26. The provisioning services coincide with the material inputs of the SEEA-2003 that the economy receives from the environment. Regulating services, supporting and cultural services are not explicitly included in the SEEA flow classification. However, it can be thought that they are included as part of “ecosystems” in the asset accounts.

D. Bringing the economic and ecosystem approaches together in the revised SEEA

27. The economic and ecosystem approaches represent different perspectives on the environment. This has implications in particular for the following aspects, which are discussed separately below:

- Stated objective of the revised SEEA
- Terminology
- Classifications

- Statistical units
- Spatial and temporal disaggregation of information
- Data producers and users

Stated objective

28. The stated objective of the revised SEEA should be reworded to encompass not only the economic perspective to the environment but also the ecosystem perspective. It could read as follows: “The objective of the revised SEEA could read along the following lines: the objective of the revised SEEA is to monitor the quality and health of the environment in its capacity to provide services to humanity”. This representation would cover that part of the environment that provides services to the economy; it is impacted by economic activity and those natural process that are known to have an impact on the health of the ecosystem thus impairing its capacity to continue to provide services. It actually provides a narrower scope than the SEEA-2003 asset boundary.

Terminology

29. The *terminology* used in the economic approach to the environment is consistent as much as possible with that used in national accounts. The ecosystem approach follows its own terminology mostly in line with the scientific community and reflected in the MA and TEEB. For example, in the ecosystem approach the provisioning services include food, fiber and water. These are called goods in the SNA and SEEA.

30. An example of a successful attempt to harmonize the terminology has been in the case of water. During the drafting of the SEEA-Water and subsequently the International Recommendations for Water Statistics (IRWS) efforts were made to develop a common terminology for the accountants and hydrologists. The development of a glossary with agreed terms and definitions was an important output of the SEEA-Water and IRWS.

31. Although it may not be possible nor desirable to completely harmonize, as it was in the case of water, the terminology between the economic and ecosystem approaches, the revised SEEA should ensure that correspondence between the terminology of the economic and ecosystem approaches is developed. This would ensure clear communication and understanding between the statistical/economic community and the scientific/environmental community.

Classifications

32. As for the terminology, the *classifications* used in the economic approach to the environment are coherent with the standard statistical classifications. These include for example, the International Standard Industrial Classification of All Economic Activities (ISIC), the Classifications of Expenditure According to Purpose and in particular their extension to the environment, namely the Classification of Environmental Protection Activities (CEPA) and the Classification of Resources Use and Management Activities

(CRUMA). The SEEA also includes the classification of physical flows which subdivided into the classification of flows from the environment to the economy, within the economy and back to the environment. The flows within the economy are classified according to the Central Product Classification (CPC). The flows from the environment to the economy and the flows from the economy to the environment are based on CPC. However CPC needs to be complemented with additional flows as not all from the environment and back to the environment are covered by CPC. These include for example grazed biomass and emissions to air.

33. In the ecosystem approach the classification used is the classification of ecosystem services. As mentioned earlier, the ecosystem services are grouped, according to the MA, into 4 categories, namely provisioning services, regulatory services, cultural services and supporting services.

34. The question is: can the classifications used in the two approaches be brought together?

35. With regard to the coverage, provisioning services correspond to the material flows from the environment to the economy. Some of the cultural services such as recreation and tourism are already included in the SEEA accounts. Supporting services are partially included in the flows from the environment to the economy as part of the SEEA-2003 ecosystem inputs classification.

36. The physical flow classification can be expanded to include those services such as regulatory, part of cultural and supporting services. A bridge table between the classification of ecosystem services being developed as part of the revision of the SEEA Volume 2 and the classification of physical flow can be developed.

Statistical units

37. The *statistical units* that are being used in the economic approach to the environment are the establishments/enterprises and households. They are the so-called institutional units defined as economic entities that are capable, in their own right, of owning assets, incurring liabilities and engaging in economic activities and in transactions with other entities (2008 SNA para 4.2).

38. The statistical units in the ecosystem approach are the ecosystems as defined by the CBD (see para 19). From a practical point of view, the ecosystem approach is interested in collecting information about a specific ecosystem delimited by a specific area. We can therefore think that the statistical unit of interest is a land cover unit about which relevant information should be collected. This information includes for example the type of ecosystem, the biodiversity living in the ecosystem, any food or other material provided by the ecosystem as well as the institutional unit owning the ecosystem (e.g. is it privately owned or government owned?).

39. To reconcile the economic and the ecosystem approaches would entail to cross-classify land cover units with institutional units and then collect the relevant data items.

40. As an example, the IRWS introduce in addition to the institutional units used in economic statistics, statistical units in the environment. They are defined as those units in the environment about which we want to collect information. In the case of water, rivers, lakes, artificial reservoirs are the environmental units. The data items collected on these units include information on their physical characteristics such as length and widths of rivers, lakes and artificial reservoirs. These units are in turn cross-classified according to which institutional sector owns them (e.g. government, private sector households) and these are in turn classified according to their primary economic activity (e.g. water supply (ISIC 36), hydro-power generation (ISIC 35), etc.)

Spatial and temporal disaggregation

41. The economic approach is based on the SNA spatial and temporal disaggregation as it links the environment data to the economic data. The spatial scale at which national accounts are compiled is national and at times at the level of administrative regions. The temporal scale is annual using the calendar year and at times quarterly.

42. The ecosystem approach requires information at specific temporal and spatial scales depending on the process and phenomenon being examined. Some processes occur at scales larger than national scale as it is the case for example of carbon dioxide concentrations others instead occur at a smaller scale as for example in the case of collapse of certain fish stocks. The spatial and temporal scales in addition to being linked to the phenomenon being studied are also linked to the type of policy decisions to be made.

43. If we take the example of water, the SEEA-Water framework can in principle be compiled at any geographical and temporal scale. At sub-national level, the options are usually to compile the accounts at either the level of administrative regions for which economic data are usually available, or at the level of river basin for which hydrological information is available. River basins are the most appropriate units of reference for Integrated Water Resources Management. Water management can in fact be more effectively pursued at the river basin level since all water resources within a river basin are inextricably linked to each other in terms of quantity and quality. To overcome the multi-scale spatial reference for hydrological and economic data, the SEEA-Water defines the accounting catchment as a collection of river basins or sub-basins large enough so that economic information is available. Accounting catchments could consist of one administrative region and be composed of several river basins or it could be composed of several administrative regions to cover a whole river basin.

44. Similarly for temporal scale, for economic data the reference is the calendar year, while for hydrological data is the hydrological year. Moreover, yearly accounts often hide seasonal variability of water use, supply and availability. Depending on the country

situations, the SEEA-Water recommends different strategies to collect policy relevant data that can be combined with economic data.

Data producers and users

45. The data needed to inform the economic approach to the environment pertains to data sources and methods of national statistical offices. Data on resource use and returns to the environment as well as throughputs in the economy are collected from institutional units through surveys. This approach brings together economic and environmental information thus expanding the analytical capacity of the SNA. These accounts have been used mostly to derive indicators and as inputs in scenario modeling. Typically indicators of resource efficiency/productivity as well as decoupling indicators are derived from the accounts. The extended input output modeling allows for example to analyze the impact of putting in place economic instruments on for example resource use and structural changes of the economy.

46. The users of the information derived from the economic approach are researchers, economists and decision makers wanting to inform macro-economic policies. In the government, the users of the information from the economic approach would most likely be the finance ministries wanting to evaluate trade offs of budget allocations, evaluating the impacts of introducing economic instruments and setting priorities taking into accounts the environment.

47. The data needed for the ecosystem approach is concerned with the health and quality of the ecosystems and its capacity to continue to produce services. It is the result of monitoring using different methods and techniques that pertain to the science domain. The data obtained often need to be interpreted and require specific modeling.

48. The use of the data derived from the ecosystem approach has to do with the changes of the physical characteristics of the ecosystems. The study of the ecosystems has to do with identifying possible tipping points that may affect the ecosystems delivery of services. It has to do with studying not only the parts of the ecosystems but how the natural processes inter-relate. Scientists would use these data to build awareness on the importance of the ecosystems and the services they deliver.

E. Way forward – revised SEEA

49. This paper presents two perspectives on the environment – the economic and the ecosystem. In the context of the revision of the SEEA, an important question has to be answered whether the revised SEEA should be portrayed as a satellite system of the SNA focusing on measuring the interaction between the economy and the environment or as a system approach to the environment explicitly and thoroughly covering both the economic and the ecosystem approaches.

50. Portraying the SEEA as the system approach to the environment would help in bringing together the statistical and scientific communities. The statistical community

will have an opportunity to elevate the environmental pillar at the same level as the economic and the social pillars within the statistical systems. Developing common classifications and terminology and exchanging some of the methods used by the statistical community will bring rigor and improve the quality of environmental data.

51. At the same time, the scientific community will be able to integrate its approach with the economic data. This has been very high on their agenda if there is any hope for the ecosystems to be included in the economic decision-making process, as indicate in the TEEB report. Similarly, the climate change debate while stimulated by scientific consideration of increases in the temperature of the planet, is increasingly paying attention to what would be the costs to meet the policy goals through mitigation and adaptation. In the same vein, water resource management has increasingly put emphasis on water pricing and financing.

52. The revision of the SEEA provides an opportunity to change the perception and explicitly integrate both the economic and ecosystem approaches in a common statistical framework. The revised SEEA consists of three volumes. Volume 1, the standard, consists of those concepts, classifications and accounts for which there is wide spread consensus. Volume 2 provides a manual of best practices and covers those accounts which are highly policy relevant but for which consensus has not yet been reached. Volume 3 consists of the application of the accounts.

53. Volume 1 of the revised SEEA, the standard, could provide the framework for the economic approach to the environment. It focuses mostly on the measurement of the intersection between the economy and the environment. It presents the SEEA satellite of the SNA.

54. Volume 2 of the revised SEEA could be seen as presenting the ecosystem approach to the environment. It focuses on ecosystems, ecosystems services and their valuation as well as valuation of degradation that is the changes in quality of the environment. It covers issues for which there is limited experience in countries and about which consensus is beginning to emerge but it is not achieved.

55. As mentioned earlier, the revised SEEA already implicitly includes both the economic and the ecosystem approaches. The implications of explicitly integrating both approaches would be mostly affecting Volume 2. It would have to do with integrating the classification of ecosystem services into the classification of physical flows and reorganizing the classification of assets. Chapter 2 of the revised SEEA on the framework would encompass both approaches and explain concepts and terminology of both approaches. It would provide the framework for the system approach to the environment.