Economic and Social Council

Economic Commission for Europe

Conference of European Statisticians

Sixty-first plenary session
Geneva, 10-12 June 2013
Item 3 (b) of the provisional agenda
Key challenges in implementing the System of Environmental-Economic Accounting

Implementation of the System of Environmental-Economic Accounting: Mexico's experience

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Summary

The paper describes the experience of the National Institute of Statistics and Geography of Mexico in implementing the System of Environmental-Economic Accounting.

Mexico has accumulated experience in the implementation of the System of Environmental-Economic Accounting for over 20 years. The paper reflects on the challenges faced along this period and the strengths that have enabled achieving the results. Exchange of ideas may help countries that are launching new work in this area to avoid similar problems and strengthen their ability to implement projects for developing environmental statistics.

The paper further highlights the importance of international collaboration, in particular the exchange of experience and views within the London Group for Environmental Accounting. The international work has led to the development of the System of Environmental-Economic Accounting in the current form.

I. Why the System of Environmental-Economic Accounting is implemented in Mexico?

1.   The production of economic goods and services involves issues beyond those that can be perceived directly, for example the damaging effects on the environment caused by the depletion of natural resources, like water or forests, and the deterioration of the quality of air or soil resources.

2.   The importance of measuring the environmental impact lies in the possibility to see the costs that would incur from reducing and preventing environmental damage caused by production, distribution and consumption activities. These data are needed by society in general, and particularly by the decision makers, for encouraging and promoting prevention, remediation and control of pollution and depletion of environmental assets. To this end, tools such as the manual for environmental-economic accounting enable the development of economic valuation of natural resources. This in turn allows deriving indicators that can be related directly to macroeconomic variables. Thus, Mexico has developed new variables such as the Ecological Net Domestic Product and the Environmental Protection Expenditures, among others.

3.   Over 20 years ago, the Mexican statistical authorities made a decision to address the challenge of quantifying environmental issues. Three factors influenced the decision, namely: the progress in the development of national accounts, international collaboration, and particularly knowledge of environmental pressures resulting from economic activity.

4.   The first factor, the development of national accounts in Mexico, in the early 1990s, already included important technical elements, such as the extension of the asset boundary to non-produced economic and environmental assets, as well as data on production of and demand for goods and services, including the early links to the depletion and degradation of environmental resources. The inputs to national accounts included data on passenger transport, the number of vehicles circulating on roads and bridges, the production of cars, trucks, tractors and buses for the domestic market and export, timber production, fisheries, oil exploitation and other issues. These data are needed for quantifying the environmental impact of economic and human activity.

5.   Secondly, the commitment of the United Nations and the World Bank, together with National Institute of Statistics and Geography of Mexico (INEGI), has greatly supported the completion of the first environmental accounts that included both macroeconomic variables derived from the national accounts and data on the impact of production activities in the environment.

6.   The third factor, knowledge of environmental pressures contributed to the development of environmental accounts in Mexico. The environmental authorities of the country highlight the strong pressure exerted by economic activities on environmental assets. Therefore, in 1988, the Congress was empowered to regulate environmental matters through the General Law of Ecological Balance and Environmental Protection. This Law demands the quantification of the cost of environmental pollution and natural resource depletion caused by economic activities by calculating Ecological Net Domestic Product (PINE) and integrating it into the System of National Accounts.

7.   This inclusion of environmental issues into the Mexican legislation corresponded to the international work for measuring the welfare of population by considering also the

quality of environment. Consensus on this issue was reached in the Brundtland Report "Our Common Future"[1], released in 1987. In addition, the available data from the late 1980's, although scarce, allowed estimating the magnitude of environmental problems that could be faced years later. Only in the last years of this decade and early 1990's a strong increase in the concentration of ozone in the Metropolitan Area of Mexico was observed: from 115 parts per billion (ppb) in 1989 to 175 ppb in 1991.

8.   The development of accounting of the interaction between the economy and the environment is the result of several factors, not only of those mentioned above. It also depends on the leadership and vision of the project, and particularly on the national statistical capacity.

9.   Dialogue and cooperation with the environmental sector in Mexico notably advanced the implementation of environmental accounts in the country. Mexico already had a strong technical capacity and willingness to collaborate in measuring environmental variables such as the ecological Net Domestic Product or PINE.

10.   The country's environmental sector was strengthened through a process of creation of different institutions. These institutions promote technical discussion and provide the necessary information to create the accounting tables for the System of Environmental-Economic Accounting (SEEA). In 1982, the Ministry of Urban Development and Ecology was established. In 1992, the National Institute of Ecology and the Federal Environmental Protection Agency started its work. In 1994, the Secretariat of Environment, Natural Resources and Fisheries (SEMARNAP), was established, in order to plan the management of natural resources and environmental policies in our country from a holistic perspective taking into account the economic, social and environmental objectives. In parallel, other agencies were established to provide environmental data regularly, such as the National Fisheries Institute, the National Water Commission and the Commission for the Knowledge and Use of Biodiversity.

11.   The Federal Government Administration Law was changed in 2000 creating the Secretariat of Environment and Natural Resources (SEMARNAT). This has given prominence to environment as a cross-cutting issue in the work agenda of three related committees of the government: Committee on Social and Human Development, Committee on Order and Respect and Committee on Growth with Quality.

12.   Mexico began the process of measuring environmental impact with a case study in 1991. This was done with the support of international experts, such as J. Van Tongeren and S. Schweinfest of the United Nations Statistics Division, as well as E. Lutz of World Bank. This cooperation led to defining indicators of the degree of environmental sustainability of the Mexican economy. The PINE is an example of this type of indicators as it incorporates issues such as the depletion of oil resources, groundwater and forests, as well as the degradation of air, water and soil.

13.   After this project was finished, the team that collaborated in the first case study was restructured to include experts from different disciplines, such as economics, mathematics, environmental engineering, biology, and certainly national accounts. They prepared a review of what had already been achieved and sought the most appropriate way to adopt the recommendations of the nascent SEEA 1993.

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[1] World Commission on Environment and Development. United Nations. 1987. Our Common Future. United Nations.

14.   Some important lessons were learned in the process of implementing SEEA 1993, which on one hand facilitated the progress with the new accounting manual and on the other hand may have created some difficulties.

15.   First, the creation of SEMARNAT brought about useful information for the development of environmental accounts. Furthermore, SEMARNAT continued and expanded the Report of the General Situation on Matters of Ecological Balance and Environmental Protection, released originally in 1992 by the Ministry of Social Development. This report provides data on water resources by areas with overexploitation of groundwater, generation and wastewater treatment, land use, forest production volume, rates of deforestation, reforestation, areas vulnerable to desertification by erosion, production and total oil reserves, air monitoring in the main cities of Mexico, fuel consumption, emissions by type of industries etc.

16.   In addition, important information sources included the National Forest Inventory 1991-1992 by the Ministry of Agriculture and Water Resources (SARH); the National Forest Inventory 2000 by SEMARNAT et. al.; data on extraction, recharge and water treatment by the National Water Commission (CONAGUA); Yearbooks, Financial Statements and Reports by Petróleos Mexicanos (PEMEX); the Comprehensive Program for Air Pollution by the Department of the Federal District; the National Energy Balance by the Ministry of Energy; data by the Mexican Association of the Automotive Industry etc.

17.   Secondly, implementing the SEEA 1993 recommendations required a methodological review of the environmental sector institutions and a series of rather technical meetings to bring environmental issues to the economic sphere.

18.   In order to define the scope of work and how the existing data and methodology should be modified, continuous consultations were held with the environmental sector institutions. The calculation methods were discussed frequently, for example with the National Institute of Ecology (through the Directorate of Environmental Economics) for each specific topic.

19.   Meanwhile the London Group on Environmental Accounting came up with a series of new recommendations in the SEEA 2003 on issues such as water, forests, and the presentation and order of the tables, or classifications. For example the new Classification of Environmental Protection Activities and Expenditure (CEPA 2000) led to reconsidering some working methods that had been used for many years.

20.   While it is true that the adoption of the SEEA 1993 in Mexico's environmental accounting was relatively easy, the application of the new manual was not, as some technical changes did not appear useful for national purposes.

21.   While the manual provides recommendations for each subject it covers, the users, researchers and analysts have to do the interpretation (to discover the story). As in drafting the manual, the economic valuation of natural resources and the amount of the loss of environmental quality created discussion. The more technical discussions covered the revaluation of non-produced economic assets, the net income approach, the application of shadow prices, the rediscount rate for measuring the net present value.

22.   Even though the economic valuation issues required much discussion, they are essential to measure the impact caused to the environment as a result of the processes of production, distribution and consumption.

23.   Consequently, INEGI, in its continuous challenge to provide decision makers, households, companies and the public sector cutting edge information, published in 1996 the Economic and Ecological Accounts of Mexico (SCEEM, Spanish acronym). This was a

welcome new in-sight responding to the demand for economic information related to the environment.

24.   Several challenges arose during the implementation of the SEEA 2003 in deciding what available data to use and how. For many areas, lack of information was the largest challenge. Selection between the diverse methodologies and approaches was also difficult. Different institutions and researchers disseminated environmental data of good quality, but often their methods were not applicable with the concepts used in SEEA.

25.   For example, from 1989 to 2001, in total 12 deforestation rates by vegetation type were released (see table 1). This confused the users and obliged them to investigate and analyze how the rate of deforestation should be measured so that it could be used as a measure of natural resource depletion.

Table 1
Estimated rates of deforestation according to vegetation types

Estimated rates of deforestation according to vegetation types (Thousands of hectares/year)				
Reference	**Forests**	**Jungles**	**Arid areas**	**Total**
Castillo *et al.*, 1989[1]	273	473	na	746
FAO, 1988[2]	125	470	20	615
FAO, 1995	na	na	na	678
Masera *et al.*, 1992[3]	167	501	na	668
Myers, 1989	na	700	na	700
Repetto, 1988[2]	na	460	na	460
SARH, 1990[4]	127	202	41	370
SARH, 1991[5]	127	189	54	370
Toledo, 1989[6]	na	na	na	1500
WRI, 1992[7]	na	na	na	615
WRI, 1994[2]	na	na	na	678
Semarnat, 2001[8]	259	535	334	1 128

[1] Annual averages for the period 1988-1994. Based on population growth.
[2] The calculation methodology is not indicated
[3] Based on the review of official statistics and case studies.
[4] Based on reports from the forestry delegations of the SARH. Excludes open forests
[5] Based on reports from the forestry delegations of the SARH.
[6] Includes open forests and grasslands.
[7] Figure taken from FAO.
[8] Figures based on preliminary results of the «National Forest Inventory 2000».
na: Not available.
Source: Masera O., Deforestación y degradación forestal en México», GIRA A.C., Documentos de Trabajo No. 19, México, 1996.
       Poder Ejecutivo Federal, **Programa forestal y de suelo, 1995-2000**, Semarnap, Talleres Gráficos de México, México, 1996.
       Semarnat, 2001.

26.   As seen in table 1 above, the data was rather scattered, primarily due to the definitions adopted when estimating these rates. Some of these measures were calculated as initial measurement exercises. As a result, users asked questions such as what is the official rate of deforestation and based on which rate should plans and policies be formulated for the protection and conservation of forests.

27.   Another challenge is how to select the source data for the accounting tables, how to evaluate the results and how to determine consistency and accuracy of the variables and the derived indicators. Suitable methods for defining data quality were needed and these should be based on defined criteria and standards, rather than subjective opinions or perceptions.

28.   As part of the quality control of the SEEA, INEGI made use of a statistical tool. This enabled us to avoid value judgments when variables were selected by analyzing their behavior or trend. A process of reviewing and updating information sources was established including choosing the calculation methods for each environmental issue. Part of the process required verifying compliance with international standards such as the System of

National Accounts (SNA), the Environmental protection expenditure accounts (SERIEE), and certainly the SEEA, among others. It is necessary to interact with other statistics in order to ensure the coverage of information needed for SEEA in censuses and surveys and their statistical accuracy, size of sampling errors and fitting methods.

29.   Mexico took advantage of the Quality Control / Quality Assurance recommendations of the 2006 IPCC guidelines, meant for national inventories of greenhouse gases. These guidelines, in Chapter VI, present recommendations for greater quality control during each stage of statistical production - from data collection to final outcome.

II.   Information for decision making

30.   As already mentioned, partnerships at national and international levels contributed to the knowledge of methodology and quality of results of SEEA in Mexico. This facilitates the use of SEEA in analyzing the economy and the environment, as well as making strategic development plans, public policy or international assessments of the environmental conditions of the country.

31.   Thus, as explained above, the accounting logic to quantify the cost of environmental pollution and depletion of natural resources, as well as indicators such as the Ecological Net Domestic Product have been stated in Article 15 of the General Law of Ecological Balance and Environmental Protection.

32.   In the National Development Plans for 2001-2006 and 2007-2012 Green GDP is considered an important indicator of sustainable development. They also call for the valuation of environmental goods and services to reconcile environmental issues with social and economic development.

33.   The National Environment and Natural Resources 2007-2012 reviewed the usefulness of the results of environmental accounts for the analysis of the environmental situation in the country stating that "...environmental-economic accounts, made by INEGI, provide a clear picture".

34.   At the *international* level, the Organization for Economic Cooperation and Development (OECD), in its Evaluation of Environmental Performance of Mexico, recognizes the country's initiative on environmental indicators such as PINE which supports environmental analysis.

35.   Moreover, the Global Environmental Outlook of Mexico[2] collects information from environmental accounts showing the relationship between Net Domestic Product (NDP) and PINE and "exemplifies the relevance of including the ecological approach in the national accounts, because it allows reconsidering the importance of economic activities in the generation of national wealth". [3]

36.   What comes to climate change, the new Climate Change Act (2012) in Article 47 emphasizes the need to generate a set of key indicators that will address among other issues the estimated costs attributable to climate change and incorporate them into the calculation of Ecological Net Domestic Product.

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[2] United Nations Environment Programme (UNEP), Secretariat of Environment and Natural Resources (SEMARNAT). 2004. GEO 4 Perspectivas del medio ambiente. México.
[3] Op cit ibídem.

37.   Variables such as the costs associated with depletion and environmental degradation have been used for mitigation and adaptation to climate change, for example in the report *Estimates of the impact of climate change, from the System Economic and Ecological Accounts of Mexico 2010-2100*. This report contains decennial estimates of GDP, NDP and the depletion and degradation costs for the period between 2010 and 2100. The estimates apply the SEEA structure in estimating the costs for climate change, while determining PINE for the same period. The report integrates information on climate change, including the effects, causes and prospects for remediation and the current environmental situation in Mexico. It explains how to estimate the effects of climate change from the information generated in Mexico's environmental accounts.

38.   The team working on the satellite accounts in INEGI has provided advice for many projects and thesis related to environmental accounting. This has been mentioned for example in the publication of *Academic study of the ecological gross domestic product of the Metropolitan Area of Mexico, 1998-2002*, and a book developed for courses on national accounting *Ecological accounts and sustainable development, the experience of Mexico*. These publications have been published by researchers at the National Polytechnic Institute.

III.   The update of environmental accounts

39.   It is difficult to determine the exact time of revising environmental accounts in Mexico, because the accounts have been constantly revised throughout their existence. However, five important critical phases can be identified: (i) the adoption of thematic recommendations for specific topics such as *SEEA Water*, *SEEA Fisheries*, the manual for forest environmental accounting and *Economy-wide Material Flow Accounts*; (ii) the implementation of the National System of Statistical and Geographical Information (SNIEG); (iii) the finalization and dissemination of data in SEEA 2012; (iv) the base year change of the National Accounting System of Mexico; and (v) the ongoing process of systematization of Mexico's National Accounts.

40.   Regarding the implementation of specific manuals, it can be said that they strengthened the implementation process, when SEEA 2012 was not concluded yet, because they brought up new tools and integration tables as proposals, as well as suggested groups of derived indicators in support of public policies and decision makers working in resource management, such as water management.

Handbook of National Accounting

Integrated Environmental and Economic Accounting for Fisheries

Final draft circulated for information prior to official editing

United Nations
Food and Agriculture Organization
of the United Nations

41.   Thus, recommendations for environmental-economic accounting of forest resources allowed, among other things, to comprehensively measure the use of forest goods and services, how they are integrated into the economy, their economic value and the size of damage incurred due to exploiting the forests. They also allowed addressing issues such as the storage of greenhouse gases in the forest, the role of forests in climate change mitigation and relation to issues such as the decline of the forest area and the capture of rain, soil characteristics and cost-benefit considerations.

42.   The *Handbook of Integrated Environmental-Economic Accounting of Fisheries* provided tools for the integration of tables with physical and monetary units on the use and status of resources and the fishing industry. Additionally, it draws attention to the sources of income, sustainability indicators, value of fish stocks and the amount and cost of resource depletion.
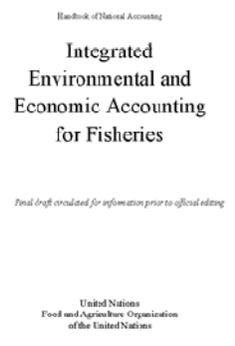
43.   The *SEEA Water* is an excellent tool for the construction of physical and hybrid water supply and use tables, including extraction, purification, distribution and treatment of wastewater. Additionally, it directs researches to determining the economic value of water and the construction of a set of indicators of productivity, intensity and water pollution.
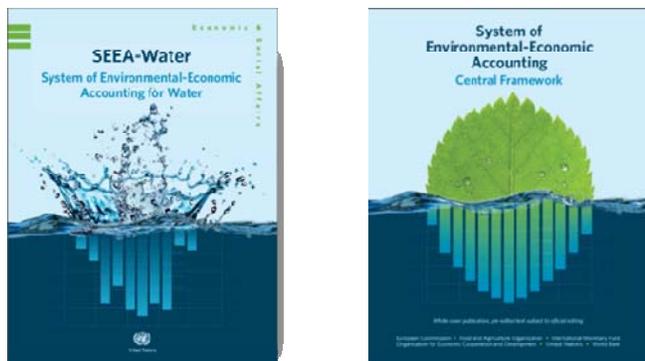
44.   Mexico developed Material Flow Accounts (MFA) in accordance with the methodology established in the SEEA 2003 and in the manuals of the OECD and Eurostat. These recommendations supported the creation of a matrix of biomass flows into the economic system from agriculture, forestry, livestock and fisheries sectors.

45.   For its part, the application of the SNIEG Law led to the establishment of cross-sectional working groups, for reviewing and updating statistical methods used for compiling information that is of national interest and is needed for national development planning.

46.   The SNIEG Law ensures that information that is of national interest is of high quality, relevant, accurate and timely in accordance with the Fundamental Principles of official statistics. To this end, the National Statistical System comprises four National Information Subsystems. Each of them is intended to produce, integrate and disseminate information of national interest in their area of competence. For example, the Economy Subsystem is responsible for the preparation and review of technical standards, guidelines, methodologies and other projects and processes required for the integration of the National Statistical and Geographical Information, including national accounts, and environmental accounts.

47.   In this legal framework, the SEEA 2012 implementation is treated similarly to the recommendations on national accounts, which are reviewed by the cross-sectional working groups (inter and multidisciplinary), i.e. Specialized Technical Committees.

48.   For example, the Specialized Technical Committee on Water Information works with other State units in the development of Integrated Economic- Environment-Water Accounts. The Committee organizes regular workshops to develop diagnostics of the information, computational algorithms for the variables, calculations, design of output tables, interpretation of integrated information, generation of derived indicators and the presentation of the results.

49.   In fact, some of the results of this inter-institutional work have been disseminated by the United Nations in the document *Monitoring Framework for Water. The System of Environmental-Economic Accounts for Water and the International Recommendations for Water Statistics*.

50. The update of environmental accounts in Mexico by implementing the recommendations of the SEEA 2012 is still on-going. Although there has been progress in the adoption of some of the new recommendations, there are still open issues. It is feasible to implement a large part of the manual in the medium term, but issues such as economic valuation of natural assets and the degradation of air, water and soil resources require more time and discussion. The ecosystems accounts, even though they have been studied since the available early drafts, are still considered a complex issue, starting with the definition of an ecosystem accounting.

51. INEGI is already working according to some of the SEEA 2012 recommendations and the following points will be updated into the Mexican SEEA:

(a) Integration of the "compensation of employees" as part of the cost of production of oil and gas;

(b) Differentiation of the terms "land" and "soil", and coordination with the terms of the Forest Resources Assessment (FRA);

(c) Adoption of concepts like environmental activities: activities for environmental protection and natural resource management;

(d) Implementation of the Classification of Environmental Activities (CEA);

(e) Measurement of environmental activities within the Environmental Goods and Services Sector (EGSS), in order to support measurement of clean production and green jobs.

52. Updating the base year of National Accounts, which is an important input into the SEEA, will provide an accounting structure that incorporates the new products and technologies.

53. The new base year, for which a detailed quantitative research is conducted for the economy, allows establishing the structure for the SEEA in detail and serves as a reference for calculating data for the forthcoming years. The updated base year provides a more up-to-date information basis for the SEEA. This is because the economy is dynamic, and after some years the structure of the base year starts to differ from the actual structure of the economy.

54. Furthermore, an input-output matrix corresponding to the new base year will be compiled, including the supply and use table at a product level. This will make it easier to establish new structures and coefficients in the environmental accounts.

55. Finally, the development and streamlining of the national accounts, even though it has more organizational than methodological nature, will be crucial for future updates of SEEA in Mexico, especially towards SEEA 2012.

56. The intention is to facilitate the systematic processing of information. Specifically, the eight products currently compiled that will be systematized:

(a) Satellite Account of Culture;

(b) Satellite Account of Non-profit Institutions;

(c) Satellite Account of Health Sector;

(d) Satellite Account of Unpaid Work of Households;

(e) Satellite Account of Tourism;

(f) Satellite Account of Housing;

(g) Quarterly Indicator of Tourism Activity;

(h)   Economic and Ecological Accounts.

57.   The development and streamlining of national accounts is expected to result in the provision of all the above mentioned products. The SEEA will greatly benefit from the process, even though it uses many more information sources in addition. For one, improvement of national accounts will help standardize the formats in which information is received (PDF, images, Excel, etc.). This way, more time can be dedicated to the analysis and review of results.

58.   Another goal of the development process is to facilitate monitoring of the progress of work by generating control points for ruling out errors in programming.

59.   The development process is expected to lead to notable improvements in the process documentation of national accounts. By having such documentation missing or unnecessary actions can be detected, which will improve product quality.

60.   Finally, the working time reduced in compiling the accounts, may be used to implement new recommendations and to expand or update the conceptual framework. Similarly, the efficiency gains will enable adding information that addresses specific users' needs, and improving the design and presentation of information to make it more accessible to a larger number of users.