INTEGRATED NATIONAL AND ENVIRONMENTAL ECONOMIC ACCOUNTING

Ichiro Kaneda
Niigata Sangyo University, Japan

Keywords: Environmental accounting, economics, System of National Accounts, SNA, System of Integrated Environmental and Economic Accounting, SEEA, accounting, productivity of nature, material /energy balances, Pareto optimum, GDP, NDP, EDP, LCA

Contents

Summary

The System of National Accounts (SNA) has been developed by the United Nations as a representative and standard national accounting. The SNA was revised in 1993, and its implementation has been recommended to every country. As natural environmental problems increase, the SNA has adopted the data related to elements of the natural environment, as far as possible. There are, however, limits to this. The main limits are thought to be derived from the fact that the data of the SNA are only in monetary terms. In the 1993 SNA it was proposed to develop satellite accountings, including one for the natural environment, which are to be linked and attached to the core system of the SNA itself. That system of accounting is the System of integrated Environmental and Economic Accounting (SEEA).

Since then, the concept of environmental accounting has been largely developed in the evolution of the SNA including the conventional framework or core of the SNA and the SEEA as a satellite accounts, the data being increased in volume through the interpretation from physical into monetary terms, which is the function of the SEEA as satellite accounts of the SNA.

The concept of environmentally adjusted net domestic product (EDP) has been

introduced into the SEEA. The EDP is lower or smaller than the net domestic product (NDP), for the uses of the natural environment or assets are recorded in the EDP in the SEEA. In the SNA, natural assets are included only if they provide economic benefits to their owners. These assets are referred to in the SNA as economic assets. In the SEEA, the assets boundary is defined much more widely. It includes in principle all natural assets, but does not go so far as to include human capital. The SEEA boundary comprises all natural assets including economic natural assets and other natural assets. The SEEA, however, does not essentially distinguish between natural assets that are economic and those that are not.

1. Environmental Elements and Accounting in System of National Accounts

The economic development after World War II has brought about many environmental problems as well as physical luxury, especially in developed countries. The environmental problems are overuse of natural assets, including natural resources, and global environmental pollution and disruption of nature. People's concerns about environmental problems are increasing day by day throughout the world, and the concept of global sustainable development has gained currency. Hence, the necessity of obtaining data related to the natural environment and international standards in methods of describing the data that can contribute to identification of elements of the natural environment. For that purpose, the System of National Accounts (SNA) has been developed and expanded, mainly by the United Nations (U.N.).

The SNA originated in the U.N.'s 1948 *Measurement of National Income and the Construction of Social Accounts* (Studies and Report on Statistical Methods, No. 7, Report of the Sub-Committee of Statistical Experts). This report was made because, after World War II, an internationally comparable measurement of national income was necessary as the base of assessment to distribute the expenditure of international bodies to various nations. Therefore, the SNA is characterized by international comparativeness and standards. Then, in 1953 an SNA report called *A System of National Accounts and Supporting Tables* was compiled by a U.N. group of experts. This report considered some issues necessary for developing countries. In 1968, the New System of National Accounts was proposed, which unified input-output tables, flow of funds accounts, International Monetary Fund (IMF) balance of payments tables, and national balance sheets with national income statistics.

The SNA was revised in 1993, and its implementation has been recommended to every country. As environmental problems increase, the SNA has been adopting the data related to elements of the natural environment, as far as possible. There are, however, limits to this. The main limit is thought to be that the data of the SNA are only in monetary terms. In the 1993 SNA it was proposed that satellite accountings be developed, including the one for the natural environment, that are to be linked and attached to the core system of the SNA itself. The accounting for the natural environment is to be the System of Integrated Environmental and Economic Accounting (SEEA).

The explanations in this article are to be made according to the 1993 SNA itself. The central framework of the SNA takes into account factors or elements of environmental

accounts. The many items of costs and capital in the natural resource accounts are separated and independent from the non-natural parts, in classification and accounts of assets, stock, and assets changes. This is the reason why the SNA could be the starting point to develop environmental accounting. However, some environmental elements of the SNA, especially those in the other quantitative changes accounts, should be disaggregated and reclassified in more detail; furthermore, the other environmental elements should be given.

In the SNA, only the produced assets, including inventories, are explicitly considered in the estimation of net valuation added. The costs of use of produced natural assets, which means agriculture, forestry, and fishery, are reflected in intermediate consumption and consumption of fixed capital, needless to say those of produced assets in industry and commerce. The non-produced natural assets that are closely related to environmental problems (for example, land, mineral resources, natural forests, etc.) are also included in the assets of the SNA, as far as they are under the effective control of institutional units. The costs of their use, however, have been not explicitly considered in production costs. In contrast to natural forests, for example, the costs of the use of marine resources—fishes, marine algae, etc.—out of the control of institutional units and whose relevant data are difficult to obtain, are virtually not considered.

Moreover, there are some problems of the valuation of natural assets and the valuation of service or utility of natural assets, as well as the valuation of productivity of nature, that is thought to be related to the problems of the valuation of environmental costs. Although that will be discussed later on, a relevant point must be mentioned here. Even produced natural assets contain non-produced parts. Those parts are divided into two kinds. One is the part whose consumption means entirely the cost as is; another is the part that could be restored by the natural restoring power or natural productivity, as with both natural and artificial forests. In the latter case, the consumption of the natural assets does not necessarily mean social, national, or private cost entirely.

The consumption of natural assets within the natural restoration cycle does not essentially disrupt the natural environment. That consumption within restoration leads to the utmost or optimal utilization of natural assets and could contribute to the increase, and finally maximization, of the social welfare economically expressed in the social welfare function on the level of flow, without diminishing stock in value. In other words, if that human consumption does not occur, the natural production within natural restoration will result in unused, futile natural consumption with natural withering. Optimal utilization is also important, as well as protection of natural assets or the environment, from the viewpoint of environmental science and accounting. Natural productivity, which must be distinguished from human labor and the service of capital, is sometimes hidden in natural assets production such as forestry.

The value of natural productivity itself is latent also in the value production of produced plants and animals or produced natural assets. The range of natural restoration should be made explicit, and natural productivity should be evaluated, unless it is thought to belong to free goods. By the way, natural laws themselves contributing to production are thought to be a safe of free goods since human beings use them freely, although knowledge of natural laws is generally not free goods because it is sometimes bought

and sold as intellectual property.

It is important to make clear the borders between natural and human production, and natural productivity and human or capital productivity, and the range of natural restoration. That could be described in the present SEEA, but more categories and entries or items might as well be set up according to the above-mentioned issues. Incidentally, the value of capital goods contains that of parts of natural assets as materials, the capital goods being originally the accumulation of human labor and the direct and imputed interests relevant to their production term or period. Economically detailed analyses are needed for the fineness and expansion of environmental accounts.

Environmental accounting systems were expanded to include the environmental costs of use of natural assets, under the concept of costs, capital formation, and capital stock of the SNA, through the SEEA: that is to say, they were complemented with additional data in monetary terms corresponding to physical terms introduced into the SEEA as satellite accounts of the central framework of the SNA. The use of natural assets corresponds to and is expressed as changes in volume of assets or stock.

Generally speaking, there are three approaches to environmental accounting. The first is accounting for natural resources, which focuses on accounting in physical terms. The second is satellite accounts in monetary terms, which are linked with the central framework of the conventional SNA just referred to. The accounts, of course, are more limited than natural resource accounts in coverage of the elements of the natural environment. The third is the welfare approach, which is related to impacts on the natural environment. This approach is especially difficult to combine with accounting.

Recently, the concept of environmental accounting has been largely developed in the evolution of the SNA, including the conventional framework or core of the SNA and the SEEA as satellite accounting, the data in the first approach and the third approach being increased in volume and number of items and being adopted by and introduced into the second approach through the interpretation from physical into monetary terms, which is the function of the SEEA as satellite accounting of the SNA. In this article, the origins of the three approaches are reconsidered.

2. The Utility of Natural Assets

This discussion is based on the 1993 SNA. Accounting for environmentally positive and negative natural assets in the natural environment first focuses on materials/energy balances and on assets balances in physical terms of natural assets in the natural environment or their stock volume at the beginning and at the end of the period and their changes in the period. The concept of materials/energy balances is based on the law of conservation of matter and that of conservation of energy. There are more complicated problems with environmentally negative assets than with positive ones.

Polluting materials do not disappear but continue to exist, and harm the natural environment and human beings unless changed into non-polluting ones. The SEEA as satellite accounting of the SNA could check polluting materials and their movement directly within the boundaries of every country and, even indirectly, could check their

movement across national borders through its import and export components if international cooperation were achieved. The present SEEA, however, cannot sufficiently check the movement and changes of polluting materials in the natural environment, for instance, the air, the sea, the oceans, etc., and the harm they cause to the natural environment. This must be covered by a system of environmental statistical data and, if possible, the assessment based on them.

Fundamentally, energy does not disappear, apart from the negligible influence of Einstein's special theory of relativity. As is generally known, the final form of energies is thought to be thermal energy, or there is a tendency for all energy to be changed into thermal energy from a macroscopic viewpoint. Thermal energy never disappears but spreads through the global environment for the time being. This means an increase of thermal energy that cannot be effectively used but that contributes to global warming by increasing its volume as it accumulates without being emitted into space.

The point is that it is not easy to change thermal energy to another type of energy—mechanical, electromagnetic, chemical energies, etc.—according to the principle of increasing entropy or the second law of thermodynamics. The present SNA and the SEEA do not check thermal energy or heat. It could be checked in the future but, for the time being, we should be committed to a system of environmental statistical data and the assessment based on them. In the future, however, the SNA and the SEEA should be expanded to check thermal energy and its global movement as a load on the natural environment, and the environmental load must be assessed as negative value or environmental cost.

The fundamental problems and the limitations of the present accounting systems for environmental materials/energy have just been discussed. Now, the service or utility of natural assets must be referred to. When a part of the natural environment provides services to human beings, that part is recognized as natural assets, as is the fact that a part of the natural environment is directly consumed. The use of natural environmental services is sometimes accompanied by degradation of natural assets and sometimes it is not. If we gaze at a mountain from a distance for recreation, the mountain will not be degraded. If we camp in the mountain, it could be degraded.

Moreover, a more remarkable example can be given. The natural environment decomposes harmful materials into harmless ones, to an extent. That is a natural environmental service. However, if there are more harmful materials than the natural environment is capable of decomposing, the natural environment will be polluted and degraded and will harm human beings. This degradation is recognized as loss or cost. In other words, it is a decrease in the value of natural assets. Incidentally, there is no essential difference between environmental degradation and depletion, in the final analysis or at the level of utility. Degradation could be reduced to a collection of depletions and decrease of function. Depletion means the human loss of materials whose value is based on utility, and decrease of function means the human loss of the value of environmental function, which is also based on utility.

The SNA classifies non-produced natural assets as "economic assets" and "other assets" that are defined as "environment," perhaps in a narrow sense, and check the changes of

the former in the items "holding gains/losses" and "other changes in volume of assets" in relation to the SEEA. Other non-produced natural assets are not dealt with in those items either in the SNA or in the SEEA. One reason for this seems to be the difficulty of checking. Moreover, the conditions of statistical systems and technique vary between nations.

Here, natural productivity is referred to again. The element "produce" in "non-produced" means the production by human beings and does not contain production by nature. Until now, economics has not considered production by nature or natural productivity. However, for instance, if deforestation is carried on within the naturally restorative capability of the forest, that part extracted for human use could be restored of itself or by natural productivity of the forest, without human labor. There is no reason for a distinction between human labor and natural function or work regarding utility production, if this is based on the modern utility theory of value.

The logic of value distribution among people is another problem. The point here is the logic of production. The part produced within natural restorative capability means natural productivity. The natural productivity of the forest is supported by the natural circulation of water as a part of natural reproduction. In precise terms, the value of the absorbed and decreased nutritive minerals necessary for the growth of trees must be subtracted from the value of that part produced, apart from mangroves, to which the minerals are automatically supplied by the natural movement of seawater.

Positive production by "other non-produced natural assets" should be more positively considered, at least in the SEEA. That is possible in the present SEEA to an extent. In that case, the naturally produced part could be transferred from "other non-produced natural assets" to "economic non-produced natural assets." In other words, this is economic internalization of economically external natural assets. Natural productivity is related to and contributes enough to the production of value added or utility. Not only the used part of the natural environment, but also natural productivity itself, is thought to have value.

-
-
-

Bibliography

Kaneda I. (1996). *Economics and Philosophy of Global Organic Production*. Tokyo: Chuo-keizai-sha. [in Japanese.] [This discusses productivity of natural assets, commenting on value theories of traditional economics.]

Makino N. (1998). *Environmental Big Business*. Tokyo: PHP Research Institute. [in Japanese.] [This discusses ecobusiness as a developing industry and green consumerism.]

United Nations. Statistical Office (1992). *Revised System of National Accounts (Provisional)* (ST/ESA/STAT/SER.F/2/REV.4). New York: United Nations. [This represents the internationally standard accounting system for national economic accounting.]

United Nations. Statistical Division. Department for Economic and Social and Policy Analysis (1993). *Integrated Environmental and Economic Accounting: Interim Version* (Handbook of National Accounting. ST/ESA/STAT/SER.F/SER.F/61. Studies in Methods, Series F; No. 61), 182 pp. New York: United Nations. [This represents the standard accounting system to supplement the System of National Accounts (SNA) in treating environmental elements.]

Wada Y., Nakano K., and Yamamoto R. (1996). *Lifestyle Safe to the Environment*. Tokyo: Gihodo. [in Japanese.] [This discusses life cycle assessment (LCA) and ISO.]

Biographical Sketch

Professor Ichiro Kaneda, born February 22, 1934, in Tokyo, Japan, gained his bachelor's degree in Tokyo University in 1962 and his doctorate in Tokyo University in 1982. He is a professor at Niigata Sangyo University and ex-president of the same university, having served as president from 1988 to 1996. His fields of specialization are environmental and food economics, mathematical economics, and regional economics. His main recent scientific publications are Economic, technical and political aspects of LNG carriers in comparison with NG pipelines (based on the paper he was invited to present at the U.N. Symposium on Natural Gas Transport and Utilization in Northeast Asia, Beijing, December 2000), *Bulletin of Niigata Sangyo University* (Faculty of Economics), **23**, June 2001; *NHK-Books: The Japan Sea Economic Rim* (The Economic Region Surrounding the Sea of Japan) [in Japanese] (Tokyo: NHK Publishing, 1997); *Economics and Philosophy of Organic Production by Global Nature* (ecological and agricultural economics) [in Japanese] (Tokyo: Chuo-keizai-sha Publishing, 1996); and The change of the viewpoint on the Japan sea rim, *DBI Economic Review* [in Korean] (Daegu Korea: Daegu Banking Institute, 1995).