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Background and Role of Environmental Resource Accounting

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1. Contenporary Society and Economic Accounting

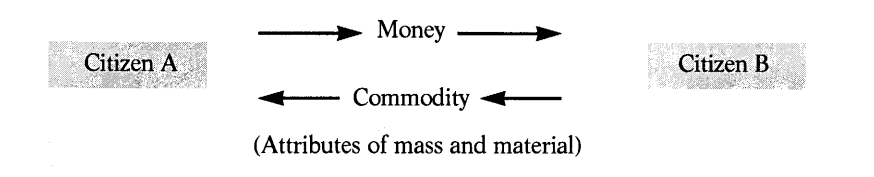
As is well known, environmental resource accounting (ERA) is carried out according to either aggregative or non-aggregative methods. This paper will focus on non-aggregative methods. Nonetheless, the expressions aggregative and non-aggregative may be somewhat misleading; the term aggregative here is used in reference to the question of whether economic values, which are a type of scalar quantity, are aggregated or not.

Adopting a non-aggregative method does not imply the total absence of aggregation; instead, it involves aggregating pieces of information which are not economic values. In other words, a non-aggregative accounting method is so termed because of the absence of aggregation of economic values.

The consistency which characterizes accounting techniques reflects regular or systematic patterns in economic circulation, but does not derive from some consistency inherent in the science of accounting as an academic discipline. An economic transaction of a thing between its old and new owners takes place as a transfer of two ownership rights in opposite directions between the two parties involved.

In contemporary economic society, there is a space where the ownership of a thing and its disposal are determined unilaterally. Specifically, things which are called environmental or public goods are not owned privately, and thus are not traded in the marketplace. The transfer (or quasi transaction) of goods without ownership rights is kept outside the market system, and in the environment.

The word "citizen" is used below not only in the sense of an economic actor who behaves in accordance with economic rules, but also of an individual having property rights and inheritance rights under modern law.



Ecological philosophers argue about the question, "can or cannot trees stand at the bar?"[1]

From the standpoint of the national economic accounting system which is currently in use, the question must be answered in the negative. Only human beings or judicial persons who can be the subject of ownership and transactions can stand at the bar. The properties of an individual which warrant his/her economic actions are not defined by economic laws, but by civil law, which constitutes the core of modern law. As experiences in the former Soviet Union demonstrated, it is not until individuals' rights to property are established that the contemporary economic system can begin to function smoothly. The proper functioning of the contemporary economic system calls for the establishment of a system of private property, in advance of technologies or funds. And this process is defined as "primitive accumulation" in Marxian theory.

Let us take the case of forests. All of Japan's forests belong to one institutional sector or another, and there are no ongoing disputes on the question of which particular institutional sector owns any specific forest. In developing countries, however, there are many instances where indigenous peoples' claims to the title of forests are not yet settled. This fact is cited, not to repeat the assertion that the establishment of modern property rights is the precondition for economic development, but to point out that the capitalist societies that came into being through historical processes are equipped with similar property rights and accounting systems corresponding to these rights.

The foregoing observations suggest that institutional sectoral accounting concerning property rights is central to national economic accounting.

Under the economic accounting techniques currently in use, the transfers of these environmental goods are aggregated, as expressed in monetary values.

Since all economic transactions involve transactions in the two opposite directions, the law of conservation is always at work regardless of how these transactions are classified and aggregated (double-entry bookkeeping).

The system of economic accounting is structurally complete, and maintains its consistency because of the "law of conservation." This consistency is self-evident in the case of corporate accounting, which is the prototype of national economic accounting. Managerial accounting in a firm means the act of compiling a comprehensive database whose basic records are all the transactions entered in the firm's general ledger. The transactions entered into the database must include all the current as well as capital transactions of the firm, including some transfers between the firm's different accounts.

Corporate accounting has not simply one, but several concrete purposes.

In order to protect the interests of the firm's shareholders, it is imperative for the firm's profit to be evaluated properly and disclosed to the shareholders. By underestimating the profits and withholding a large portion undistributed to the shareholders, the management can promote its own interests, but this behavior is viewed as depriving the shareholders of what rightly belongs to them.

From the standpoint of safeguarding the interests of creditors, the firm's assets must be underestimated, in accordance with the concept of historical cost. From the standpoint of taxation offices, the profits of firms to be subject to taxation should not be hidden.

It is true that the accounting system gives a certain degree of discretion to individual firms. For instance, firms are free to choose between two methods of depreciation, i.e., the declining balance method and the fixed installment method. However, the amounts of depreciation calculated by the two methods do not differ significantly. This is due in part to the fact that the accounting principles are very solidly established at the base.

This seems also ascribable to the fact that corporate accounting is designed to be an objective method of processing information or describing an economic system.

2. The Locus of Fictitious Accounting

The contemporary capitalist economies, or what Hicks calls the industrial societies,[2] have their historical origins in the economic system that first developed in the Netherlands and Great Britain. The system is characterized by transactions, including those that encompass even the very basic aspects of reproduction in society, taking place in the marketplace. Transactions are so pervasive that even the basic necessities of life for the working class are supplied through markets which extend worldwide. In this sort of society, the accounting system which accounts for and aggregates all the transactions forms a complete and closed system.

In this way, the national economic accounting system forms a complete system. Some of the accounting works is performed, because of sheer necessity, by means of fictitious accounting methods, but the use of these methods is subject to very severe restrictions.

National economic accounting is very stoic about the use of fictitious accounting methods. As a general rule, the use of inputed values is prohibited except for rents of houses which are owned by the inhabitants. Lately there has been much discussion about whether domestic work should be evaluated, and, if so, by what method, but the domestic work performed by housewives is not regarded as economic activity.

To recapitulate the foregoing discussion, which is of crucial importance, national economic accounting rejects fictitious accounting. The question is, why? Inputed values of prices which are not realized in the marketplace cannot but be unstable, and thus are deemed inappropriate as measures of economic activity to be incorporated in the national economic accounting. It is, however, none other than this kind of fictitious accounting that expanded GDP proposes to take into account of. Formally speaking, the theoretical values of economic activities which are never transacted in the actual marketplace can be calculated as an aggregation of the products of price and quantity; but these hypothetical economic values are qualitatively different from the values of economic activities which are actually realized in the marketplace. This implies that the proposal for expanded GDP ought to be convincing enough to overcome the national economic accounting system's mistrust about fictitious accounting.

Nonetheless, the attempt to make us of fictitious accounting is not without precedent. As industrial societies grew ever more complex, and as business activities in the private sector alone were deemed increasingly inadequate to satisfy the needs of citizens, the public sector came to be charged with operating an increasing number of public works. Decisions to launch such public works are made politically, and their prices are not determined by the law of supply and demand. However, in order to obtain an objective measure for use in deciding whether a public work is worth undertaking or not, a cluster of techniques called cost-benefit analysis was developed. The techniques of cost-benefit analysis were then further expanded into a concept of social cost-benefit analysis, which takes into account environmental indices and the costs and benefits of infrastructure proposed for developed in the locality concerned. It should be pointed out, however, that the economist E.J. Mishan, who has made significant contributions to theoretical and empirical studies on cost-benefit analysis, is very negative about its easy-going use.[3] It is said that economists are reluctant to use

this analysis, perhaps because they are well aware that future benefits estimated on the basis of hypothetical, inputed prices, detached from the pricing mechanism of the real marketplace, are very arbitrary and cannot withstand criticism. Because of this drawback, cost-benefit analysis is seldom used by developed countries to assess the viability of public works they undertake domestically, but it is still in wide use in assessing development projects in developing countries.

One thing needs to be pointed out here on the question of the consistency of this technique. Given the fact that pre-assessment of a project by means of cost-benefit analysis often tends to overestimate the project's benefits while underestimating its costs, it is customary to set aside in advance what is called a contingency item. In reality, setting up this item corresponds to having a reserve or spare fund to prepare for some unforeseen situation. Nonetheless, under the private property system, there is no economic actor with whom this item can be associated, or to whom it can be ascribed; as such, the existence of this item has a very crucial bearing on the nature of the project assessment technique itself.

To sum up the foregoing observations, while fictitious accounting has a long history, it has not yet been widely accepted in the discipline of economics.

3. Linking Up Information on Areas of Concern

Various attempts have been made to expand statistics, but many such attempts seem to aim primarily at expanding the concepts of aggregate values, or scalar quantities, concerning production activities.

The central preoccupation in recent environmental statistics has been to link up between pieces of information concerning national economic accounting with those concerning environmental resources. However, the national economic accounting system forms a complete system of its own. On the other hand, the environmental and resource accounting system also form a complete system of their own, because of the limited nature of mass balance or land. It seems impossible to expand these accounting systems by retaining the structure of one system intact, and letting it absorb the structure of the other.

The only viable approach will be to prepare, in a systematic way, clusters of associated information which explicitly show the relationships between the corresponding items in the two systems. In the technique employed in Norway and elsewhere, the national economic accounting system and the environmental resource accounting system are linked by the sector-commodity table, which serves as an intermediary for linking the forest accounting system and the mass-balance table, which are complete in themselves, with the national economic accounting system.

4. Consistency Between the Forest Accounting Syetem and the Sector Commodity Table

The forest accounting system and the forest sector commodity table are linked, respectively, with the item of harvesting in the sector-commodity table.

Forest accounting allows us to estimate that portion of a decrease in the stock of forest resources obtained from a survey of forests which is ascribable to harvesting by human

beings rather than to natural decrease. On the other hand, sector-commodity tables enable us to estimate from the amount of lumber consumption the amount of forest resources harvested. The two estimated values, which are derived from completely different data sources, can sometimes differ from each other by significantly large margins.

In many developing countries, forest resources are often consumed in the form of fuel, and, unlike statistics on the quantities of petroleum and other raw materials imported, refined, or transported, which are fairly accurate, the amount of forest resources consumed as fuel tends to be left out of statistics.

The rapid decreases in forest resources of recent years have led a number of countries either to officially prohibit the harvesting of forest resources or to institute various restrictions on harvesting activities, if not totally banning them. When the harvesting of forest resources is made illegal, bureaucracies see no point in gathering statistics on illegal harvesting, which by definition should not exist. Consequently, government offices in charge of forest administration cease to take account of illegal harvesting in their official statistics.

It should also be noted that, as total forest area decreases, there is a growing tendency not to harvest trees by clear cutting, but rather to subject forests which are already partly harvested to additional harvesting. In Thailand, with the exception of the southernmost and northernmost districts, forests account for less than 10% of total land area, with the only intact forests on steep slopes or protected for religious reasons. Chronological surveys of the same plots of land point to significant decreases in amount of wooden biomass per unit area. This accelerated decrease is considered to have been caused not so much by commercial clear cuts as by additional harvesting by local farmers.

Meanwhile, the sector-commodity table offers, under the heading of the timber industry, detailed statistics for lumbering activities, but fails to give a detailed picture of the consumption of firewood and charcoal, as it limits itself to the commercial distribution of firewood and charcoal.

In the light of this fact, Thailand, for instance, is conducting a comprehensive sampling survey on the social and economic situation of farming households, in order to get a more accurate grasp of the consumption of wood, including the domestic consumption by these households. The findings of the survey show that a considerable amount of wood is consumed as fuel, not only in the countryside but also in urban areas. This seems to be due to the fact that the Thai preference for foodstuffs is stable across the country, as is the method of cooking.

The articulation between the forest accounting system and sector-commodity table will provide a great incentive for improving the consistency of various statistics in developing countries.

Let us take lumber harvesting from forests as an example, and see what can be expressed by resource and environmental accounting and what cannot be expressed by expanded GDP.

Forest accounting describes changes in the state of forests by breaking them down into those in different categorized components of forests. This method makes it possible to keep track, at least, of decreases in forest biomass. If trees in a forest are counted by classifying them into a series of diameter ranges, as is being done in France, it is possible to understand changes in a forest in greater detail.

Information on changes in land attributes is also diverse. In measuring environmental resources, information on rates of change over time is more important than information on absolute amounts. The land accounting system in France includes entries for forest land plots converted to other uses, and for land plots for other uses converted to forests. These

entries make it possible to identify whether a decrease in forest areas is due to their conversion into farming plots or into industrial sites.

In understanding changes in forests, the most important information is pieces of information on changes in the land area and in the total deposit of wood. The land area covered by forests can be calculated on the basis of statistical data at various levels of public offices, and data obtained by earth resource satellites or from aerial photography. Whether various data sources are put to effective use or not depends on the competence of the administrative system in the locality concerned. The competence here is affected not only by the size and quality of the staff, but also by institutional factors such as the relationship between the central and local governments, and the extent to which bribery is practiced.

Assessing the quantity of biomass involves even more serious problems. Data on the quantity of wood deposit cannot be obtained by satellites, but must be gathered by field surveys in the forests. Conducting such field surveys on a nationwide basis, and with properly controlled levels of accuracy is extremely difficult. Moreover, since statistical work is, by its very nature, regarded as nonessential and non-urgent, government offices in charge of statistical investigations often become easy targets for downsizing in times of fiscal deficits. Because of these factors, few countries, even in the developed world, conduct forest surveys on a continuous basis.

What will be the possible effects of the implementation of environmental resource accounting on the existing accounting practices?

On the one hand, the environmental resource accounting system estimates the quantity of lumber consumption as derived from the national economic accounting system and input-output tables. On the other hand, government offices in charge of administration of forest resources rely on different data sources in estimating the amount of lumber harvested from forests. The two estimates seldom agree, and usually differ from each other by significant margins. Biases characterizing statistical data compiled by bureaucracies are not new problems but have long been regarded as non-negligible; these should not be left untouched. The quantity of lumber harvested and the quantity consumed should not differ excessively each other even if losses during transportation and other factors are taken into account. The publication of environmental resource accounts is expected to accelerate the work of bringing these estimates closer to each other.

5. Problems about Estimates from Mass-Balance Tables

Turning next to the mass-balance table, emissions into atmospheric air and into waters are serious problems in developing countries. Emissions from wooden materials into the atmosphere take the form of carbon dioxide, the substance which is an increasingly serious environmental concern globally, but which does not pose any serious problem locally. In contrast, waste water drained by the pulp and paper industry has large impacts on the environment, and is a serious environmental concern in many countries.

The problem of waste water emissions, however, has already been resolved in developed countries. One underlying factor is that these countries, in their efforts to promote energy and raw material conservation, have switched to kraft processes aimed at improving as much as possible either the rates of utilization, or recovering, of energy and raw materials. As for the handling of drainage water, intensive water treatment methods have been adopted. These production processes are expensive and require a staff of well-trained opera-

tion and maintenance engineers. In other words, they require an input of large investment funds which does not bring about increased profits.

Given this fact, government offices in charge of environmental protection on the whole are not eager to implement means of mitigating air and water pollution problems. However, if a mass-balance table derived from a sector-commodity table goes into wider in use, it can help change the public authorities' attitude toward pollution problems.

What is described by a mass-balance table? A mass-balance table bases itself on the law of the conservation of matter, the law which states that the quantity of biomass fed into a certain sector is equal to the quantity of biomass discharged by the sector. In other words, the difference between the amount sold as a product and the amount of input represents the volume of biomass that has been discharged into the environment in one form or another. If a mass-balance table with this particular feature is put into use in a situation where pollution-related indices are not yet disclosed or published widely, it can facilitate the disclosure of such indices. In order to make the disclosure of such data possible, it is imperative to gather data on physical inputs and outputs for each business entity, and indices of the quality of air and water which are consistent with such input and output data.

The very serious problems related to lumber which are afflicting developing countries include water pollution caused by the paper and pulp industry. To begin with, large quantities of organic matters are discharged by paper and pulp factories into waters, causing an increase of enriched nutrients, and as these nutrients decompose, they consume much of the oxygen contained in the water, causing the death of large numbers of fish and other aquatic life forms. Proper treatment of waste water is indispensable for tackling this problem. A number of business entities in Southeast Asian countries, however, are not even performing primary treatment of waste water in a proper manner, to say nothing of installing sophisticated and very expensive facilities for waste water treatment.

The bleaching of pulp causes another serious problem. A substance called lignin, which is one of the major constituent element of wood, along with cellulose, has a molecular structure similar to phenols, and reacts with chloride to generate dioxin. This problem can be avoided if the pulp is bleached with oxygen rather than chlorine. The future adoption of a mass-balance table which takes account of the amount of chlorine gas will help solve the problem.

6. Natural Resorce Accounting as From of Communication

6.1 The Fundamental Structure of National Economic Accounting

The significance of natural environmental accounting for society lies in the fact that it facilitates communication. Global environmental problems foreshadow the end of the pattern of economic growth which neoclassical economics has been advocating since the end of the Second World War. Nevertheless, GDP-based descriptions based on the neoclassical theory of that era continue to be used today.

The national economic accounting system, which has been used as the means of describing economic activities in the period of neoclassical economic growth, is a system which aggregates the data on accounting systems of neoclassical firms (including households) — namely, the data on all transactions undertaken by the firms concerned — and

compiles flow values into profit and loss accounts, and stock values into balance sheets. Thus, transactions are the constituent factors of national economic accounting. Underlying this fact are formulae of correspondence between firms and assets, capitalists and capital, and financing companies and debts. And common to these formulae is the formula of correspondence between owners and transactions, which is reflected in individual firms and the national economy. The basic idea is that economic transactions involving individual firms, if aggregated for the entire society, add up to national economic accounting.

It is true that for shareholders, managers, and employees of a firm, the firm is the "arena for generation of incomes" with which they sustain their existence, while for the state, it is a "source of tax revenue." However, a firm which serves as the source of environmental destruction, has no *raison d'etre* because it seriously fails to live up to its purpose and mission of contributing to the "maintenance and improvement of national living standards."

The concept of accountability is much in use of late.[4] In essence, the concept may be equivalent to the disclosure of information. As has become evident from the scandals involving Daiwa Bank's illegal dealings in securities and Sumitomo Shoji's fraudulent futures transactions in copper, Japanese firms, as communities of both managers and employees bound together by a common fate, are being condemned increasingly severely for their failure to disclose important pieces of information to consumers, community residents, and even shareholders. There is a growing demand for Japanese firms, in order to rectify this situation, to disclose important information to all parties concerned, including persons interested in their activities.

In Western societies, where corporate information was in the past disclosed only to capitalists and creditors, there is a growing tendency toward disclosing information more extensively to employees, analysts, dealers, and suppliers, and even to the public at large.

Attitudes toward the disclosure of information may be summarized as follows:

	(Insiders)	*(Outsiders)*
Justifiability theory	Active	Passive
Social accountability theory	Passive	Active

What is called justifiability theory asserts that the firm as the actual embodiment of "assets" as defined by the formula "Assets = Debts + Capital" should be treated as the primary actor, and all other subjects should be consigned to passive positions.

Correspondingly, national economic accounting thus far has been dictated by the philosophy that attaches importance to economic growth and market mechanism, and has been concerned primarily with the GNP growth rate. At present, however, it is imperative for national economic accounting to also become more oriented toward addressing the concerns harbored by various social strata.

As noted above, the existing national economic accounting system is based on the ownership of individual firms and on the transactions dictated by such ownership. As such, the system is very simple in structure; but at the same time, its simple structure makes it highly resistant to reform, and in particular to reforms that would make it more sensitive to environmental issues.

6.2 How Capital Is Perceived in Various Country Reports

Capital is understood as a concept closely linked to value. In fact, the very idea of environmental resource accounting was proposed based on dissatisfaction with the failure of the preexisting means of describing economic cycles to take account properly of the situation of the environment and resources.

One problem that is expressed with regard to statistical work is the underestimation of forest resources. It is pointed out that governments fail to assign adequate value to lumber harvesting concessions, or that inappropriate economic rents are accelerating the destruction of forests.

Yet, in an economic system only realized transactions are treated as real. The national economic accounting system basically rejects fictitious accounting, because, while it is not impossible to estimate inputed values of economic activities which are not transacted in the marketplace, the adoption of such imputed values can disrupt the consistency of budget constraints on various economic actors and macro circulations.

Some assert that the national economic accounting system fails to take account of the depletion of forest resources. It must be kept in mind, however, that national economic accounting is not intended to concern itself with such matters. In fact, the accomplishments of government offices in charge of statistical work in North Europe have been attained through their efforts to find viable methods available outside the framework of national economic accounting.

In the case of Indonesia, it is asserted that environmental conservation is charged with two tasks — that of keeping the ecosystem in proper balance, and that of safeguarding the environment as a source of foreign currencies for local communities. The environmental accounts of the Chesapeake Bay regard the natural environment as an asset, but the asset here is ownerless, or rather the very question of whether it is ownerless or not is unclear. No transactions take place.

The Philippines has introduced what is called a "factor rate," which has the purpose of maintaining a growth rate for forests higher than that of secondary forests. Depending on the degree of environmental urgency, different forests are assigned different factor rates.

This factor rate represents services performed by the environment which are not reflected in prices. One way of inputing the value of forest resources is to compute the macroscopic quantity of wood resources at the beginning and the end of a period, and express the value of the resource in terms of the net price of lumber. Another way is to estimate the future price of standing trees from the expected future flows of the prices of lumber and services, and then discount the future price of standing trees to obtain their current price.

Both the natural growth of forests and reforestation are taken into account, while the amount of depletion due to natural withering and other factors is subtracted.

As admitted by the report itself, these techniques can be affected significantly by future changes in the material production structure, estimated future price levels and the discount rates employed for calculating current prices.

Observations regarding these methods seem to suggest that the main difference between them and national economic accounting is ascribable to their approach which treats environmental degradation in much the same way as the depreciation of capital goods. For instance, the very idea of taking account of natural growth on the basis of inputed prices is something foreign to the system of national accounts (SNA).

It must be kept in mind, however, that only artificially nurtured wood lots, such as orchards, gain in value with the passage of time, and that the natural growth of forest resources should be treated, just like losses due to natural disasters, in reconciliation accounts.

6.3 The Concept of Depreciation Is Unfit for Application to Natural Resources

Consistency of the Mass-Balance Approach

	Physical	*Monetary*
Forest balance	O	X
Sector/commodity table	X	Δ (O in underlying SNA)
Lumber mass balance	X	Irrelevant

Hicks in his book *The Social Framework* makes the following observation about depreciation.[5]

> "The most important of the artificial items is Depreciation. Fixed capital declines in value by use, quite apart from any purchases or sales of capital goods. An entry for this requires to be made in the 'capital' account; the corresponding entry goes into the trading account. This is the artificial item of which the correct value is most uncertain.
>
> "There is, however, one particular sort of capital equipment which is not capable of being increased by human agency to any appreciable extent; it is agricultural land. . . [V]ery little can be done to remedy a shortage of land, though up to a point the evil can be moderated by using the land more economically, or by making improvements in its quality."

Hicks' Classification of Capital Goods

Capital goods —	single-use goods	
	durable goods	— land (any and all durable goods offered by nature)
		— fixed capital (man-made durable goods)

According to T.J.C. Robinson, many adjectives can be attached to resources, including indestructible, exhaustible, depletable, extractive, reproducible, renewable, and replenishable.[6] They can be grouped into the following three categories.

(1) Indestructible resources
(2) Renewable resources
(3) Exhaustible resources

Exhaustible resources correspond to what David Ricardo called "the indestructible power of soil" in his definition of land, and is also equivalent to what N. Georgescu-Roegen called the catchment of sunlight and precipitation.[7]

Renewable resources consist of animals and plants which can be increased or depleted.

Exhaustible resources have either zero or extremely low rates of reclamation/reproduction. Many mineral deposits were originally made of organisms, but normally their rates of reclamation/reproduction are much slower than their extraction rates. In this sense, forest resources are often very similar to exhaustible resources, and aquatic resources are similar to land. Among aquatic resources, whales are characterized as being strongly exhaustible.

6.4 Statistics as a Means of Communication in Developing Countries

The modern market economy system was developed in Europe, and the process of economic development in Southeast Asia has been the process of introducing this system. The introduction of the market economy system was naturally followed by that of a system of economic accounting that was also developed in the West. At the micro level of individual firms, this system, called corporate accounting, pivots around the profit and loss account and balance sheet. Central to economic accounting at the macro level of national economy is the system of national accounts, or the expansion of what used to be called national income statistics.

When Southeast Asian countries began to modernize following the Second World War, these accounting techniques were at first imported in their unmodified original form. Because they were transplanted into countries whose natural climates, social systems, and, above all else, historical backgrounds were radically different from those of the West, they were naturally subjected to modifications to adapt them to the realities of the different countries.

The natural environmental accounting system was created in Europe in response to the expansion of damages caused by industrial pollution and to the growing awareness about the limited availability of natural resources. As such, it was designed with a view toward dealing with industrial pollution and natural constraints as they existed in Europe or as they were perceived from a European standpoint.

Southeast Asian countries give a high priority to achieving high rates of economic growth. Consequently, their economic policies tend to play down issues which have a trade-off relationship with economic growth, meaning the issues of environmental protection and resource conservation.

Whereas corporate accounting has a clearly defined purpose, namely the disclosure of the firm's profits and losses to its shareholders and creditors and to taxation authorities, the purpose of national economic accounting is not immediately clear.

National economic accounting can serve the function of indicating the extent to which a country's economic plan has been achieved. On the other hand, it can be criticized as simply a manifestation of a policy which attaches top priority to high economic growth. The environmental resource accounting system aims to describe certain important aspects, if not the totality, of the relationship between economic circulations and the environment. Environmental resource accounts adopted by Southeast Asian countries may be regarded as portrayals of how they themselves assess their environmental situations.

As noted above, economic statistics assume that a market-based economic system is universally applicable, or that there are aspirations to make it universal. This economistic orientation of economic accounting may collide with environmental concerns. The question

now is how Southeast Asian countries themselves perceive the possibility of conflict between economic and environmental accounting.

Officials at government statistics offices engaged in environmental resource accounting must deal with two tasks which are in mutual conflict — the work on economic statistics with its economistic orientation, on the one hand, and the task of describing the reality of the environment by means of environmental accounting. The question of how statistical officers in Southeast Asian countries objectively perceive this methodological discrepancy between the two systems, and how they are trying to solve the conflict, can be of crucial importance in terms of how these countries perceive environmental problems and what options they take with regard to these problems in the future.

Economic statistics are a means of self-reference about economic circulation. National income accounting, as a means of self-reference and as a means of describing the working of a contemporary capitalist economic system of the European type, has a relatively short history.

The *tableau économique* proposed by the physiocrats did not win wholehearted acceptance by the discipline of economics. The concept of national income had to wait until it was formulated by J.M. Keynes, and subsequently refined by Hicks in his book *The Social Framework*.

However, Keynesian theory came to be understood primarily in line with the interpretations offered by Hansen and others from the standpoint of equilibrium analysis. The works of Hicks in his later years are also often regarded as deviating excessively from neoclassical theory. It is, nonetheless, quite interesting to discover which aspects of the contemporary industrial society Hicks wanted to analyze by means of his new concept, "social accounting."

Economic accounts take private ownership as a given, and are built on the free and unrestrained disposal of privately owned property as the sole constituent factor. Ownership is defined by the absolute nature of the right to disposal, and by the unequivocality of the implication of the word "owner." Since the disposal of a property takes the form of a two-way transaction, the practice of using a balance sheet for recording transactions makes good sense. The entry in the balance sheet means that the system of transactions is complete in itself.

There is no need to bother to refer to K. Polanyi in order to see that modernization means the bringing of all economic factors into this system of transactions, without giving consideration to circumstances peculiar to individual workers or specific land plots.

Europe, as well as several other areas which managed to carry out capital accumulation under strong European influence, built economic systems similar to this one. The process of establishing such systems was accompanied by profound institutional changes.

To comment on how the social accounting system has changed over time in terms of the way it is perceived as a system, national income theory still remains the symbol of the quantitative expansion of an economy, and is assessed negatively by environmentally conscious persons. In response to such negative views, various indices for describing affluence have been proposed, but these indices are a far cry from the systematic completeness of the balance sheet.

One possible method for improving the social accounting system is to make some of the economic factors outside the accounting system subject directly to market mechanism and to treat them as factors internal to the marketplace. The market, by its very nature, as Hicks pointed out, does not exist in advance of or independent of institutional regulations. Instead, the market is equipped with strong rules and punishments governing the process of transactions. To begin with, if it becomes technically possible to fully regulate and control

the emission of pollutants, and if such control is buttressed by compulsory power, the emissions can be dealt with within the system of transactions.

What about the situation in developing countries? The number of economic activities or economic phenomena which have profound social impacts, even if they are neglected as transaction systems, is much larger here than in developed countries. In particular, developing countries assign underground mineral deposits and vast tracts of farmland and forests the role of earning export incomes.

The question of whether a country faced with such a situation chooses to express its economic system as defined narrowly in terms of transactions alone, or to express it more broadly, taking into consideration resources and the environment, has a decisive bearing on the country's view of the social system.

Europeans are deeply concerned about the emission of carbon dioxide. In Sweden, in particular, where a carbon tax has been introduced, all the basic information on carbon dioxide emissions is collected and disclosed to interested groups in the form they request. In this way, there must be a general correspondence between citizens' environmental concerns and the ways in which these concerned are expressed.

Speaking from Japanese experiences, it is undeniable that problems of environmental pollution aggravated rapidly as the process of rapid economic growth unfolded, and environmental statistics fell far behind the needs of the time. Environmental problems in their present phase, however, are much more difficult to solve than they were in the rapid growth period, because it is now necessary to reduce the emission of each pollution causing material with smaller inputs.

With plenty of energy and resource inputs, it would not be impossible to treat sulfur oxides, nitrogen oxides, and waste water from pulp factories. But trying to attain the same results concurrent with the conservation of energy consumption, and by means of physical and chemical methods alone, is next to impossible. Efforts to reduce pollution with smaller energy and resource inputs ought to be supplemented by institutional improvements, including, for instance, a major switchover from transportation by trucks to transportation by rail and ships. In order to facilitate such institutional changes, there is a need for an accounting system that can comprehensively and consistently describe the interactions between economic activities and environmental protection. Awareness of the need for such an accounting system seems to be gradually rising among public officials engaged in statistical work and members of various academic associations.

Notes

1. D. Stone, "Should trees have standing!?: Toward Legal Rights for Natural Objects," *Southern California Law Review*, Vol. 45; 450, 1972.
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