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# Environmental and Resource Accounting: An Overview

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### ABSTRACT

GDP is essentially a short-term measure of economic activity for which exchange occurs in monetary terms. It is of limited usefulness to gauge long-term sustainable growth partly because natural resource depletion and degradation are being ignored under current practices.

Prudent economic management requires that governments (and households) know the maximum amount of income that can be consumed without eventual impoverishment. Therefore, it is important that national income should reflect sustainable income as closely as possible. The current measurements of GDP contain a number of shortcomings. The two major ones being addressed in the paper are the so-called "defensive expenditures" and the depletion/degradation of natural resources.

Defensive expenditures are those that defend society against the unwanted environmental side effects of production or consumption activities. Such expenditures are treated as income under the System of National Accounts (SNA). Therefore, as more resources are spent on environmental protection, national income increases. This seems counter-intuitive. Various proposals have therefore been made in order to treat defensive expenditures more properly.

As to the exploitation of natural resources, there is an evident asymmetry in the treatment under the SNA of man-made assets and natural resources. Man-made assets -- buildings and equipment, for example -- are valued as productive assets and are written off against the value of production as they depreciate. Natural resources, which are also assets, are not so valued, or adequately accounted for in most instances. They have been regarded as "free gifts of nature", a bias which provides false signals for policy makers. This approach confuses the depletion of valuable resources (sales of assets) with the generation of income.

Two main conceptual approaches to deal with the depletion/degradation of natural resources have been proposed: the depreciation and the user cost approach. The principle of depreciation of man-made capital could be applied straightforwardly to the consumption of renewable and non-renewable resources. Behind the user cost approach is the notion that the net sales of a depletable resource can be split into a capital element or user cost, and a value-added element representing true income. The capital element presents asset erosion and should be actually or hypothetically reinvested in other assets so that it continues to generate income after the resource has been exhausted.

Environmental accounting in physical terms is very important for it provides the basis on which all accounting can be made. At the same time "monetization", to the extent possible, is important as well. Given the current state-of-the-art, more conceptual and empirical work is needed before GDP and NDP can be replaced by more sustainable GDP and NDP. As an interim step, satellite accounts, linked with the SNA can be constructed, where proper adjustments are feasible.

**ENVIRONMENTAL AND RESOURCE ACCOUNTING: AN OVERVIEW**

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## ENVIRONMENTAL AND RESOURCE ACCOUNTING: AN OVERVIEW

### Introduction

Most production and consumption activities have some impact on the physical environment. As economic growth and population expansion have occurred, they have increasingly put pressure on the environment and the natural resource base. When the pressure was still small years ago, there may have been some justification for economists to make no reference to the role played by the environment in economic activities, both as a resource base and as a "sink" to receive the residues of the production and consumption process. But there is little justification for this now.

Side-effects of production and consumption activities have been considered as "external effects" by economists. But such effects are external only if a narrow view is taken without considering the impact on the resource system as a whole which, while generally being large, is nevertheless finite, and in certain respects subject to great stress. The understanding is gaining ground that, where the environment is concerned, "there is no such thing as a free lunch", and that someone will eventually have to bear those "external" costs. If a broader view is taken, environmental costs would be internalized in the actual production processes. In this connection, it is essential to properly attribute costs and benefits, and to clearly distinguish between true income generation and drawing down capital assets by resource depletion or degradation.

### Shortcomings of the Current National Income Measures

Development planners, economists and politicians make frequent use of the national income measure of Gross National Product (GNP) and its variants (GDP, NNP, etc.) for a variety of purposes. GDP, the most commonly used variant of aggregate income, is essentially a short-term measure of total economic activity for which exchange occurs in monetary terms within a given year. It is valuable mostly for indicating short- to medium-term changes in the level of economic activity, and is particularly useful for demand management and stabilization policies. However, as calculated at present, it is less useful for gauging long-term sustainable growth partly because natural resource depletion or degradation is being ignored. Furthermore, GNP is often used inappropriately as an indicator of "welfare," frequently without any cautioning about its shortcomings for that purpose. The concept of welfare is much broader than a monetary income measure, and covers many dimensions of subjective well-being other than those involving market transactions and those that can be measured in money terms, particularly for people whose basic material needs have been met.

As most economists know, there are a number of controversial issues with regard to national income accounting, as currently being reckoned, such as the treatment of leisure; household and subsistence production, and other non-market transactions; services of long-lived consumer durables, etc. This paper will not deal with any of those issues; what we shall attempt to address are certain environmental and natural

resource issues as they relate to the proper measurement of income and variations in assets. In this regard, there are two key shortcomings, because of which GDP, as measured at present, does not adequately represent "sustainable" income. These concern the treatment of (a) environmental protection costs and (b) of degradation/depletion of natural resources. The fact that these issues are not properly dealt with under the current United Nations System of National Accounts (SNA) represents a serious flaw from an accounting point of view. As a result, policy advice based on measurements produced under the SNA, can be faulty to the extent that GDP does not adequately reflect environmental and natural resource erosion.

### The Objective: Measurement of Sustainable Income

True income is sustainable income. This is a key point stressed by Daly (1986) and El Serafy (1981, 1986). True income may be thought of as the maximum amount which a recipient can consume in a given period without reducing possible consumption in a future period. This concept encompasses not only current earnings but also changes in the asset position: capital gains are a source of income; capital losses reduce income. The essence of the concept of income has been stated by Sir John Hicks as follows:

"The purpose of income calculations in practical affairs is to give people an indication of the amount which they can consume without impoverishing themselves. Following out this idea, it would seem that we ought to define a man's income as the maximum value which he can consume during a week, and still expect to be as well off at the end of the week as he was at the beginning. Thus, when a person saves, he plans to be better off in the future; when he lives beyond his income he plans to be worse off. Remembering that the practical purpose of income is to serve as a guide for prudent conduct, I think it is fairly clear that this is what the central meaning must be" (Hicks, 1946, p. 172).

Prudent economic management therefore requires that governments know the maximum amount that can be consumed by a nation without eventual impoverishment. It is important, therefore, that national income be measured correctly to indicate "sustainable income." Adjustments of the SNA appear to be necessary in the two areas noted above as these are currently not dealt with satisfactorily: the so-called "defensive expenditures" and the depletion/degradation of natural resources.

### Defensive Expenditures

Actions are often taken to defend the environment against encroachments by economic activities, and the SNA treats their costs as generating income. Defensive expenditures can be large or small depending on where we draw the boundaries. For the purposes of this paper we are only considering defensive expenditures against the unwanted side-effects of production and consumption (such as pollution) but not those relating to national security, even though similar arguments would apply to the latter. The most obvious category of costs to be included under defensive expenditures is expenditure on environmental protection activities.

Another possible category would be car repair and medical expenses, as a result of traffic accidents. Leipert (1985) has listed other costs that might be included and produced a recent paper measuring defensive expenditures for Germany (Leipert, 1987).

Incorporating expenditures, incurred to redress some or all of the negative consequences of production or consumption activities in the stream of income generated by economic activity does not make sense. It therefore has been proposed that such outlays should not be counted as final expenditure as is currently the case, but rather as intermediate expenditures. However, there are counter-arguments for doing this. First, there is one type of defensive expenditures -- national defense expenditure -- which is much more important in terms of size and is counted as final expenditure. The same would hold true for other production and consumption activities such as those involving tobacco, drugs and alcohol, where one could justifiably argue for their exclusion from national income aggregates. Second, for the sake of consistency with current definitions and conventions under the SNA, defining defensive expenditures as intermediate ones, so that they can be deducted from the national income aggregates, meets with resistance from national accountants (see p. 21 below).

A conceptually different approach can be taken by looking at water, air, soil, etc., as natural capital. When such capital is being drawn down or degraded, this should show up as consumption in the measures of national income. It should be reflected irrespective of whether defensive expenditures are incurred either to redress the negative effects or to restore the drawn-down natural capital. The difference between the defensive expenditures actually incurred and the depreciation of the environmental capital would be reflected at the level of NDP. This approach has been proposed by Harrison (1988). A similar conceptual approach has been proposed by Peskin (1988) who proposes the introduction of a "nature account" in addition to the standard accounts for households, industry and government. Aside from the difficulty of reaching a consensus as to how the environment/natural capital is to be treated conceptually, the major difficulty lies in the area of actually estimating the level of natural capital and environmental services and damages.

**Some Aspects of Measuring Pollution within the SNA Framework.**  
Pollution, i.e., the discharge of wastes in ways that raise the cost of later activities, harm people or reduce the enjoyment they get from their surroundings, is an important area where the national accounts can be used to improve environmental policy making. Blades (1988) distinguishes four aspects of pollution and considers the extent to which it is possible and useful to measure them within the framework of the national accounts. These are: the output of pollutants, the damage of pollution, the costs of abatement, and the benefits derived from it.

Although it may be feasible to use national accounts to measure the output of pollutants, the information so obtained may be too general to be useful for environmental policy making. As regards the measurement of pollution damage, Blades notes that while there are conceptual and practical difficulties in estimating the total costs involved, it would be possible and helpful to identify some of the main costs that are already included in the national accounts, but not shown separately at present.

The costs of pollution abatement are a part of defensive expenditures. They have been measured in several countries and have been incorporated in macro-economic models in order to show the impact of abatement policies on prices, output and employment. In this area the national accounts would be a valuable tool for environmental policy-making, and Blades considers in detail the conceptual and practical problems of measuring abatement costs. Finally, it is noted that although it would be interesting to measure the "market valuation" of the benefits of pollution abatement, the practical difficulties involved are enormous and it would generally not be feasible to incorporate such data in the national accounts on an ongoing basis.

The issue of the treatment of defensive expenditures for national accounting assumes greater significance the higher the degree of industrialization of the country concerned. The issue of depletion/degradation, which is considered immediately below, on the other hand, is not directly related to the level of industrialization, but is particularly relevant to countries which base their economic activities on the exploitation of natural resources.

#### Depletion/Degradation of Natural Resources

There is an evident asymmetry in the treatment under the SNA of man-made assets and natural resources. Man-made assets -- buildings and equipment, for example -- are valued as productive assets and are written off against the value of production as they depreciate. Natural resource assets are not so valued, or adequately accounted for in most instances, and their loss entails no charge in the national accounts against current income to reflect the decrease in potential future production. A country may be exhausting its renewable or non-renewable resources, and its current income will thus be inflated by the sale of natural assets which will eventually disappear. Differences in recording in the SNA may arise depending on whether a resource is publicly or privately owned. In this connection it should be mentioned that some private companies which take a long view of the natural assets they own, do make provisions for the decrease in the capital stock of natural resources, and in certain countries tax legislation permits the exclusion of such provisions from taxable income.

Underlying this asymmetry is the implicit and inappropriate assumption that natural resources are so abundant that they are costless or have no marginal value. Historically they have been regarded as "free gifts of nature", a bias which provides false signals for policymakers. This approach confuses the depletion of valuable resources (sales of natural assets) with the generation of income. Thus it promotes and seems to validate the idea that rapid rates of economic growth can be obtained by exploiting a resource base that may be rapidly diminishing. The growth can be illusory and the prosperity it engenders transitory if the apparent gain in income means permanent loss in wealth, i.e., if at least part of receipts is not re-directed into new productive investments. In natural resource-dependent countries, failure to extend the depreciation concept or something similar (see below) when depleting the capital stock embodied in natural resources represents a major flaw of the accounting process.

Existing natural capital of geological (non-renewable) and biological (renewable) resources is needed for agricultural, industrial and

other production. New geological discoveries, as well as recycling and conservation, do not reverse the process of depletion of existing stocks. The newly discovered stocks themselves come from a finite stock of resources and they merely extend the time span over which depletion can continue. Depletion of renewable natural resources can have serious indirect effects because reduced stocks or populations of plants and animals may also lead to a reduction in the sustainable flow of resource inputs and ecosystem services. Only careful husbandry of environmental capacities can ensure sustainable and potentially larger income flows in the future. The optimistic argument that human ingenuity is bound to find substitutes for the natural resources being depleted may be generally valid, but it would be imprudent for society to base their behavior on such optimism and wrong for economists and accountants not to take rational precautions in case this does not occur.

Two main conceptual approaches to deal with the depletion/-degradation of natural resources have been proposed: the depreciation and the user cost approach. The principle of depreciation of man-made capital can be applied straightforwardly to the consumption of renewable and non-renewable resources (Daly, 1986; Harrison, 1988). Since geological and ecological information on depletion or degradation comes in physical units, this must be priced or valued in some way before some adjustment can be made to GDP in order to arrive at a corrected net product. Valuation could be based either on the principle of replacement cost where replacement is possible or on (discounted value of) willingness to pay. Present conventions would value the depleted or degraded resources at current prices.

The "user cost" approach has been proposed as a way of properly taking into account the depletion of mineral resources. It avoids the difficulties of putting a value on the stock of the resource, but relies on the conscious assessment of current extraction rates in relation to the total available stock, measured in physical terms. Depending on the rate of depletion and on a discount rate, the gross revenue from the sales of a depletable resource, net of extraction cost, can be split into a capital element, or user cost, and a "value-added" element, representing true income. The capital element represents asset erosion and it has been proposed that it should be actually (Ward, 1982) or hypothetically (El Serafy, 1981) reinvested in alternative assets so that it continue to generate income after the resource had been totally exhausted. Unlike the depreciation method, this would seek to alter the reckoning of GDP itself, not just NDP. This method is in harmony with accounting principles, using current market prices for valuation purposes, but it requires a rule-of-thumb discount rate to convert the capital sales into an income stream. It is also rooted in a proper understanding of the economic meaning of "value added" and of "rent" which should not be confused with asset sales.

How the net revenue can be split into user costs and true income is explained in El Serafy (1986). One first needs to decide on a discount rate  $r$ , say 5%. Second, one needs to determine the number of periods  $n$  over which the resource is to be liquidated. Then one uses the formula developed by El Serafy to calculate the ratio of true income  $X$  to total receipts  $R$ :

$$X/R = 1 - \frac{1}{(1+r)^{n+1}}$$

R - X would be the "user cost" or "depletion factor" that should be set aside as a capital investment and excluded from GDP.

### Resource Accounting

For resource accounting, data need to be collected on renewable and non-renewable natural resources primarily for the purpose of planning their long-run exploitation in pursuit of sustainable economic activity. Several industrial countries have developed resource accounts that are tailored to their specific resource availabilities and policy priorities. Among them are France, Canada, Norway, Japan and the United States. Below we describe some of the important features of the French and Canadian approaches to resource accounting.

Instead of the term "resource accounting" the French use the term "patrimonial accounting" which could be described as "accounting for the national environmental heritage" (Theys, 1984). This is broader than resource accounting as it covers cultural heritage in addition to natural resources. The French resource accounting approach is intended ultimately to relate economic growth to the quantities of natural resources that have to be used up or imported to make economic growth possible. Such a system would also enable the optimization of the economic value of available natural resources, determine the fraction of GDP that should be set aside for the efficient protection of the environment, and lastly help orient economic growth so that it does not threaten ecosystems.

The system when fully developed would be versatile, serving various ends as follows: (a) optimizing the use of natural resources as factors of production (e.g., inversion of a quantitative input/output table that would indicate the intermediate use of natural resources in the productive process); (b) describing the economic aspects of resource use (which resources would be marketed and in what quantities and values; how to improve the productivity of processing industries to optimize the use of natural resources; the opportunity costs of alternatives, etc.); (c) treating resources as "environmental goods" (taking into account changes in the quality of the environment, costs and benefits of environmental policies, the economic consequences of alternative environmental policies); and lastly (d) taking stock of the national environmental heritage and defining the long-term implications of its transformations, so that it could be preserved for future generations. However, as resources to develop such a system are limited, stress is placed on satisfying the needs of the policy-maker. While it would be easier to collect environmental data in the form of flexible reports on the state of the environment and country profiles, the need for developing a system of environmental accounts is paramount so that the information is standardized, exhaustive, summed up in physical and money terms, and is comparable in time and space. The long-term goal is to match the standards already reached by national (economic) accounting, which make the SNA such a powerful planning tool for short-term economic management.

The French approach is only one among several being pursued in developed countries. Its thrust is to build up balance sheets of resources in and monitor their change from year to year with emphasis on measurements in physical terms. Physical measurements are clearly a sine qua non without which accounting in money terms cannot be undertaken. Built into the French approach is that a comprehensive physical inventory system must be in place before any changes can be proposed in national accounting methodology. This is a point of view shared by many, but there are many others also who would want to see national accounting methods adjusted gradually as measurements become available of parts of the physical environment.

#### On the Linkage Between Environmental/Resource Accounts and the SNA

The SNA does not contain an explicit environmental dimension. The currently ongoing SNA revision was mandated by the U.N. Statistical Commission to simplify and clarify the existing system rather than to propose radical changes. This position is being justified by a desire to maintain consistency in time series, even if those series contain conceptual shortcomings.

Among the environmentalists or economists with environmental and resource concerns, there are several schools of thought (Norgaard, 1985). Some advocate environmental accounting in physical terms with little interest in establishing any linkage with the SNA. At the other end of the spectrum are those who feel that environmental accounting would be useless unless the accounts are monetized and integrated into the SNA, resulting in an adjusted National Income that is more sustainable. Here we take a balanced position. We believe that environmental accounting in physical terms is important, particularly when it includes collecting data that indicate the direction and speed with which the quantity or quality of a resource are changing. At the same time we recognize that "monetization," to the extent possible, is important as well and that a linkage with the SNA and an adjustment of the current income concepts are urgently needed. However, given the current state-of-the-art, we believe that more conceptual and empirical work is needed before GDP and NDP in the core of the SNA can be replaced by a more sustainable GDP and NDP. That is why we, as an interim step, would encourage the construction of satellite accounts, linked with the SNA, where the adjustments are to be made. In other words, by having satellite accounts, the user can compute sustainable GDP and NDP in them. This does not represent a threat to the historical continuity of GDP, but has a fair chance of being adopted by the users. If it does, national accountants are bound to take the issues discussed here more seriously, and might eventually be willing to adjust the core of the SNA itself.

#### Developing Environmental/Resource Accounts for LDCs

In order to make progress so that eventually resource concerns are reflected in the SNA and in policy making, it is necessary to proceed at an operational level so that government officials, national accountants and economists alike see how one can practically go about including environmental and resource concerns in their calculations. Certain factors might even facilitate resource accounting work in LDCs, as the problems in

most developing countries tend to be concentrated and easily perceived. Besides, benefits can be derived from progress made in developed countries, and remote sensing methods of surveying are now available. On the other hand, environmental and resource accounting are demanding in terms of data and effort, and a plurality of disciplines is required for working on these accounts. The problems are compounded in the developing countries by the still limited political demand for this type of activity, as short-run problems are more pressing, and the relevant human resources are acutely scarce.

It is therefore clear that the development of environmental and resource accounts will take time. This fact, however, should not keep statistical and planning officials in LDCs from initiating relevant work now, especially on minerals and forestry, where data are already available.

Peskin (1988) argues in the case of Indonesia that a local research effort should start right away, supported initially with periodic consultant inputs. He also proposes that ideally not only environmental but also other important non-market factors be considered in an expanded accounting structure.

Empirical Work. Repetto, Wells, Beer and Rossini (1987) have applied resource accounting to fuel and forestry activities in Indonesia. For forestry they estimated harvesting, deforestation and degradation net of re-growth, valued the estimates at certain rent factors, and suggested that it be treated like depreciation of man-made assets, i.e., they proposed reducing the Net Domestic Product (NDP) by the estimated depletion. The proposed reductions amounted to over US\$3 billion annually for the years 1979 to 1982, which represents more than 3% of GDP. A similar approach was followed for valuing the depletion of fuel reserves (but see reservations about this approach and an alternative proposal in El Serafy (1986)). Another empirical study (Magrath and Arens, 1987) estimated the costs to the economy of soil erosion of Java. The annual amount estimated was US\$350 to US\$415 million which is somewhat less than 4% of the dryland agricultural GDP of Java. Over 95% of these costs are on-site costs of declining productivity. These two studies have made valuable contributions, but it is clear that further empirical work is needed.

#### A Variety of Approaches, but a Common Theme

Some of the papers presented at the Joint UNEP/World Bank Workshops on Environmental Accounting put forward incompatible propositions for amending the SNA. This incompatibility should not detract from the central theme argued by all authors that in their present form the guidelines for income calculation under the SNA leave out extremely important aspects of economic development that should be brought into the accounts. In their present form they produce readings of levels of activity and growth over time that lead often to faulty policy advice. Such readings frequently exaggerate income and thus encourage consumption and promote habits of behavior that cannot be sustained over the longer term.

An interesting argument over "desirable and practicable" adjustment is that highlighted by the approaches regarding depletable resources of Anne Harrison (1988) and Salah El Serafy (1986). Both are in

fundamental agreement about what constitutes "sustainable" income and what doesn't. Harrison would work within the existing framework of the SNA by preserving the definition of final demand as presently used, but would include consumption of natural capital as a parallel entry to consumption of man-made capital with appropriate adjustments to NDP. Further, she argues that income measures should exclude all capital consumption and therefore net products should be used as indicators of the level of economic activity and its development over time. El Serafy by contrast would redefine the distinction between intermediate and final demand, arguing that sale of natural capital must not be viewed as generating value added and that at least part of that should be excluded from GDP itself, as well as from the net product, so that the GDP measurement can continue to be used extensively as it is being used at present to describe performance and guide economic policy.

Norgaard (1985) is skeptical about the economists and accountants, concerned about the environment, ever being able to agree on a set of corrections that would simply rectify and fill in gaps in the existing SNA, so that they end up with one aggregate figure expressed in money terms. He claims that the existing SNA contains contradictions because they are based on conventions and reflect consensus rather than being built on deductive reasoning. Norgaard does not view sustainability as implicit in the definition of income, which characterizes the approach of both Daly and El Serafy, but as an "ethical" goal, representing a "separate objective of objective strategies." He sees the cause of undervaluation of the concerns of future generations as reflecting the non-participation by future generations in the capital markets of today. A more conventional view would ascribe such undervaluation to the use of too high a discount rate which has the effect of reducing the value of future net benefits almost to nothing the more distant the future. Since future generations will never be in a position to participate in today's capital markets, the surest way of reflecting their preferences is to use lower discount rates. The main thrust of Norgaard's argument, however, is against the economic approach to "sustainability of development" based on accounting that relies on market valuations. He espouses "methodological pluralism" in the belief that a multiplicity of perspectives would ensure that "all values are respected" so that decision-makers have information alerting them to "as many aspects of environmental and resource phenomena as possible." Norgaard, however, never spells out how such alternative value systems can be established or used; nor does he speculate on the sort of solutions they would bring about.

Readers of the various papers presented at the Workshops on Environmental Accounting (as well as the forthcoming Compendium) would find other areas where the participants have disagreed, but the main message this paper hopes to convey is the urgent need to adjust current practices for national income accounting -- a common thread in all the contributions of the various authors.

SNA Expert Group Meeting, Vienna, March 21-30, 1988

At the SNA expert group meeting in Vienna, the Bank presented a note for discussion under the agenda item "Links Between SNA and Environment Statistics". With regard to defensive expenditures, the Bank recommended that the experts:

- (a) Discuss and as soon as feasible, decide which expenditures are to be included under "defensive expenditures";
- (b) Agree that these are to be shown as a separate line item; and
- (c) Decide where the adjustments are to be made and where the adjusted aggregates are to be shown (in satellite accounts or in the main system of production, consumption, and accumulation accounts).

As far as resource depletion/degradation issues are concerned the Bank recommended that the expert group:

- (a) Adopt the principle of satellite accounts, linked with the SNA (where adjustments for resource depletion and degradation can be made);
- (b) Advise countries with a significant portion of GNP based on depletion/degradation of natural resources that current income, as calculated at present, overestimates sustainable income and that policymakers should explicitly be alerted to this; and
- (c) Encourage work on estimating costs and benefits of resource depletion/degradation.

The Expert Group agreed that the two issues presented are very important. They share the Bank's concern with the environment and support the construction of satellite accounts linked with the SNA. However, they do not yet agree on the changes to be made in the core accounts of the SNA. The reasons given included the following:

- (a) Although a functional breakdown in the central framework, e.g., in terms of environment, health, research and development, etc. would be valuable from an accounting and analytical point of view to various interest groups; such a breakdown, however, would not be possible during the ongoing revision to be finalized by 1991, and it would not be justified to functionally rearrange the core accounts for just one function -- environmental concerns. But because of the importance of the issue, proper adjustments should be made in satellite accounts;
- (b) There are various conceptual approaches that could be taken to revise the SNA; a consensus should be arrived at before the core SNA is revised;
- (c) In the environmental field many valuation issues are very difficult; more work is required before standard valuation techniques can be applied; and
- (d) The Expert Group welcomed the fact that a list of papers presented at the joint UNEP/World Bank workshops was attached to the Bank's position paper; but they had no access to these

and therefore were not adequately knowledgeable of what the issues and options were (which supported the urgent need for producing the Compendium).

As a concession to the environmental community the chairman stated that if and when adequate experience has been gained with satellite accounts and various conceptual and valuation issues have been resolved, the national accountants should be open to an SNA revision even if that was much sooner than the 20-year period between the last and the current revision.

During the discussion some other points were made by various participants:

- (a) In agreement with one of the Bank's proposals, GDP should not be "oversold" to users; rather, the revised SNA manual ("blue book") should include a discussion of the shortcomings of the GDP and give necessary warnings about these;
- (b) Communication between national accountants and environmental economists should be encouraged as the problems should be discussed jointly;
- (c) Some approximations that may be needed in environmental accounting may not be worse than some current arbitrary estimation methods already sanctioned by the SNA;
- (d) There should be a linkage of the SNA not only with environment statistics but with social statistics as well;
- (e) In order to help individual countries avoid tackling similar or the same problems again and again, it would be valuable if an international organization could pull together existing knowledge on environmental/resource accounting; the emphasis should be on "solvable" problems such as how to define defensive expenditures.

At the end of the meeting it was stated that these issues would have to be discussed again; that preferably national accountants and resource economists should address them together; and that all of them should have access to and be familiar with the papers in the forthcoming World Bank Compendium. An important SNA Expert Group Meeting is scheduled for January 1989, which will deal with stocks and other physical assets and their treatment in balance sheet and reconciliation accounts.

#### Planned Work

United Nations Environment Programme and the World Bank, in consultation with the United Nations Statistical Office and with support from some bilateral sources, are planning to undertake case studies in three developing countries on the integration of environmental and resource concerns into development strategies. The integration of environmental and resource concerns into the SNA would be an important part of the project. Parallel to the three developing country studies, an in-depth review is also planned of the resource accounting done by a number of industrial

countries (e.g., Japan, Norway, France, Canada and the United States) so that lessons can be drawn from that work. As the case studies are undertaken, perhaps over a two to three year period, parallel work should proceed to produce internationally standardized methodologies, in a handbook on environmental accounting within the handbook series of the SNA.

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