IV. GREEN NATIONAL ACCOUNTING AND THE MEASUREMENT OF GENUINE (EXTENDED) SAVING

> *"[The] difference in the treatment of natural resources and other tangible assets [in the existing national accounts] reinforces the false dichotomy between the economy and 'the environment' that leads policy makers to ignore or destroy the latter in the name of economic development"*
>
> *Repetto et al., 1989:3*

A. Introduction

The environment plays a number of important roles including, sustaining basic life support systems, providing raw material inputs to producers and consumers, serving as a receptacle for the waste products of producers and consumers, and providing amenities to consumers (e.g., recreation). In the periods when the world's population and the scale of economic activities were relatively small, environmental inputs were often regarded as 'free' goods and the environment was treated as a 'sink' for disposal of waste. However, there is a limit to the extent of the environment's capacity to assimilate waste. Pollution and environmental degradation begin to occur when this assimilative capacity is reached. Furthermore, once this limit is exceeded, the ability of the environment to provide other services (e.g., provide inputs) is compromised. There is a need to view the natural environment not only as a resource but also as an asset similar to traditional assets such as land, labour and capital. The value of this resource must therefore be integrated into the economic system. In Chapter II, the deficiencies in the traditional System of National Accounts (SNA) which places emphasis on GDP/GNP measures were discussed. Measures such as Net Domestic Product (NDP), while better than GDP for measuring sustainability, account only for the depreciation of produced assets and ignore the depreciation of natural resources and degradation of the environment. Alternative 'greener' measures such as Green Accounting and Genuine Saving were briefly introduced in Chapter II. This Chapter discusses the two approaches in a little more detail, noting their limitations. The chapter concludes with case studies reporting applications of the two approaches.

B. Green accounting

The 'greening' of the SNA to reflect environmental concerns followed the initial work of Ahmed et al. (1989), Repetto et al. (1989) and Hartwick (1990). The approach taken by Hartwick is based on neo-classical growth models and attempts to specify 'optimal' adjustments to the SNA. The second approach, that of Ahmed et al. (1989) and Repetto et al. (1989), is a more practical approach that attempts to make piecemeal changes to the widely accepted SNA.[11] As of now, there is no universal agreement among economists as to how these adjustments should be made to reflect environmental damage. In December 1993, the UNSO, in collaboration with international agencies, launched the SEEA, which is based on the framework presented by Ahmed et al. (1989)[12]. The SEEA is implemented in the form of satellite (or supplementary) accounts that are linked with the core accounts of the SNA. In that sense, the SEEA maintains concepts and principles embodied in the SNA. The basic features of the SEEA are as follows:

- **Segregation and elaboration of all environment-related flows and stocks of traditional accounts.** This aspect of the SEEA seeks to identify the part of GDP which reflects the costs necessary to compensate for the negative impacts of economic growth, i.e., defensive expenditures;
- **Linkage of physical resource accounts with monetary environmental accounts and balance sheets.** This component attempts to establish comprehensive physical resource accounts to be linked to the monetary balance sheet and flow accounts of the system of national accounts. The resource accounts will consider the total reserves of natural resources and changes therein even when such resources are not yet affected by the economic system;
- **Assessment of environmental costs and benefits.** This key part of the SEEA seeks to improve on the SNA by accounting for depletion of natural resources and changes in environmental quality due to economic activity;
- **Accounting for the maintenance of tangible wealth.** In this component, natural capital is handled in the same way as physical capital. Natural capital defined here includes renewable resources

[11] Excellent reviews of this literature can be found in Hamilton (1994) and Hanley (1997).

[12] The five agencies are the Commission of the European Communities, IMF, OECD, UN and World Bank.

(e.g., forestry, fisheries,), non-renewable resources (e.g., land, soil, mineral), and air and water resources; and

- **Elaboration and measurement of indicators of environmentally adjusted product and income.** The intention here is to develop modified macroeconomic measures of national income such as environmentally adjusted domestic product (EDP). This measure accounts for the costs of depletion of natural capital and changes in environmental quality.

As indicated earlier, EDP is obtained by subtracting from NDP the costs of environmental degradation and the depreciation of the stock of natural resources. Two alternative measures of EDP have been suggested:

EDP1: NDP minus depreciation of natural resources due to extraction; and

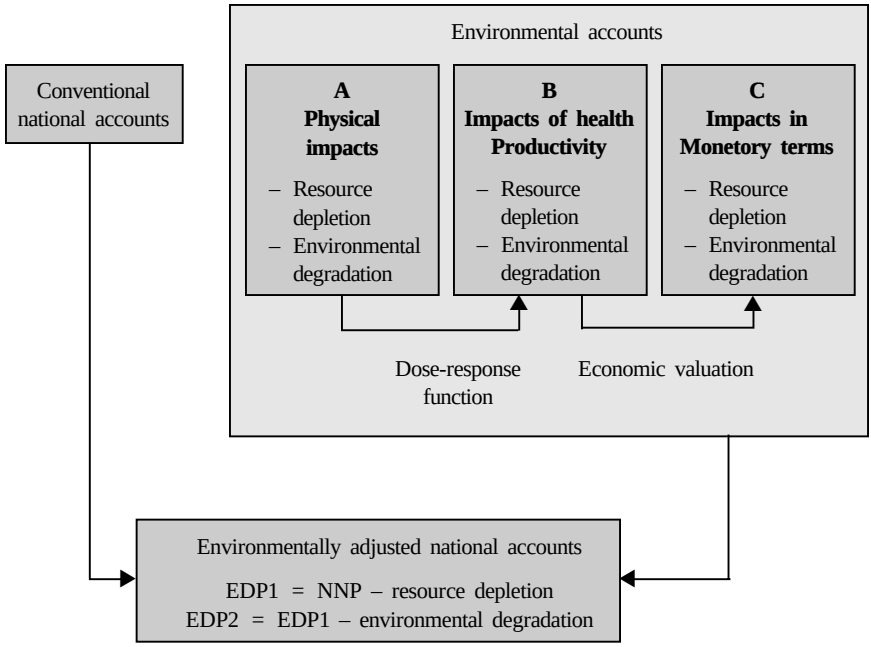
EDP2: EDP1 minus the cost of environmental degradation.

The construction of the SEEA proceeds in four steps (see Figure IV.1). The first step involves compilation of physical accounts. These are non-monetary accounts that measure resource depletion and environmental effects. The second step is to compute the non-monetary impacts. These include impacts on health, agricultural production, global warming, and ozone depletion. The third step is to value these effects in monetary terms. The final step is to adjust the conventional national accounts using the EDP measures. The first measure, EDP1, uses the market value of extracted resources to compute depreciation from NDP, with no allowance for changes in prices. As the majority of environmental costs are non-market in nature, EDP2 is based on willingness-to-pay estimates that are obtained by using the non-market valuation methods discussed in the previous chapter. There are a number of problems with implementing the EDP measures and these are discussed below.

The SEEA (and variants of it) has been implemented on a trial basis in a number of developing countries including Papua New Guinea (a case study is presented below), Mexico and Indonesia. In the Indonesian study, David Repetto and others at the World Resources Institute in Washington, D.C., adjusted Indonesia's national accounts for environmental effects in 1990 (Repetto et al., 1989). Indonesia's natural resources consist of oil, gas, minerals, timber and forest products. Together, these resources account for 44 per cent of GDP, 84 per cent of exports, and 55 per cent of total employment. Economic progress over the period of the study, 1970 to 1990, has been considered very good. For example, GDP per capita grew at 4.6 per cent per annum between 1965 and 1986. This is quite high in relation to that of low-income and middle-income countries. Repetto et al. (1989) adjusted Indonesia's national accounts for the period 1971-1983 by subtracting from GDP estimates of net

national resource depreciation for only three sectors: petroleum, timber and soils, to arrive at an estimate of NDP. The results clearly indicated that official GDP estimates overstated net income and growth of net income. The actual overstatement was higher since only three natural resources (petroleum, timber and soils) were considered. Items not included were: (i) exhaustible resources – natural gas, coal, tin, nickel; and (ii) depreciation of renewable resources (e.g., fisheries and non-timber forest products).

Figure IV.1. Framework of the System of Integrated Economic and Environmental Accounting



Source: Adapted from Serageldin and Steer (1994).

1. Issues and Limitations of Green Accounting

Although progress has been made in terms of trying to change the way national accounts are compiled with the view to making them reflect environmental considerations, several practical difficulties and issues remain to be resolved. These issues include: accounting for defensive expenditures and pollution damages, the valuation of environmental damages, the treatment of

transboundary pollutants, and the treatment of socio-political development goals and issues.

(a) Defensive expenditures and pollution damages

'Defensive expenditures' can be defined as expenditures incurred by households and governments to reduce the effects of pollution. Examples of defensive expenditures for the household include buying water purification equipment to improve drinking water quality or buying a malaria prophylactic. For the government, this could include expenditures on litter removal or repairing degraded recreational sites. There is no agreement on to how to handle these expenditures. Maler (1991) argues that such expenditures should not be deducted from NDP if the changes in the values of 'environmental services' (e.g., air and water quality) are included, since this would amount to double counting. Dasgupta (1995), on the other hand, states that defensive expenditures should be included in final demand. Bartelmus and van Tongeren (1994) argue that the cost of restoring polluted or damaged natural environments to their original state at the beginning of the accounting period should be deducted from NDP. This is similar to the EDP2 measure mentioned above and is referred to as the 'maintenance cost' approach to accounting for environmental effects. However, this maintenance cost approach has also been criticized on two grounds. First, Aaheim and Nyborg (1995) argue that costs that would have been incurred to prevent an increase in emissions could severely underestimate the cost of actually repairing the damage, especially if the damage is irreversible. Second, the maintenance cost approach is problematic for cumulative pollutants for which any emission adds to the stock because there is no assimilative capacity. Hueting et al. (1992) argue that a better approach would be to value environmental damage at the cost of bringing environmental quality to 'sustainable levels'. However, the problem with this suggestion is that there is likely to be disagreement over how to determine what level is sustainable.

(b) Valuation of environmental damages

Regardless of which measure of environmental damage to use, there are difficulties in placing monetary values on effects that are non-market in nature. As was discussed in Chapter III, techniques such as contingent valuation, choice experiments, hedonic pricing and travel cost methods have been developed to assist environmental valuation. However, there are some environmental effects that are difficult to value even with the state of the art techniques. Even when such effects can be valued, there is the additional issue of whether the society's valuation is equal to the sum of the individual valuations. A practical consideration is that the different techniques often

yield different estimates, implying that there could be large differences in the value of environmental depreciation used to compute EDP.

(c) Transboundary pollutants

The transboundary issue concerns the case where some pollutants (e.g., SO_2 and NO_2) are emitted in one country and has adverse effects on other countries. An extreme case is where the effects (e.g., global warming) are worldwide. The practical issue here is how, or whether, we should account for the polluting effects external to the country for which EDP is being computed. The same question applies to the case of imports of transboundary pollutants. Some people (e.g., Maler, 1995) have argued that pollution damages of a country on other countries should be deducted from its NDP, since NDP measures the welfare impacts of projects in that country. However, he suggests that imports of emission into the country should be ignored. His suggestion raises a couple of issues. The first is the practical problem of separating out pollution impacts in the country, which is more difficult if there are also similar emissions from the country. The second point is the counter argument that if NDP is a measure of the welfare of the inhabitants of a given country, then imports of emissions should be counted but exports should not. Whatever the approach adopted, there is the additional problem that all countries should reach a consensus for the SEEA to be meaningful at the global level.

(d) Treatment of socio-political development goals and issues

Development goals such as equity, cultural aspirations or political stability are difficult to quantify and quite impossible to value in monetary terms. Such effects would have to be specified in normative terms as targets or standards. In many developing countries today, there is increasing poverty, income inequality, corruption, and crime. These issues are difficult to measure, even when we use non-economic indicators.

C. Genuine (extended) saving

The concept of genuine (or extended) saving (Pearce and Atkinson, 1993) has been proposed as a broad measure of sustainability that values changes in the natural resource base and environmental quality in addition to man-made (or produced) assets. The traditional measure of a country's rate of wealth accumulation is gross saving which is given by the difference between GNP and private consumption. Gross saving is the total amount that is set aside for the future in terms of either foreign lending or investment of productive assets, and it tells us little about whether or not a particular development path is sustainable. This is because we expect productive assets to depreciate.

The issue then is whether the amount of depreciation is greater than gross saving. Net saving, which is gross saving minus depreciation of produced assets is a slightly better indicator of sustainability, although it focuses only on produced assets.

The World Bank has proposed a methodology for calculating genuine saving (GS) which they have applied to a number of countries. The process begins with the conventional national accounts. First, gross domestic saving is obtained by deducting net foreign borrowing (including net official transfers) from gross domestic investment, which consists of total investments in structures, machinery and equipment, and inventory accumulation. That is,

$$\text{Gross Domestic Saving} = \text{Gross Domestic Investment} - \text{Net Foreign Borrowing} + \text{Net Official Transfers} \quad (4.1)$$

Next, net saving is obtained by deducting depreciation of produced asset from gross domestic saving. That is,

$$\text{Net Saving} = \text{Gross Domestic Saving} - \text{Depreciation of produced capital} \quad (4.2)$$

Finally, GS is obtained by subtracting the value of resource depletion and pollution damages from net saving, and adding on the value of investment in human capital. That is,

$$\text{GS} = \text{net saving} + \text{human capital investment} - \text{depletion of natural resources} - \text{pollution damage} \quad (4.3)$$

Human capital investment:

The inclusion of human capital is based on the rationale that human capital contributes to overall sustainability by assisting in the ongoing creation and maintenance of national wealth. Human capital investment in the current period is assumed to provide the resources for improvements in productivity and income in the future. Although, historically, a number of specific measures of human capital have been developed (e.g., see OECD, 2000), in computing the GS measures, the World Bank uses current educational expenditures as a proxy for the value of human capital.[13] Obviously, this is not the best measure because expenditure by itself is an indicator of financial input into the process of human capital formation. Therefore, it is only an indirect indicator of the economic contribution of education to a nation's growth and productivity.

[13] Current educational expenditures consist of teachers' salaries and expenditure on textbooks.

Depletion of natural resources:

Depletion of natural resources is measured as the total rents on resources extracted and harvested. For renewable resources (e.g., bauxite, copper, gold, iron ore, and so on) rents are estimated as the difference between the value of production at world prices and the total production costs. For forest resources, the rent is computed as the difference between the rental value of log harvests and the corresponding value of natural growth and plantations less harvesting costs. In the computation of forestry rents, only the commercial value of timber is considered and other environmental services provided by trees such as carbon storage, watershed protection and the value of non-timber forest benefits are excluded. The calculation of resource rents also omits other natural assets such as fisheries resources and the economic costs of soil degradation.

Pollution damages:

Due to problems associated with precisely determining the welfare effects of pollution damage, a very simple approach is adopted in the computation of GS. Pollution damage is calculated only for CO_2, using a global estimate of US$ 20 per metric ton of carbon emitted. It is, however, possible to extend the calculation to include other critical pollutants such as chlorofluorocarbons (CFCs).

1. Policy uses of genuine savings estimates

For PICs that are dependent on natural resources for the bulk of their national income, GS estimates computed over a period of time can be used to answer pertinent questions about the sustainability of natural resource use. Such questions include:

- Are the rents from natural resources invested or consumed?
- What are the types of investments that a country makes?
- Do existing property rights regimes encourage sustainable exploitation of natural resources?
- Are royalties set appropriately to capture resource rents?
- Do policies to promote natural resource exports also contain plans for the investment of the resource royalties?
- What micro and macroeconomic policies such as government expenditures, taxation and interest rates can be devised to create incentives for higher genuine savings?

Some PICs are beginning to experience pollution problems associated with rapid urbanization. Computation of GS estimates would enable planners to answer the following questions:

- Do the current pollution reduction policies target efficient levels of emissions?
- Are sufficient savings being made to offset cumulative effects of pollution?

2. Limitations of genuine saving measures

There are a number of limitations associated with GS as a measure of sustainability. These can be divided into two categories – conceptual and technical. The conceptual issues deal with the way the measure is defined, while the latter deal with how the measure is actually computed. There are at least four conceptual problems with the definition of GS. First, it cannot be assumed that savings necessarily equates to investment. Furthermore, even if all savings are channeled into investment, this does not mean that the level of output will be sustained. The sustainability of output will depend on the quality of the investment in capital and how efficient it is. For example, a developing country investing heavily in primary education may be setting itself up on a more sustainable growth path than one that is consuming the proceeds of natural resource extraction. Second, GS does not address the issue of intra-generational equity. For example, a country may have a high level of savings but these could belong to a small fraction of the population and therefore may not contribute much to the country's development. Third, GS is based on weak sustainability since it does not distinguish between the types of capital that can be substituted for each other. In that sense, it is a narrow concept of sustainability. Fourth, due to the fact that GS is measured in monetary units, changes in resource prices (which is usually beyond the control of individual countries) may cloud changes in physical stocks, and may therefore give a less than clear picture of changes in sustainability.

The main technical limitation of GS measures relates to the fact that it is currently based on the World Bank's methodology that excludes some important aspects of natural capital. For example, the approach restricts pollution damage to only CO_2 emission, which is estimated at a flat rate of US$ 20 per ton for all periods. Other major air pollutants such as SO_x, NO_x, particulates, ozone and CFCs, as well as damage from water pollution, are excluded. The approach also restricts natural resource depletion to only two components – minerals and forestry – and makes no provision for the depletion of other land-based capital due to factors such as soil erosion, salinity and water pollution. Finally, the current approach also ignores the following

important components of natural capital: freshwater and marine-based resources; the value of ecosystem services such as carbon sequestration, biodiversity and watershed regulation; the value of native remnant bushland (e.g., dry tropical savannah); the value of air resources; and industrial and household uses of water. Admittedly, mostly these omissions are due to the technical difficulties associated with estimating non-market values such as biodiversity and other ecosystem services. However, research advances should make it possible to at least obtain ball park estimates of some of these effects.

Case Study IV.1: A Calculation of Genuine Savings for Queensland[14]

Introduction

Estimates of GS were computed for the state of Queensland using the World Bank's methodology. Queensland is a natural resource dependent state with mining accounting for 45 per cent of its natural capital, and agriculture and forestry accounting for 38 per cent (see Figure IV.2)

The GS for Queensland was estimated for the period 1989/90 to 1999/2000, at constant (1999/2000) prices. Some modifications were made to the calculation to reflect the State-level equivalent of each component in the World Bank's methodology. GS was defined as follows:

$$\text{GS} = \text{Net State Saving} + \text{Human Capital Investment} - \text{Depletion of Natural Resources} - \text{Pollution Damage} \quad (4.4)$$

where

$$\text{Net Saving} = \text{Gross Domestic Saving} - \text{Consumption of Fixed Capital} \quad (4.5)$$

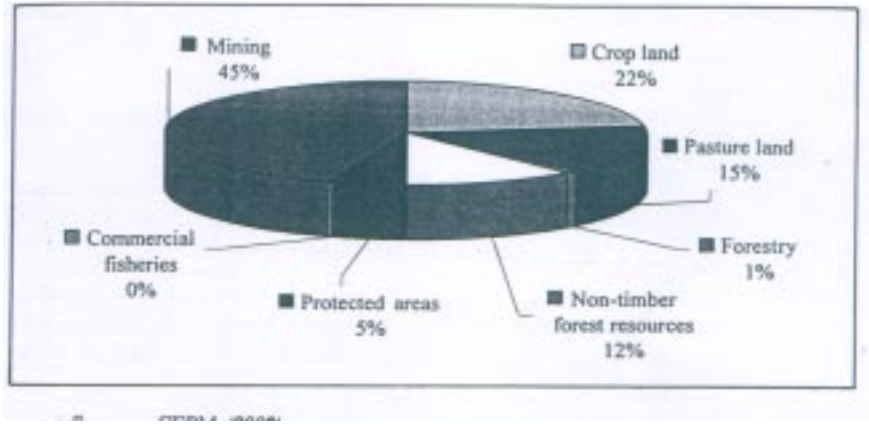
and;

$$\text{Gross Domestic Saving} = \text{Gross Domestic Investment} - \text{Net Foreign Borrowing} + \text{Net Official Transfers} \quad (4.6)$$

Gross Domestic Saving was measured using the State level equivalent of national disposable income, defined as national income plus net unrequited transfers. At the level of a State within a country, this implies adding the current account balance to Gross State Product (GSP). Human capital investment was measured by government expenditure on education. Effectively, this

[14] This section is based on Brown et al. (2003).

Figure IV.2. Components of Natural Capital for the State of Queensland



Source: CEPM (2002).

is a re-classification of government expenditure, as education expenditure is usually treated as an element of government consumption. It ignores other components of human capital such as health, and it measures the value of human capital in terms of the cost of education measured by public expenditure on the education sector.

Following the World Bank's approach, pollution damage was restricted to include carbon dioxide only and water pollution damage was not included. Estimated carbon emissions were based on annual data for the whole of Australia and Queensland data for two years, 1989/90 and 1998/99. The intermediate years' values were estimated by interpolation using Queensland's share of total Australian emissions in the two end years. The calculation also restricted the calculation of natural capital depletion to forest and mineral resources. These two components represent the depletion of the economy's renewable and non-renewable resources, respectively, and make no provision for the depletion of other land-based capital due to factors such as soil erosion, salinization and water pollution. Furthermore, freshwater and marine-based resources are also excluded.

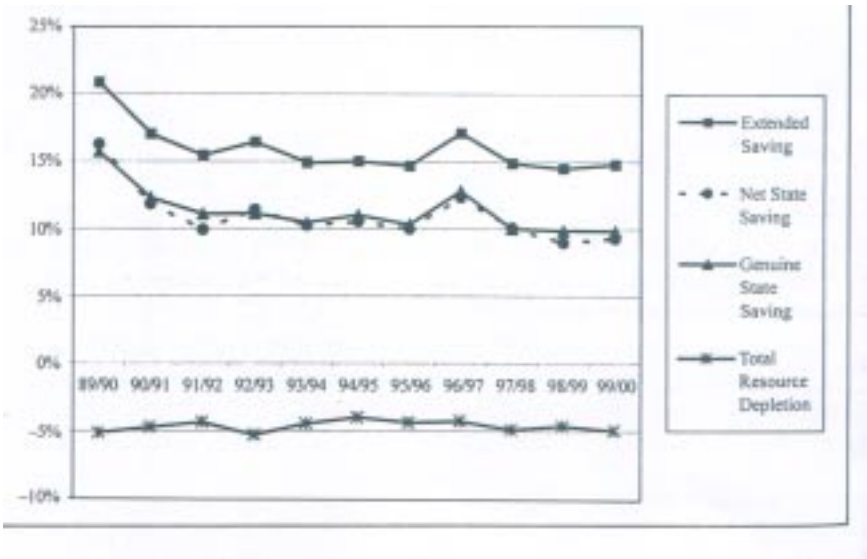
To estimate resource rent for mineral production and forestry, gross surplus was calculated first by adding royalties and company taxes to gross operating surplus. Next, 'normal profit' was calculated as 10 per cent of total costs (including depreciation). This was then subtracted from gross operating surplus to arrive at the estimates of resource rents for mining and forestry.

Results

The results of GS estimates are graphed in Figure IV.3. The main findings are as follows:

- Since 1989, Queensland's GS has fallen from 15.7 per cent to 9.9 per cent, implying that although, following the World Bank interpretation of GS, we are possibly on a sustainable growth path, the decline should be of concern to policy makers;
- Mineral depletion is the leading component of the State's overall depletion of natural resources. It comprises approximately 80 per cent of the total depletion of natural resources; and
- The extent of any divergence between saving as measured by State accounts and the GS is dominated by two components – the effects of mineral depletion and ongoing investments in human capital. These two parts of the GS effectively offset each other implying that Queensland's Net State Saving rate as measured in the State Accounts closely approximates the GS.

Figure IV.3. Genuine Saving Estimates for the State of Queensland



Source: Brown et al. (2003).

Interpretation of Results

The interpretation of these estimated trends in the aggregate levels of Genuine Saving requires a consideration of the following issues:

- First, it needs to be acknowledged that apart from the mobilization of State savings for investment in physical capital, savings are also required for investment in human capital. When human capital investment is added to State saving to obtain extended State saving, the trend is positive in absolute terms, as shown in Figure IV.3. It could be concluded that the proceeds from the exploitation of natural capital are, in effect, supporting a higher level of human capital accumulation than what would be possible otherwise. This hypothesis requires further empirical analysis;
- Second, it would be more meaningful to express the levels of saving in relation to some aggregate such as GSP to gauge saving performance relative to other macroeconomic aggregates. This is done in the next section of this chapter; and
- Third, while data on the levels of natural capital depletion are instructive in providing some indication of the extent to which State income, saving and the accumulation of physical and human capital are dependent on the exploitation of natural capital, they do not provide any indication as to the sustainability of the historical and current levels of depletion and environmental damage.

Case Study IV.2: An Application of Green Accounting to Papua New Guinea[15]

Introduction

The main purpose of this case study was to apply the proposed SEEA in a country at a relatively early stage of development and with as yet moderate environmental problems. One of the challenges of the project was to see to what extent environmental accounting could be applied with limited effort in country with relatively weak institutional capacities and limited data.

Papua New Guinea is country of about four million people, 90 per cent of whom live in rural areas. It has few urban centres and there is a low level of industrialization. A few large copper, gold and silver mines contribute about

[15] The material in the section is based on Bartelmus et al. (1992) and Asafu-Adjaye (1991).

70 per cent of export. Central government expenditures on the environment are low, accounting for less than one per cent of total budgeted expenditure for the period 1986 to 1990, which was the period for this analysis.

The SEEA was implemented in three steps. In the first step, the national accounts framework in PNG was adapted to meet the structure of the SEEA so as to identify environmental expenditures and to incorporate balance sheets of produced and non-produced (natural) tangible assets. However, due to inadequate data, environmental protection expenditures could not be presented separately for any of the economic agents in PNG. Also, the lack of physical resource accounts, with the notable exception of mineral resources, made it difficult to estimate scarcities of other renewable and non-renewable resources.

In the second step, an attempt was made to value the natural resource scarcities in monetary terms. Two approaches were considered for calculating the depletion costs of the use of scarce natural resources – the user cost approach and the net price approach. The user cost approach attempts to convert the stream of revenues from sales of an exhaustible natural resource into a permanent income stream by investing a part of the revenues (referred to as the "user-cost allowance") over the lifetime of the resource. According to El Serafy (1989), only the remaining amount of the revenues should be considered as "true income". The "net price" is applied in this study, which is defined as the market price minus all factor costs including a normal return to capital. The final step was to compute the discounted future stream of income using the net price. This was used to estimate an 'environmental depletion cost' which was deducted from net value added to obtain estimates of environmentally adjusted net value added of the sector and environmentally adjusted net domestic product of the economy.

Results

Table IV.1 shows estimates of the economic costs of environmental quality degradation of four sectors – agriculture, forestry, mining and energy.

The main environmental impacts of agriculture are from the effects of forest clearing for cultivation. Non-economic, ecological, and related social and spiritual values of forests are lost through the conversion of forests for agriculture and other uses. The main consequences of the depletion of PNG's forests include loss of biodiversity, soil loss, impairment of watershed regulation and nutrient cycles, and the increased risk and intensity of flood and landslides. The estimates of the costs of forest depletion are for conversion of forest land to agricultural uses. The estimates are based on the rate of compensation to be paid to landowners deprived of traditional uses of the forests by logging activities and should therefore be regarded as very

conservative. The low estimates are 9.4 million (1981-85) kina (K) and K 8.1 million (1986-90) per annum. The high estimate is K 119.0 million per annum for the period 1981-1991.

Table IV.1. Papua New Guinea: Average Annual Costs of Environmental Quality Degradation (millions of kina)

Sector	*1981-85*		*1986-91*	
	Lower Estimate	*Upper Estimate*	*Lower Estimate*	*Upper Estimate*
Agriculture[a]	9.4	119.0	8.1	119.0
Forestry[b]	10.0	45.0	10.0	61.0
Mining[b]	35.7	101.2	35.7	101.2
Energy[a]	0.03	0.03	0.03	0.03
Total	55.1	265.2	53.8	281.2

Source: Bartelmus et al. (1993:125), Table VII.12.

Notes: [a] Based on compensation values.
[b] Based on avoidance costs.

As is the case in the agricultural sector, the major environmental impacts of logging are the losses of ecological and cultural functions of forestry resources. The social costs of logging are estimated at about K 45 million per annum for 1981-85 and K 61 million per annum for 1986-90. In PNG, the main environmental effects of mining are from the discharge of mine tailings that pose a threat to aquatic resources in fresh and marine waters. Estimates of the costs of avoiding environmental damage from mining range from K 35.7 million per annum to K 101.2 million per annum.

Table IV.2 presents estimates for environmentally adjusted net value added and domestic product using only the lower values of the estimated environmental damage. The results indicate that EDP1 reduces NDP by amounts ranging from 1 to 8 per cent and EDP2 by 2 to 10 per cent.

Due to the fact that the period under review is short, no definite conclusions can be reached regarding the trends in environmental depletion and degradation. EDP2 (i.e., the additional accounting for environmental quality degradation) reduces NDP by a further 2.1 per cent on average. A comparison of the ratios of final consumption (C) to EDP2 indicates that consumption exceeded net (environmentally adjusted) domestic product.

Table IV.2. Papua New Guinea: Estimates of Environmentally Adjusted Net Value Added and Domestic Product, 1986-90 (millions of kina)

Adjusted items	*1986*	*1987*	*1988*	*1989*	*1990*
NDP	2,313.6	2,569.2	2,861.6	2,698.1	2,760.2
EDP1	2,186.8	2,359.5	2,755.3	2,672.9	2,579.5
EDP2	2,132.9	2,305.6	2,701.6	2,619.2	2,525.7
[(NDP-EDP1)/NDP]*100	7.8	10.3	5.6	2.9	8.5
[(NDP-EDP2)/NDP]*100	5.5	8.2	3.7	0.9	6.5
(C/EDP2)*100	105.4	105.5	94.5	102.1	109.1

Source: Bartelmus et al. (1993:128), Table VII.13.

Conclusions

The study shows that it is feasible to implement the SEEA in a developing country situation. But at the same time, it highlights the constraints and limitations of the approach. The main contribution of the study is to reveal the many significant data gaps that exist. The following priorities for environmental data collection were identified:

(i) It would be necessary to establish natural resource accounts and balance sheets in the areas of forests, soils, subsoil assets of minerals, gas and oil, and fish stocks;

(ii) There is a need to monitor effluents and loadings of water pollutants from agriculture, mining, industry and municipalities, as well as changes in levels of biodiversity; and

(iii) Statistics should be developed on environmental (protection) expenditures by the government, industries and households.

It is hoped that a strong physical database would enable a more accurate estimate of the environmental costs of economic development to be made. Box IV.1 highlights some of the issues that need to be addressed before the SEEA can be more effectively implemented. These include promotion of awareness and devoting more resources to human resource development and research.

Box IV.1. Environmental Accounting in Papua New Guinea

Papua New Guinea (PNG) is at an early phase of industrial development and, in general, is yet to experience the kinds of serious environmental problems that we have seen in some countries. The use of an approach such as the SEEA could serve as an 'early warning' system for potentially serious environmental problems. The main constraints to implementing the SEEA in PNG include: (i) awareness; (ii) training; and (iii) research.

Awareness

In spite of the high profile given to environmental issues, individual governments are not putting their money 'where their mouths are'. In PNG, for example, environmental protection services account for a meagre 0.2 per cent of total budget expenditure. There is a need for an environmental awareness campaign aimed at government policy makers and analysts, emphasising the need for effective environmental management.

Training

Statisticians and economic planners in government departments such as Finance and Planning, Agriculture, Minerals and Energy, must be given training not only in the concepts of the SEEA but also in relevant aspects of the emerging discipline of environmental economics.

Research

Considerable research effort is required to provide the necessary inputs into the SEEA. The problem of data availability is especially acute in developing countries such as PNG. Areas of research could include: impacts on agriculture, forestry and fisheries, soil erosion and run-off, and non-market valuation techniques. Research funding could be sought from external agencies such as the World Bank.

Source: Asafu-Adjaye (1991).

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