

# *Natural Resource Accounting:*

*Working Group Document*

May 25, 1998

INTOSAI Working Group on Environmental Auditing  
C/O The Netherlands Court of Audit

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## Preface

As Chair of the INTOSAI Working Group on Environmental Auditing I have the honour to present to you this paper on Natural Resource Accounting. The purpose of this paper is to inform SAIs about the current state of affairs with regard to natural resource accounting, and hence to give them the knowledge they need in order to pursue an informed debate on the opportunities available to SAIs in this field.

At the fourth meeting of the Working Group in Tallinn (Estonia) in September 1997, the paper has been discussed by the members of the Working Group and the document has been accepted by the INTOSAI Working Group on Environmental Auditing as a working group document.

The paper consists of two parts:

- part 1 presents possibilities for SAIs to play a role in Natural Resource Accounting;
- part 2 contains a preliminary study on Natural Resource Accounting, dealing with subjects like definition of Natural Resource Accounting, problems in the practice of natural resource accounting, the state of the art of international organisations dealing with natural resource accounting as well as the activities which are world-wide performed at the national level. The study ends with a chapter on the accounting of "fresh water", this being the central theme of the Working Group.

I hope that this document will contribute to the understanding of natural resource accounting and will be an impetus for SAIs to think about the subject.

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Chair of the INTOSAI Working Group on Environmental Auditing  
and

Member of the Board of the Netherlands Court of Audit

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## *Part I*

# *Natural Resource Accounting: An inventory of possibilities for SAIs*

May 25, 1998

INTOSAI Working Group on Environmental Auditing

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## Inventory of options available to sais

This memorandum contains an inventory of the various options open to supreme audit institutions in the field of natural resource accounting. This proposal is based on part 2 of the paper on natural resource accounting.

It is clear from the paper on natural resource accounting that natural resource accounting is a relatively new discipline, and that certain guidelines and customs are gradually coming to be accepted as forming the basis for standard practice (e.g. un guideline sna-93, seriee and namea). Opinions differ on a number of points, such as the desirability of calculating a 'green national income' and the method of monetarising natural resources. These are issues on which agreement still needs to be reached, at both national and international levels.

Supreme audit institutions need to know what sort of action they could take in relation to natural resource accounting. Once they

have access to information on the options available to them, they can decide which of these are worth pursuing, in the light of the powers vested in them and the role which each of them plays in its own specific operating environment.

A first attempt at producing an inventory of the options available to national audit institutions generates the following list of suggestions:

- audit institutions can discuss the possibilities of natural resource accounting and can make their knowledge on this subject available to their governments;
- audit institutions can make contact with other related professional organisations to exchange information on national resource accounting;
- where the government has drawn up a plan of approach for natural resource accounting, audit institutions can monitor progress;
- in countries where natural resource accounts are already compiled, audit institutions can conduct audits of their reliability;
- in countries where natural resource accounts already exist, audit institutions could find out whether these are actually used in the decision-making process;
- at a micro-economic level, audit institutions could identify those government agencies and firms which compile environmental accounts or which have a policy for encouraging such accounts to be compiled and used;
- audit institutions could conduct natural resource accounting themselves.

The debate on the options available to national audit institutions would be facilitated if one knew whether audit institutions had already audited national accounts and whether they were active in the field of natural resource accounting.

The situation at present is, in fact, that very little is known about the extent to which national audit institutions are involved in auditing their countries' national accounts. There are, however, various examples of audit institutions which are active in the field of natural resource accounting, such as the Colombian and the Canadian supreme audit institutions.

In 1995, the Colombian Suprême Audit Institution carried out a study into the state of the natural resources in the country and attempted in doing so to place a figure on the monetary value of

a particular river basin. This meant monetarising certain environmental values (see Appendix A).

The Canadian supreme audit institution was involved in a case study of sustainable forestry management which unctad had commissioned. The case study is essentially a model which sets out a methodology as to how commercial principles can be applied to sustainable concepts and how commercial practices should be modified in order to determine the costs and benefits, sacrifices and implications of a move towards sustainability. Mr Daniel Rubenstein, a member of the staff of the Canadian audit institution, was the principal researcher in this project.

## Appendix: Natural resource accounting by the sai in Colombia

*Report published by the Colombian sai*

In 1996, the supreme audit institution in Colombia published a report entitled 'Report 1995: The state of natural resources and the environment'. It set out the findings of an audit which the sai had performed of the Colombian government's environmental programme, known as 'El Salto Social'. This programme seeks *inter alia* to provide detailed information on the state's duty to guarantee the quality of its environmental policy and to ensure that natural resources are used with a maximum of efficiency. The sai was especially interested in three particular aspects of the programme: sustainability, consistency and enforceability. The sai also examined the problem of valuing environmental costs. A separate chapter in the report discusses the theoretical background to the valuation of environmental costs, stressing that academic opinion on this issue remains divided. The reports contains, in addition to examples of environmental costs which other organisations have expressed in monetary terms, three case studies in which the Colombian SAI attempts itself to monetarise certain environmental costs.

The object of one of these case studies is the 'plan for the restoration of the Rio Blanco'. The plan was drawn up with the aim of providing an answer to the environmental problems affecting the basin of the Rio Blanco; the idea was that the plan should serve as a pilot project for the restoration of all other river basins in Colombia. The problems in question were the result of both natural and human causes. The SAI developed a method for attaching an economic value to the soil in the basin of the Rio Blanco. With this method, the total value of the soil is calculated by deducting from the value of agricultural production the value represented by the loss of nutrients, the water pollution caused by the use of fertilizers, pesticides and weed killers, and subsequently adding to the figure thus obtained the

benefit represented by the decline in soil erosion resulting from the presence of reservoirs. Unfortunately, however, there were no data available on the pollution caused by agricultural activity and the amount of soil erosion that would have occurred had the reservoirs not been there. The valuation method was therefore adjusted, with the value of the loss of nutrients being deducted from the market value of production in the basin.

The subsequent calculations showed that 9.6 tonnes of nutrients were being extracted each year from the river basin, representing an annual depreciation of usd 13 million (at 1993 prices) in the basin's environmental value. The aggregate value of the soil in the basin of the Rio Blanco was usd 542,478 million. If account is taken of the depreciation and the loss of nutrients, the value of the soil as a natural resource declines by approximately usd 129 million (see Table 1).

Table 1: Computation of the natural asset value of the Rio Blanco basin in 1993, in US dollars

	Annual value	Aggregate value
Value of agricultural production	55,888,583,003	542,607,621,393
Annual depreciation	13,276,623	128,899,252
Value of natural assets	55,875,308,380	524,478,722,140

Source: Informe 1995. El estado de los recursos naturales y del ambiente. Contraloria General de la República de Colombia.

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## *Part 2*

### *Natural Resource Accounting*

#### *A preliminary study*

May 25, 1998

INTOSAI Working Group on Environmental Auditing

C/O The Netherlands Court of Audit

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## Summary

The purpose of this paper is to inform states about the current state of affairs with regard to natural resource accounting, and hence to give them the knowledge they need in order to pursue an informed debate on the opportunities available to states in this field. The immediate inspiration for this paper was the Cairo Statement, in which the Working Group on Environmental Auditing was encouraged to address the issue of natural resource accounting. On 25 June 1996, the Governing Board of the Intosai approved the Working Group's plan of action for the period from 1996 to 1998; this plan announced the Working Group's intention of producing a discussion paper on natural resource accounting.

Natural resource accounting is the compilation, within an accounting framework, of data relating to natural resources which are organised in terms of stocks and flows. The term also covers the interpretation of data and reporting. Natural resources accounts may involve both physical units and monetary values. The resources in question may include both those which contribute to marketable forms of production as well as non-commercial or environmental resources such as air, water and biological life. Natural resource accounting may be applied not only at a macro-economic level (for example, in the compilation of national accounts), but also at a micro-economic level. Generally speaking, natural resource accounts are regarded as a means of creating linkages between the environment and the economy. One of the particularly thorny problems relating to natural resource accounting is the valuation of resources in monetary terms. The way in which natural resources are priced is often the result of decisions based on subjective criteria.

There is now widespread international support for the concept and practice of natural resource accounting. Among the international organisations which are active in this field are the United Nations (un), the United Nations Environment Programme (unep), the United Nations Statistical Division (unsd, formerly known as unstat), the Organisation of Economic Cooperation and Development (oecd), the World Bank, the World Resource Institute (wri), the Statistical Office of the European Communities (eurostat) and the World Wildlife Fund (wwf).

One of the key international developments has been the reform of the system traditionally used for the compilation of national accounts, known as the sna. In 1993, the un formerly adopted the sea manual for an integrated system of environmental and

economic accounting. Unlike the conventional accounting system, this system contains satellite accounts for computing the depletion of natural resources and environmental degradation. Thanks to these satellite accounts, links may be made between conventional economic accounts and the environment. Although the sea does not provide any guidelines for monetarising environmental stocks, it does offer the basics needed to compute green indicators such as the 'green national income'. The problems encountered in the "greening" of the national accounts, illustrate the problems which occur in natural resource accounting in general.

Because audit institutions are by definition geared to dealing with the problems and issues affecting their own national governments, there is an obvious interest in identifying those countries whose governments have commissioned activities relating to natural resource accounting. A study of the literature reveals that there are a number of countries where activities are already taking place, including both those which have just launched programmes in this field and those such as Norway with many years of experience. The list of active countries includes both Western and non-Western countries.

The situation varies considerably from country to country. First of all, there are differences with regard to the type of resources selected (although most countries tend to follow the same principle of concentrating on those resources which play a vital role in their economies). Some countries have launched ambitious schemes involving a very large number of natural resources, whilst others have decided to exercise more caution by starting one or two pilot accounts. Some countries are interested in calculating a green national income, whilst others are not.

An inventory of the activities performed in the various countries shows that certain standards for natural resource accounting are gradually being accepted by a growing number of countries.

The Working Group on Environmental Auditing has chosen to adopt 'fresh water' as the theme for its activities, and has examined the extent to which natural resource accounting is applied to fresh water supplies. Eurostat is currently designing a method for compiling 'water accounts', and is conducting trials in six different countries. In addition, a number of individual countries, such as Canada, France and the United Kingdom, have either compiled water accounts or are in the process of doing so. There are a number of organisations which could act as suppliers of data for the compilation of water accounts, and these include the World Resource Institute, the Global Environmental Monitoring System (managed by the unep), and various national

and regional organisations which are responsible for managing drinking water supplies.

## Introduction

### The aim of the paper

#### *Inspiration*

The immediate inspiration for this paper on natural resource accounting was the Cairo Statement, which was drafted in response to the incosai xv. This statement encourages the Working Group on Environmental Auditing to focus on the possible role which SAIs could perform in assisting the development of natural resources and in auditing these assets. The subject was initially brought up in a paper given by Dr Mostafa Tolba at the incosai xv in Cairo. Attachment 1 contains a summary of this paper.

The intosai Working Group on Environmental Auditing followed up the Cairo Statement by including the production of a paper on natural resource accounting as one of the activities listed in its 1996-1998 Plan of Action. The Plan of Action was approved by intosai's Governing Board at its meeting in Vienna on 25 June 1996.

#### *Aim*

The aim of this paper is to inform the members of the intosai about the current state of affairs in relation to natural resource accounting. The paper starts by examining the question of what exactly natural resource accounting is (in Chapter 2) before going on to list those international organisations which are involved in research or other work in this particular field (Chapter 3). The paper subsequently discusses those countries whose national governments are taking action in the field of natural resource accounting (Chapter 4). As the work of supreme audit institutions is geared primarily to the public sector, this aspect is of particular importance for determining the role which such institutions could potentially perform. The paper concludes (in Chapter 5) by presenting a review of natural resource accounting in the context of one particular natural resource, i.e. fresh water (given that this is the theme selected by the Working Group).

The paper focusses on one particular direction of natural resource accounting, namely the direction of the "greening" of the national accounts. This direction is the most advanced direction in natural resource accounting.

# Definition of terms

## What is natural resource accounting?

Natural resource accounting is the compilation of data on natural resources within an accounting framework. The term also covers the interpretation of data and reporting. Natural resource accounts may involve either physical quantities or stocks valued in monetary terms. Natural resource accounts differ from other data in that they are organised in terms of stocks and flows. The terms 'natural resource accounting', 'green accounting' and 'environmental accounting' are used interchangeably in the literature on the subject and are regarded as synonyms for the purpose of this paper.

The aim of natural resource accounting is to provide information on the state of natural resources and the changes affecting them. As such, it is therefore an important link in the chain of sustainable development. The term 'sustainable development' is taken to mean a form of development which is capable of meeting the needs of the present generation without jeopardising the ability of future generations to meet their own needs.

## What are natural resources?

It is important to explain what is meant by 'natural resources'. Whilst a variety of classifications are used in the literature, they all have in common with each other the fact that they refer not only to those resources which contribute to marketable forms of production, such as subsoil resources, cultivated plants and livestock, as well as non-cultivated natural assets that yield products such as timber, but also to non-commercial or environmental resources such as air, water, land and biological life. The principal aspect in the former case is quantity, whereas quality is the most important factor in relation to the latter type of resource.

## The aims of natural resource accounting

Natural resource accounting is one of the tools which may be used to support environmental policy, alongside instruments such as environmental impact assessments at a project level, integrated environmental and economic analyses for policy work at the sectoral and macro-economic levels, and public investment/expenditure reviews (Kirk and Hamilton, 1996). The provision of information on the income and expenditure associated with the maintenance or restoration of natural resources can also be an aim of natural resource accounting. Generally speaking, natural resource accounting is seen as a

means of demonstrating linkages between the environment and the economy.

Natural resource accounts may contain either physical units or monetary values. Physical quantities are always a first, necessary step. Their inherent value lies in the fact that they provide a means for direct monitoring and for the evaluation of stocks and flows relating to the state of the environment. Physical quantities need to be expressed in monetary terms when monetary accounts are compiled. The resultant information can form the basis for the computation of environmental performance indicators. At a macro-economic level these indicators can include for example, a 'green' national product or other 'green aggregates' such as 'green' savings.

There are various types of natural resource accounts: stock accounts, flow accounts, a combination of these two, emission accounts, waste accounts and environmental expenditure accounts. An example of each type is given in Attachment 2.

Natural resource accounting can be used for:

- the demonstration of accountability for the management and protection of natural resources
- identifying environmental problems such as resource depletion;
- analysing government policy;
- undertaking resource management and decision-making;
- monitoring sustainable development;
- drawing up (macro-economic) indicators for environmental performance or prosperity;
- improving benchmarks for measuring a country's national product.

Natural resource accounting may be applied at either of two levels: the macro-economic and the micro-economic level. One well-known macro-economic application is the frequently cited integrated system of environmental and economic accounts (seea) used by the United Nations. This particular system involves the use of satellite accounts alongside the conventional national accounts. The former contain data on the value of natural resources and the monetary effect of environmental degradation, and thus allow alterations in the state of natural resources to be related to economic development. At the micro-economic level, environmental accounting may also be used in relation to an individual firm or a specific project. Here, the

principal aim is to ensure that the relevant financial statements take full account of environmental aspects. This is not the same, incidentally, as the compilation of a separate environmental annual report, an activity that is generally referred to as 'environmental reporting'. In the paper, we are interested primarily in the macro-economic application of natural resource accounting, mainly because most developments to date have occurred at the macro-level.

## Problems

Natural resource accounting is a discipline which is still in an experimental stage at the moment. Not surprisingly, therefore, not only is it beset by practical problems, it is also the subject of fierce debate about the most suitable methodologies. One of the most contentious issues is, for example, whether or not natural resource accounting should lead to the generation of a figure for the 'green' national product, i.e. a totally new indicator, or whether the compilation of an account is in itself sufficient. If the answer is that one needs to have a figure for a green national product, the next question that arises is whether the figure calculated should be that for the net or the gross national product, and how it should be arrived at. The various organisations involved in the debate each take a different view about this.

A further complicating issue is how to assess the value of natural resources in monetary terms. This is one of the toughest nuts to crack, as it requires not only information on quantities, but also qualitative data on each particular resource, e.g. water. In addition, the way in which each resource is used (in the case of fresh water, for example, whether this is as drinking water, to fill natural lakes and rivers, as an aquatic habitat for fish or as cooling water for power stations) also affects the value assigned to it. Finally, account needs to be taken of the impact which a certain degree of pollution of the resource in question may have on public health. The difficulty of valuation is exacerbated by the absence in many cases of a market price for the resource (e.g. clean air).

The following diagram, which originates from the World Bank, shows how the valuation of natural resources and environmental degradation can result in the production of a natural resource account (otherwise known as an environmental account).

Figure 1: Relationship between conventional and environmental accounts

conventional national		environmental accounts	
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accounts			
	A physical impacts (non-monetary)	B impacts on health, productivity etc. (Non-monetary)	C impacts in monetary terms
	resource depletion	resource depletion	resource depletion
	environmental damage dose-response function	environmental damage economic valuation	environmental damage

adjusted national accounts

- adjusted for resource depletion

Source: World Bank, 1996.

The diagram gives a clear indication of the steps which have to be taken, taking a conventional account as the starting point, in order to compile a natural resource account (i.e. an environmental account) in either physical terms (see column A) or monetary terms (see column C). The monetary version of the natural resource account can then be used to draw up an adjusted version of the national accounts (see bottom row).

The cost of data collection is another potential problem affecting the compilation of natural resource accounts. This is of particular significance to those countries which have yet to begin collecting the relevant data. It is always advisable to perform a cost-benefit analysis of the situation before starting to collect new data. The chief factor determining the degree of benefit is the use that is made of the data. The high cost of obtaining new data has led some countries to decide in practice to work with estimates rather than actual figures.

## International organisations

### Introduction

This chapter looks at the current state of natural resource accounting from an international perspective. Special attention is given to a recent development that is of considerable importance, i.e. the compilation of 'green' national accounts. The

chapter also discusses the organisations which are active in this particular field, and describes the various declarations of intent which have been published by international organisations on this issue. This chapter illustrates the importance which the international community attaches to natural resource accounting.

## Greening the national accounts

The United Nations has promoted the integration of environmental factors in national accounts ever since the early 1980s. Guidelines for the compilation of conventional accounts have been in existence since 1968, and these have been observed by individual countries. These guidelines were published in the System of National Accounts (sna) Handbook, and remained in force until 1993 (Hamilton & Kirk, 1996, p.2). The national accounts are compiled by the central statistical offices in the various countries. An explanation of the conventional sna is given in Attachment 3.

In their traditional form, national accounts were intended to record economic transactions which had actually been observed and which could be expressed in monetary terms. This approach had the drawback that it failed to identify either the scale of environmental damage or the extent of resource depletion caused by these transactions. This meant that the utilisation of the environment and natural resources had an exclusively beneficial effect on economic indicators such as the gross national product (gnp) and the net national product (nnp). 'This difference in the treatment of natural resources and other tangible assets 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'.

In conjunction with various other organisations, the United Nations has launched a number of initiatives all of which are aimed at providing a complement to conventional systems of national accounts by enabling countries to measure the depletion of natural resources and the degree of environmental degradation. As a first step, the unep organised five workshops in collaboration with the World Bank at the beginning of the 1980s. These workshops were intended to enable participants to debate the shortcomings of their snas, and helped both to encourage people to think about integrating environmental and economic accounts and to create a broader base of international support for such a strategy. In addition, the United Nations Statistical Division (unstat) has spent a number of years developing a satellite system for use in parallel with the conventional accounts. This satellite system is known as the

'integrated System of Environmental and Economic Accounts (seea)' and is designed to reflect the use that is made of natural resources and the damage that is caused to the environment. The satellite accounts are intended to complement the four main accounts of the conventional sna. unstat published a seea manual in 1993, which contained guidelines for estimating the degree of use that is made of natural resources and the damage that is caused to the environment. The seea delineates a series of accounts for resource stocks and flows, pollutant flows and environmental protection expenditures, with explicit links to the existing national accounts, thereby allowing an integrated study to be made of environmental accounts and economic accounts. Although the seea lays out a structure for satellite accounts for natural resources and the environment, it does not give guidelines for the valuation of natural resources and the environment. What it does do is to provide a basis for the calculation of an ecological domestic product (edp). The satellite accounts have to be compiled as far as possible in accordance with predetermined sna concepts and definitions.

The seea was tested in Mexico and Papua New Guinea. The main elements of the seea and the case studies were published during a unstat-World Bank Symposium (Lutz, 1993). The system of compiling satellite accounts in tandem with the current national accounts is sometimes referred to as the 'revised sna'. The un General Assembly, meeting in plenary session, gave its approval to the revised sna in 1993 and issued recommendation sna-93 in which it commended the system to the governments of its member states.

### Criticism

The revised sna elicited a wide range of differing responses. One of the main sources of criticism was the wwf, which claimed that the system of satellite accounts was not radical enough, arguing that the economic indicators in the seea had not been adjusted. This meant, in the wwf's view, that a growing amount of income would be achieved at the expense of the environment and the natural resource base, and that this would reduce the potential for generating future income. A further criticism was that the seea was a framework that did not provide international comparability due to the optional status of the methodologies used (Sheng, 1995). The wwf was in favour of reforming the sna's central system, as this would lead to a correction of the national accounting aggregates, such as a *green* gdp.

However, as we have already indicated in Section 2.4, the concept of a green gdp is not one that has received blanket support. One of the arguments frequently cited against monetarisation is that there is no generally accepted method of

calculating the relevant figures, as many natural resources are not priced. This means that, despite the fact that resource prices are a key determinant in the exercise as a whole, actually pricing the resources in question remains a highly arbitrary activity.

## International organisations

There are a number of organisations which are active in this field in addition to the un agencies already referred to earlier in the chapter, such as the United Nations Environment Programme (unep) and the United Nations Statistical Division (unsd, formerly known as unstat). These organisations include the Organisation of Economic Cooperation and Development (oecd), the World Bank, the World Resource Institute (wri), the Statistical Office of the European Communities (eurostat) and the Worldwide Fund For Nature (wwf). The activities performed by these organisations are described in brief below.

### UNEP

The United Nations Environment Programme (unep) initiated global efforts in developing environmental accounting during a consultative meeting in 1983. Together with the World Bank, the unep presided over a number of early workshops on natural resource accounting and has also sponsored several more workshops in recent years. In 1993, the unep launched an environmental economics programme with a focus on environmental accounting. In 1995, the unep was still supporting national efforts to develop environmental accounting in Ghana, Indonesia, Hungary and South Africa, in collaboration with other international organisations such as the unsd and the United Nations Economic Commission for Europe (unece).

### UNSD

The UNSD has carried out country projects to test the ideas contained in the sea. The UNSD was mandated by the un action plan Agenda 21, which emerged from the Earth Summit in Rio de Janeiro in 1992. The unstat has started experiments with the sea in Colombia, Ghana, Indonesia, South Korea, the Philippines and Cote D'Ivoire. The unsd organised a workshop for Anglophone countries in conjunction with the un Economic Commission for Africa (uneca), and also joined forces with the unep in organising a similar workshop for Francophone countries. In March 1994, the unstat and unep jointly organised a workshop on 'Environmental and Natural Resource Accounting with Particular Reference to Countries in Transition (cti) to Market Economies'. This workshop was held in Modra Harmonia in Slovakia, and is described in more detail in Attachment 4.

## OECD

The work performed by the oecd on environmental accounting has been part of its programme on environmental indicators and has been carried out with support from the oecd Council and the G7 countries. The programme focuses on natural resource and environmental accounts in terms of physical units.

## THE WORLD BANK

The World Bank co-supported the un workshops in the early 1980s and has also collaborated with the unstat in the sea case studies on Mexico and Papua New Guinea. The Bank has a special division called the Pollution and Environmental Economics Division; various members of its staff have published on environmental accounting. One of the more recent publications is *Green National Accounts: policy uses and empirical experience* by Kirk Hamilton and Ernst Lutz (June 1996).

## EUROSTAT

The Statistical Office of the European Communities (Eurostat) is responsible for the implementation of the sna within the eu. Eurostat has focused on environmental statistics, environmental indicators and environmental expenditures that are consistent with the sea. Eurostat is not in a favour of the production of a revised version of the sna that would allow adjusted economic indicators to be calculated. In collaboration with the central statistical offices in the member states, eurostat has designed a special method for collecting data on expenditure on environmentally-benign activities. This is known as the *Système Européen de Rassemblement de l'Information Economique sur l'Environnement (seriee)*, and consists of a series of satellite accounts which are designed to describe specific environment-related economic activities and transactions in the core national accounts. Following a lengthy trial period lasting a number of years, seriee is now ready for use.

## THE WORLD RESOURCES INSTITUTE

The wri is an independent centre for policy research and technical assistance on global environmental and developmental issues. Created in 1982, the wri is dedicated to helping governments and private organisations of all types meet environmental, resource-related and developmental challenges of global significance, and publishes papers and reports for them. The World Directory of Country Environmental Studies, for example, is a bibliography describing the contents and availability of hundreds of studies of environmental and natural resource conditions around the world. The World Resources

1996-97 is published in collaboration with the un Development Programme (undp), the unep and the World Bank. It is widely recognized as providing an authoritative assessment of the world's natural resource base and gives the latest information on essential economic, population, and natural resource conditions and trends for virtually every country in the world.

## Declarations of intent

The large number of declarations of intent which have been issued by international organisations demonstrate the importance which is attached around the world to the widespread application of natural resource accounting. The following declarations have been issued during the period since 1980:

In 1985, the member states of the Organisation of Economic Cooperation and Development (oecd) adopted a document entitled *Declaration on the environment: resources for the future*. This declaration argued for the development of suitable methods for compiling accurate resource accounts. Identical declarations were issued by the World Commission on Environment and Development, the World Bank, the World Resource Institute and the United Nations Environment Program (unep) (cml, 1993, p.11).

At the un Conference on the Environment and Development that was held in Rio de Janeiro in 1992, the member states adopted an action programme known as Agenda 21, in which the signatory governments recommended the development of integrated environmental and economic accounting. This declaration emphasised the importance of adopting a strategy for sustainable development that would allow member states to improve the way in which they managed and monitored the environment and their natural resources in the future. It was thought that it would be easier to attain this goal by using satellite accounts for the environment and natural resources.

In 1992, the Commission of the European Union (eu) adopted the Fifth Action Programme, which set out a detailed timetable for the implementation of environmental accounting.

"Environmentally adjusted national accounts (i.e. adjusted to take account of the natural resource stock of air, water, soil, landscape, heritage, etc.) should be available on a pilot basis from 1995 onwards for all Community countries, with a view to formal adoption by the end of the decade." In 1993, the Commission requested its Forward Study Unit to lead a working group on environmental indicators and accounting. The interim report from this working group discussed both environmental accounting in physical units and the sea as a satellite system

linked to the sna.

In 1994, the European Parliament's Committee on the Environment, Public Health and Consumer Protection unanimously adopted a resolution on "the inclusion of environmental considerations in the calculation of the Gross National Product". The European Parliament formally adopted the resolution on 22 April 1994.

## Conclusions

The creation of a revised version of the sna, containing guidelines for the compilation of satellite accounts for natural resources, may be regarded as a milestone in the international debate on natural resource accounting. To date, the un has been a key actor in the development and dissemination of natural resource accounting. In many cases, activities such as experiments conducted by other organisations either have been performed in collaboration with the UN or have been found to tie in well with the un's work. The adoption of the un guideline on satellite accounts and the many declarations of intent which have been issued at various levels form the basis for the propagation of a uniform method of natural resource accounting that is accepted all over the world.

The large number of activities and declarations of intent demonstrate the importance which the international community clearly attaches to the widespread application of natural resource accounting.

## Activities performed at a national level

### Introduction

This chapter discusses the way in which natural resource accounting is being implemented at a national level. The type of action involved takes the form both of government-sponsored activities and of experiments conducted by international organisations in a range of different countries. Section 4.2 takes a broad look at the types of activity which are being performed in countries around the world. Section 4.3 compares the situation in three individual countries, the aim being to demonstrate the diversity evident to the various approaches. Two trend-setting research studies performed by international organisations provide the subject matter of Section 4.4, and the chapter closes with a number of conclusions in Section 4.5.

In brief, this chapter examines the extent to which international efforts have produced results at a national level.

## Activities performed by governments

There are a number of countries whose governments have commissioned activities relating to natural resource accounting. These countries include, in addition to India, Japan and Thailand, the Western countries listed in Table 1.

Table 1: Countries undertaking action in the field of natural resource accounting

Country	Government-sponsored action	Study performed by international organisation	Member of London Group
Australia	x		x
Canada	x		x
Costa Rica		wri	
Denmark	x		x
Germany	x		x
Estonia	x		
Finland	x		x
France	x		x
Ghana		unep/unstat/unece	
United Kingdom			x
India	x		
Indonesia		wri/unep	
Japan	x		x
Mexico		World Bank	
The Netherlands	x		x

ds			
Norway	x		x
Papua New Guinea		World Bank	
South Korea		unep/unstat/ unece	
The Phillipines		wri	
Tanzania		World Bank	
Thailand	x		
The United States of America	x		x
Zimbabwe		Independent researcher	
Sweden	x		x
Hungary		World Bank ?	

The table specifies those countries which are members of the London Group. The London Group is an informal forum for consultation between national statistical offices on natural resource accounting and includes five international organisations among its members in addition to the 12 countries indicated in the table. The London Group meets on a regular basis to discuss the progress made by the participants in incorporating natural resource accounting in their national accounts. The minutes of the most recent meeting of the London Group, which was held in June 1996, refer to (in Section 3.2) the broad acceptance of the sna-93 recommendation as being a notable recent development. The same minutes also make clear that, whilst all the member countries intend to incorporate monetary values in their national accounts within the next few years, consensus still needs to be achieved on the valuation method which is to be used.

Most countries are working on the development of physical material flow and waste output accounts that are linked to conventional input-output accounting systems. The seriee

classification of pollution abatement and control expenditures appears to be emerging as a broadly accepted standard. Yet another interesting development is the recent decision by two European countries, Sweden and the United Kingdom, to adopt the Dutch "National Accounting Matrix including Environmental Account" (namea) framework as the organising structure for their work.

Environmental accounts are beginning to find a market niche among policy-makers, although this niche is still relatively underdeveloped. In Finland and the Netherlands, the accounts are being used in connection with the national budget documents, whilst the Norwegian government uses environmental accounts for national economic planning. In addition, the Commission of the European Communities issued a communication to the European Parliament recommending further work on environmental indicators and green national accounting. In several other countries, governments are supporting the development of environmental accounts and will presumably be major users once the accounts have reached a higher stage of evolution. However, discussions at a meeting, organized by the oecd in 1994, on policy uses of environmental accounts suggest that statisticians still have a lot more work to do before the accounts find broad application.

Another activity which deserves special attention is a pilot project to construct sustainable development accounts for a federal department in Canada. This work is being undertaken jointly between the co-operating department and the Commissioner of the Environment and Sustainable Development. In addition, an interdepartmental working group is providing input into the design stage of the project to ensure that the results will be transferable to other departments.

The actions of the Canadian federal departments have substantial impacts on the environment, including the physical, biological and social aspects of the environment. Effective decision-making in the context of sustainable development requires that these impacts be incorporated into the information provided to departmental decision-makers in a way which lends itself to comparison with other critical variables.

The overall objective of the study is to demonstrate the practical feasibility of preparing a set of accounts for sustainable development. These accounts would be used to support decisions as departments make the transition to operations consistent with the tenets of sustainable development. The three subobjectives are: (1) to document the state of the art for integrating new information on environmental assets, costs, liabilities, and impacts; (2) to design practical and

implementable accounts to reflect considerations of sustainable development in the operation of departments; and (3) to implement prototype accounts for sustainable development in the context of the operations of one federal department.

## Differences in approach between countries

It is clear from Section 4.2 that the situation in relation to natural resource accounting tends to vary from country to country. Some countries are experimenting with natural resource accounting, whilst others have actually implemented it in practice. This section seeks to identify the various similarities and differences by comparing developments in three individual countries, viz. Norway, France and Sweden.

These three countries have all started using natural resource accounting, albeit in different decades. Norway and France initially launched ambitious programmes covering a wide range of natural resources. Even today, the stated objective of the French government remains to produce a complete set of natural resource accounts. Norway, on the other hand, has now abandoned its original plan and has decided to concentrate on a limited number of natural resources, specifically energy and water. The Swedish government, finally, began developing pilot accounts for energy and heavy metals in 1993. Accounts for other natural resources may be added to the project at a later stage, where this is requested by the Swedish parliament.

As far as the purpose of the accounts is concerned, it is interesting to note that, to date, the three countries have not gone beyond the development of physical accounts. The Swedes have not ruled out the possibility of computing a green national income in the long term, but the Norwegians, on the other hand, have made clear that they do not have such a goal in mind. The Norwegians' original intention was to use their natural resource accounts for improving the long-term management of their stocks of natural resources. More recently, however, the Norwegian government has adopted the French position and has announced that it wishes to link the natural resource accounts to macro-economic models for economic development. One of the reasons why the French government wishes to do this is to use the natural resource accounts to describe the state of natural ecosystems.

## Leading studies into natural resource accounting

This section briefly discusses two trend-setting studies which were performed by the wri in Indonesia and Costa Rica. The

findings of these studies have generated fresh data on the links between the economy and the environment.

Both studies attempted to come up with an adjusted figure for the net national product that would take account of capital reductions caused by the use of natural resources and by environmental degradation. The study in Indonesia centred on crude oil, timber and soils for crop production, whilst the resources studied in relation to Costa Rica were fish, soil and forests. In both cases, the natural resources selected were ones which were of crucial importance for the national economy. The conclusion drawn in both studies was that there would be a sharp drop in the net national product if account was taken of the depreciation of the value of natural resources and the environment.

## Conclusions

Natural resource accounting has evolved at different paces in those countries which are active users of the system. In some countries, the government has only recently commissioned the compilation of natural resource accounts, whilst others have many years of experience in this field. The vast majority of the active countries have accepted the un guideline on satellite accounts. There are also a number of systems, such as namea and seriee, which are gradually receiving widespread acceptance.

The main national differences occur in the type of resources which are selected. In addition, many non-Western countries have achieved good results with natural resource accounting. It has now become more or less standard practice in Western countries, although agreement still needs to be reached on the precise way in which the system should be implemented.

## Fresh water

### Introduction

In its 1996-1998 Plan of Action, the Working Group on Environmental Auditing adopted fresh water as the common theme of its activities. It did so because it recognized that countries all over the world have a shared interest in the availability of fresh water of good quality. The importance of this was further underlined by the Stockholm-based Environment Institute, which is currently performing a study of global water stocks on behalf of the unep. Researchers at the Environment Institute have reported that about two thirds of the world's population will experience the adverse effects of water shortages by the year 2025, unless immediate steps are taken to prevent

the wastage and pollution of water supplies. The unep is to submit the report to the un General Assembly in 1997.

This chapter contains a brief review of natural resource accounting in relation to fresh water.

## Water accounts

A natural resource account for fresh water may incorporate various types of demand for water, such as waste water and water usage. At an international level, Eurostat is currently developing a system for use in compiling water accounts and is, in this context, conducting experiments in six countries involving the application of natural resource accounting to water. Two differing perspectives have been identified in relation to water accounts:

- there are those who wish to measure water only when it enters the economic system, is used, treated or returned to nature in a less clean state than it was before;
- and there are those who wish to measure the full cycle of water from precipitation through various ecosystems and human use, back to nature, with an assessment of the damage that is caused if it is polluted en route.

The economic uses are the easiest to measure and would provide essential information about the economics of water management, but cannot alone show whether water management is actually sustainable. Eurostat is considering the possibility of devising an economic module in such a way that it could sit within a broader hydrological module that would be developed at a later stage.

Apart from Eurostat, there are also a number of individual countries, including France, Norway, Canada and the UK, which are developing their own water accounts. In France, the general information system on water has recently changed with the creation of a National Water Data Base. The Institut Français de l'Environnement (ifen) is developing a new version of environmental protection expenditure accounts for water, and these should enable more accurate indicators to be produced for the scarcity of water. The availability of water in France is a severe, but seasonal problem. The ifen is also a member of the working group launched by the Eurostat on water accounting.

The Norwegian central statistical office began developing pilot water accounts during the period from 1978 to 1981, but dropped the project because water quality was not perceived as

constituting a genuine problem in Norway. The general consensus was that data on water quality would need to be provided at a highly disaggregated level in order to be useful. In Norway, environmental protection expenditure accounts in relation to municipal waste water treatment were compiled in 1993 and in certain years in the mid-1980s.

Statistics Canada developed a water use account for 1991, using data from surveys of water use. This account could be extended to cover other years.

In the United Kingdom, the Department of the Environment, Transport and the Regions, has completed a pilot survey involving the water supply among other resources. The results of the study are currently being evaluated.

The Netherlands also intends to compile water accounts in the future. On request of the UNCED and the OECD the Ministry of Housing Planning and Environment of the Netherlands was asked to develop indicators for fresh water, as well as for soil, wetlands, forests, fish and biodiversity. A report was published in 1996. The purpose of the developed indicators was to supply information on the intensity of changes of natural resources caused by human actions and/or autonomous developments.

### *Data*

Data which are suitable for use in natural resource accounting are published by various authorities, including the World Resource Institute (wri). The wri publishes information on the natural resource conditions in virtually every country in the world, and this includes data on water as a natural resource. The wri has also assembled information on water indicators on its web site (<http://sedac.ciesin.org>). In addition, the Global Environmental Monitoring System, managed by the unep, collects data on water pollution in some 150 countries (Steer & Lutz). Finally, there are separate organisations in most countries, such as district and national water boards, which also collect data on water supplies.

### **Conclusions**

Water accounts are compiled in a limited number of countries. A large number of countries and organisations publish data which could form the basis for natural resource accounting. There are, however, only very few countries which have actually designed a method for processing the data in the form of a water account.

### **Attachment 1**

Summary of paper given by Dr Tolba at the incosai xv in Cairo,

October 1995

Mankind has always cared about the environment. Societies which have been able to find a sustainable means of satisfying their needs have survived, whereas civilisations that have violated the confines of their physical surroundings have disappeared or declined. Over the past 25 years, as the signs of irreparable environmental damage have strained the limits of human needs and jeopardised the earth's physical resources, environmental concern has increased dramatically. Heated discussions on the interaction between development and the environment have taken place since the Stockholm Conference on the Human Environment in 1972. In 1969, the then un Secretary-General warned the international community that it needed to improve the human environment immediately, in addition to halting the arms race and the population explosion.

The internalisation of external environmental costs that are not normally included in cost-benefit analyses underlying investment decisions is an essential prerequisite for environmental improvement. In order for our civilisation to be sustained, economists must strike a realistic balance between the prices of goods and services as opposed to the social cost incurred by their production as a result of the use of natural resources and pollution during production and consumption.

Environmental auditing figures among the instruments for healthy environmental management. Environmental auditing is not, however, a panacea for environmental abuse. Instead, this method should form part of an integrated environmental management system.

This survey of resource economics and ecological economics needs to be supplemented with a description of the progress of natural resource accounting. The recurrent theme is that the current national accounting systems do not reflect the losses resulting from the production and use of natural resources, and thus create an illusion of wealth. The United Nations has tried to compensate for this shortcoming. For example, the United Nations system of national accounts has included a series of national satellite accounts for posting environmental decline since 1992. These efforts have, however, yet to result in the systematic inclusion of the loss of natural resources in a modified system of national accounts.

Attachment 2

Examples of various types of accounts

(see excell-file )

### Attachment 3

#### The conventional sna

The main purpose of the sna may be said to be that of describing economic activities during a certain period in the past in monetary terms. The information thus obtained can be usefully applied to both public and private activities, reflecting the development of, among other things, consumption, incomes and saving. sna contains four main accounts, each describing an important part of the national economy. The production account describes the value of the production destined for end use. The three other main accounts of the system are all linked to the production account. They describe household consumption and incomes, national savings and capital formation, and national trade with the rest of the world. As far as possible, the sna shows all goods and services at their market prices (Commission for Environmental Accounting, 1991, p.5).

The sna may be regarded as an essential part of macro-economic planning in a range of different countries. It also makes it easier to make macro-economic comparisons between countries given that the national accounts are compiled on the same basis.

The central sna concepts are the national accounting aggregates such as the Gross Domestic Product (gdp), the Gross National Product (gnp) and the Net Domestic Product (ndp). These aggregates give a broad picture of the general direction in which a national economy is moving. The gdp is a concise measure of a country's production capacity in the course of a year and can be calculated in three different ways. The gnp is gdp plus net factor earnings from abroad, and is, essentially, the value of the production to which a country's citizens and owners of capital contribute. It is often used as an indicator of a country's wealth (Kuik & Verbruggen, p.46). The ndp, finally, is gdp minus that portion of the capital stock that is worn out in the production process (Commission of Environmental Accounting, 1991, p.7).

### Attachment 4

Workshop on environmental and natural resource accounting with particular reference to countries in transition to market economies.

The 'Workshop on Environmental and Natural Resource Accounting with Particular Reference to Countries in Transition (cti) to Market Economies' was held in Modra Harmonia, Slovakia, from 21 to 23 March 1994. The Workshop was convened within the framework of the joint unep and unstat programme on environment and natural resource accounting,

that was set up in response to the decision taken by the unep's Governing Council at its seventeenth session. It was organized in close collaboration and consultation with the United Nations Economic Commission for Europe (unece). The Workshop was attended by 34 environmental and statistical experts from Central and Eastern Europe. The countries represented were Armenia, Byelorussia, Bulgaria, Croatia, the Czech Republic, Estonia, Georgia, Hungary, Latvia, Lithuania, Moldavia, Poland, Romania, Slovenia, Slovakia and the former Yugoslav Republic of Macedonia. Representatives and resource experts from France, Germany, Italy, Norway, the Netherlands, the unece, the oecd, the unep and unstat also attended the Workshop. The primary aim of the Workshop was to enable Central and Eastern European states to gain new experience in the field of natural resource accounting, given that the official statistical offices had no tradition of dealing with environmental problems. A secondary aim of the Workshop was to identify the needs of these countries in relation to environmental and natural resource accounting. These included the human, institutional and financial requirements for the introduction of environmental and natural resource accounting.

The Workshop emphasised the need for a further exchange of information on, and the acquisition of experience in, environmental and natural resource accounting, as well as the need for strengthening cooperation between the countries of Central and Eastern Europe.

Attachment 5

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Attachment 6

List of abbreviations

*cbs*: Central Statistical Office of the Netherlands (Statistics Netherlands)

*edp*: Environmentally Adjusted Net Domestic Product (otherwise known as the Ecological Domestic Product)

*eurostat*: Statistical Office of the European Communities

*gdp*: Gross Domestic Product

*gnp*: Gross National Product

*namea*: National Accounting Matrix including Environmental Accounts

*ndp*: National Domestic Product

*nepp*: Dutch National Environmental Policy Plan

*oecd*: Organisation of Economic Cooperation and Development

*sam*: Social Accounting Matrix

*seea*: System for integrated Environmental and Economic Accounting

*seriee*: Système Européen de Rassemblement de l'Information Economique sur l'Environnement

*sesam*: System of Economic and Social Accounting Matrices

*sna*: System of National Accounts

*un*: United Nations

*undp*: United Nations Development Programme

*unec*: United Nations Economic Commission for Africa

*unece*: United Nations Economic Commission for Europe

*unep*: United Nations Environment Programme

*unsd*: United Nations Statistical Division

*wri*: World Resource Institute

*wwf*: Worldwide Fund For Nature

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