

# CEPAL

## Review

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#### Notes and explanation of symbols

The following symbols are used in tables in the *Review*:

Three dots (...) indicate that data are not available or are not separately reported.

A dash (—) indicates that the amount is nil or negligible.

A blank space in a table means that the item in question is not applicable.

A minus sign (-) indicates a deficit or decrease, unless otherwise specified.

A point (.) is used to indicate decimals.

A slash (/) indicates a crop year or fiscal year, e.g., 1970/1971.

Use of a hyphen (-) between years, e.g., 1971-1973, indicates reference to the complete number of calendar years involved, including the beginning and end years.

Reference to "tons" mean metric tons, and to "dollars", United States dollars, unless otherwise stated.

Unless otherwise stated, references to annual rates of growth or variation signify compound annual rates.

Individual figures and percentages in tables do not necessarily add up to corresponding totals, because of rounding.

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# CEPAL

## Review

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# Natural heritage accounts and sustainable development

*Nicolo Gligo\**

The economic growth of a country undoubtedly entails an environmental cost. This cost is much higher if development is based largely on the exploitation of natural resources. The existence of methods to detect and calculate this cost would afford parameters which would help us to determine the corrections to development strategies that we would have to introduce in order for development to be environmentally sustainable.

To a great extent, this is the main objective of natural heritage accounts, a subject much in vogue in recent years. Unfortunately it has not resulted in the undertaking of concrete studies, but rather has remained in the realm of theoretical discussion.

This article presents alternatives based on conclusions from a project prepared in ECLAC by the Joint ECLAC/UNEP Development and Environment Unit. The project is unique in terms of what has been done on the subject in the region.

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## Introduction

The state of the physical environment in Latin America has progressively deteriorated. The manifold efforts of environmentalist sectors have been unsuccessful and today serious hazards exist because the development processes of countries are, to a greater or lesser extent, environmentally unsustainable.

The preparation of natural heritage accounts as an instrument for changing the state of the environment has generated the greatest interest. Some consider this subject to be important from a semantic point of view, as a way for economists and planners to communicate with ecologists and natural scientists. Others who are more realistic maintain that they are a very useful tool only insofar as countries adopt explicit, environmentally sustainable development strategies.

In 1986 an exploratory study was published in the *ECLAC Review* to provide background information on natural and cultural heritage accounts and to draw up recommendations for promoting them in Latin America (Gligo, 1986). The conclusion reached in this study was that the region was lacking in experience as well as in attempts to establish programmes for the preparation of heritage accounts, although it was shown that in many countries there were specific inventories of traditional natural resources. At the time, given the extraordinary interest generated by the subject, recommendations for promoting these programmes were quite optimistic. Concordant with this interest, the study did not look into the causes as to why these programmes had not been started and, the criterion used was simply to recommend the necessary steps to make them operable. Emphasis was placed, among other things, on the objectives of modifying or complementing national accounts and of placing them within information structure schemes. In addition, methodological tables were drawn up to carry out adjustment accounts with their classic debit and credit columns.

Despite reiterated concern for the subject, countries of the region have made no attempts to undertake heritage account programmes. Only two timid efforts began to be outlined in 1989.

At least light has been shed on many of the problems and options that arise in preparing these programmes. In this respect, it is clear that there has to be a physical valuation of changes in natural endowments over time, which would facilitate the compilation of a series of satellite accounts to national economic accounts.

Undoubtedly, we have the option of appraising these physical accounts economically, although already a series of problems are apparent which we shall analyse later. This valuation could give rise to the modification of national accounts, which, if this were to occur, would incorporate environmental development costs not usually included.

Between 1988 and 1990, through its Joint ECLAC/UNEP Development and Environment Unit and with funding from the Federal Republic of Germany, ECLAC undertook a

project of natural and cultural heritage inventories and accounts, for the purpose of making practical and realistic recommendations that would induce policy makers to develop heritage account programmes. Some conceptual problems were analysed in this project, particularly those pertaining to economic valuation, and three case studies were undertaken using various methodologies. One study was carried out in Mexico, in the State of Morelos, on the Chichinautzin biological corridor; the second was in Argentina, in the province of Río Negro, in a foothills area with a temperate-cold forest; and the third was in Chile in the entire region of Magallanes, focusing only on methodological aspects, due to the size of the area.

This article presents the main conclusions of the project.

## I

### Rapprochement between economics and ecology

It was generally thought that heritage accounting would quickly play a leading role among economic-environmental tools. However, the possibility of implementing them has gradually lessened both at the level of countries and international agencies, as a result of a number of factors to be analysed.

The idea of promoting heritage accounts, in particular those on natural endowment, arose when it was proved that there was no need for the gross domestic product growth rate to be related to the resource conservation rate. Moreover, in many instances, a greater GDP rate was obtained at the expense of natural heritage "consumption", a phenomenon which occurred above all in countries that based their development on the exploitation of natural resources. For this reason, the question began to be raised as to why national account systems did not detect this problem and what should be done to remedy the situation.

National account systems were set up at a time when the Keynesian macroeconomic model—basically concerned with employment—prevailed in economic thinking. In this context, the

importance of natural resources was discounted, although previously, classical thinking had considered them to be one of the three basic income-generating factors. Neoclassical thinkers, in turn, virtually excluded natural resources from their model (Repetto, *et. al.*, 1989).

Heritage accounts as a tool appeared, then, at a time when it became essential to bring economics closer to ecology, a matter which will be discussed in greater depth in order to understand the issues surrounding heritage accounts.

Recognition must be given to efforts made in this respect. Early in the century, and based on a rational critique of economic growth theories, Frederick Soddy tried to draw attention to the fact that wealth depended on physical laws and was part of solar radiation flows (Martínez Alier, 1987). Various authors followed in the wake of Soddy, all of them meeting with little success. Resource depletion has been a topic of discussion for over a century. If it only gathered momentum a few decades ago, this was due to the ever-growing awareness of the effects of depletion processes and to the increasingly frequent occurrence of disasters that graded the

physical environment. "Resource depletion, energy and material flows are historical phenomena; awareness of them is also historical" (Martínez Alier, 1987, p. 57).

We should also recall efforts by adherents of the school of "natural economics" at the time of Linnaeus and of the physiocrats who attempted to reconcile this kind of economics with that of chrematistics.

However, not much headway was made due primarily to the specialization of economic sciences, which often followed the path of economic reductionism.

José Manuel Naredo states that there are three routes along which economists have tried to extend the operating range of standard theoretical tools towards the subject of natural resources (Naredo, 1987). The first, put forward by Harold Hotelling attempts to price exhaustible resources on the basis of intergenerational preferences (Hotelling, 1931). The second, advanced by A.C. Pigou, corrects market imperfections by making private costs bear social costs through taxes or subsidies and by adjusting national accounts (Pigou, 1935). The third, established by R.H. Coase looks to the market to internalize negative externalities through modifications of the institutional framework (Coase, 1960).

The various streams refined their quantitative instruments and attempted to come up with some answers primarily at a micro level, but they were unable to respond to the major questions that arose out of the environmental crisis. Nevertheless, they are recognized for their well-known pioneering merit, in particular that of Hotelling, who rejected the possibility of an optimum allocation of resources over time unless total future demand was known (Georgescu-Roegen, 1975).

Despite the difficulties that arose from limitations inherent in the very laws of economic sciences, the greatest contributions were made in terms of concern for the economics of natural resources. The necessary framework was provided by Nicholas Georgescu-Roegen who related the laws of entropy and thermodynamics to economics. This author holds that thermodynamics is basically economic-value physics, as cannot unknowingly established, and that the law of entropy is the most truly economic of all natural laws (Georgescu-Roegen, 1966).

There were contributions in the field made on the role and evaluation of natural resources in economic models (Smith and Krutilla, 1982). Also of note were contributions by authors such as Partha Dasgupta in the evaluation of the social costs of environmentally degraded resources, especially under conditions of uncertainty (Dasgupta, 1982), and those by a significant number of academic studies, such as those done by Harold Barnett or Anthony Fisher, who dealt with forms of measuring scarce natural resources (Barnett, 1979; Fisher, 1979).

The new conceptual thinking has tended to improve methods of evaluating natural resources and the physical environment. However, this does not bring economics any closer to ecology, but merely boils down to dealing with ecological problems through the use of new or rejuvenated methodologies conceived within the bounds of traditional economic laws.

This point is basic if we wish to analyse the role of heritage accounts beyond their use as an instrument for economic-environmental integration. Many of the arguments put forward to promote heritage accounts have been based on the need for a language—if possible an economic and one-dimensional language—that would permit planners or economic policy makers to "economically" understand what is happening to natural resources and other natural elements. Notwithstanding the importance of recognizing the need for a common language, what is even more crucial—in environmental science terms—is to understand what is happening to natural endowment, what changes have occurred in it over time, what changes are foreseeable. These questions must be answered in order to evaluate clearly whether development is environmentally sustainable. Obviously this evaluation should be comprehensive and, therefore, multidimensional and interdisciplinary.

In other words, as it has already been discussed in other papers, the basic objective of heritage accounts should be to provide those responsible for devising strategies and development policies, with a tool that would allow them to ascertain, among other things, what the cost of the various development strategies to natural heritage is and what the trends of this cost will be. The instruments and methodologies do not necessarily have to be standard, but rather could

be adapted to the ecosystemic determinants of the territory under study and to its social conditioning factors.

For this reason, heritage accounts should not be identified with a mere search for an economic language that would define changes in a one-dimensional way, setting a price on natural resources and on certain natural elements, which, in some cases, could be a complementary objective.

This does not imply that the subject of economic valuation should not be dealt with. On the contrary, it is seen as being necessary and extremely useful. However, it should not be the only tool sought, but rather should reinforce the use of methodologies and physical information. Nevertheless, we must bear in mind that valuation could pose serious limitations since there is no thesis within economic thinking in which the exchange value or its essence measures the use value of goods. As Pedro Tsakoumagkos states, the essence of value can be abstract work time, subjective pleasure or anything else, but never directly the very properties of the objects of use. The objective pursued by economic-environmental policy (and, consequently, by the preparation of environmental accounts of both inventories and

flows) is to design and implement strategies to counteract the deterioration of these very qualities. Economic calculation *per se* will never provide us with a measurement of what we are seeking, i.e., a *direct* measurement. This translates into the domain of "natural" processes—among these the natural social processes of deterioration of the physical environment—being different from other domains, regardless of how much they are juxtaposed. But it is precisely this juxtapositioning which makes it possible to design physical and economic measurements that correspond to each other unambiguously, and that will show us (and even measure) what we are seeking (Tsakoumagkos, 1990).

Heritage accounts should therefore be undertaken within an interdisciplinary framework of activities. The task is not easy since the various natural sciences are at a totally different level of abstraction from social sciences. Moreover, the historical nature of the latter contrasts with the non-historical nature of the former.

Nevertheless, the influence of the latter on the former would constitute an interdisciplinary exchange that would be the domain of the environmental dimension.

## II

### The workability of heritage accounts

Notwithstanding the proliferation of studies, meetings, recommendations, etc., on the usefulness of heritage accounts to establish new environmentally sustainable development strategies, there are very few countries that can show significant progress in this field. Moreover, in some relatively less developed countries there has been an obvious step backwards, because, despite having greater opportunities for resource evaluation through technological advances in remote sensing, their traditional systems for evaluating natural resources have deteriorated. A number of reasons are given for the scant progress made. Perhaps what is *essential* is that there are very few countries that have progressed in

establishing environmentally sustainable policies. It is a well known fact that the environmental problems faced worldwide are mounting.

The problem is even more complicated by the short-term development options that have been chosen, which obviously correlate with the generation and assimilation of all sorts of technologies that entail environmental risks. Immediate demands defer any concern for natural heritage until its deterioration or drawdown begins to threaten the possibilities of growth. Only then is there awareness of the problem, but usually by then it is too late.

In this context and, lacking any in-depth knowledge of changes over time in the natural

heritage inventory, wealth or stock, there are very few governments interested in showing how their development strategies and policies "consume" natural endowment or how a portion of the figures on their country's growth are not due to an improved combination of production factors, but rather to the deterioration and consumption of one of these.

The first point that needs to be made clear, then, is that heritage accounts are a useful instrument for new development strategies that *explicitly* propose substantial modifications to incorporate the environmental dimension. Efforts have been made at a global and regional level, but little can be said about national initiatives (World Commission on Environment and Development, 1987); (Sunkel and Gligo, 1981). Undoubtedly, in order to devise development strategies that are environmentally sustainable, it is essential to evaluate periodically what happens to both natural resources and to other natural elements.

Another factor that has had an influence on the inoperativeness of heritage accounts is the very definition of natural heritage. Each country, each local area, each academic group has a different definition of what it is. This leads to the proposing of similar methodologies for different purposes.

It is not a matter of specifically defining which are the natural endowment elements of a country or local area, but rather of surveying general concepts. Virtually all definitions of natural heritage start out with the concept of its *utilization*. And if there is utilization, there is a certain degree of transformation or making it artificial.

The problem does not lie in defining as natural all that is not man-made. The author, in a

previous publication, refuted this false dichotomy stating that anthropic actions actually tend to render the environment artificial in varying degrees. These different degrees of artificiality create a continuum that ranges from 0 to 100% (Gligo, 1986).

The need for a more precise definition is especially important for Latin American countries. In the United States natural heritage has been defined as anything that is related strictly to wildlife. For this reason no major conflict exists since natural heritage is easily definable in territorial terms. In other developed countries, primarily European natural heritage has been defined in terms of specific resources: water, fauna, soil, native forests (primary or secondary) (Gligo, 1986).

In Latin America not only is this definition of natural heritage of interest, but also, given the speed of change from pristine or semiwild ecosystems to agricultural systems, it is important to have a conceptual definition of ecosystem that denotes changes of the territory over time, since this process is closely linked to an ecological cost that varies depending on the transformation technologies applied.

Another common confusion is to identify heritage assets with goods that fall in the public domain. Although it is true that there is some overlap, many heritage assets have been privatized. This is the case with land that, despite being a natural heritage asset of primary importance, is privatized in the large majority of countries (CICPN, 1986). The legal issue in the future could contribute to the implementing of strategies to limit the abusive treatment of certain natural endowments which, due to their being privatized, conceal their status as social goods.

### III

## Description and classification of natural goods and resources

The debate over the description and classification of natural resource endowment has involved three essential biases for Latin America and the Caribbean. First, the almost exclusive

hierarchization of goods and resources that are of interest to developed countries in terms of their trade in the international market. Second, the importance given to certain goods and



resources that play an increasingly significant role in global environmental conditions. An example of this would be the endowments of biodiversity and humid tropical ecosystems. Third, the crossculturation and acculturation processes that alter lifestyles and tend to undervalue regional traditions and customs, thus altering natural heritage functions and, therefore, their valuation.

To decide in favour of the importance of resources based on traditional classifications, accepting the biases indicated, would mean introducing an instrument for environmentally sustainable development that, while not ignoring that it could have an alternative use for a given country, would prove extremely useful for a global strategy headed by developed countries.

Consequently, the descriptions and classifications that should have the greatest effect in the Latin American view are those based on a country's own approach, which should, if possible, be multivaluational.

The fact that the theory of value has developed as part of political economics could be indicative of the need to use economic categories to classify goods and resources according to their valuation. This position is clearly reductionist. A natural element can be valued in various ways, depending on the disciplinary or scientific approach. Thus, it can have a permanence value based on its ecosystemic contribution, an historic value depending on its contribution to the region's evolution, and an economic value when it is a market product.

A decade ago, the French proposed six options for setting up a classification. These nomenclature options were: i) institutional (by producers); ii) functional, from the standpoint of natural elements (reproductive condition, more or less renewable characteristics, cycles); iii) heritage functions and uses by man and his activities; iv) homogeneous geographic spaces (territories, ecosystems, spatial criteria); v) biospheric elements (environmental criterion) (lithosphere, hydrosphere, atmosphere, holobiomass); and vi) physical and chemical elements (the Mendeleevian arrangement, classification of energy forms).

The main streams followed the path of promoting classifications based essentially on

traditional natural elements (option ii) of the French).

In 1985 a regional proposal recommended using a combination of two options: the classical one based on the usually exploited natural resources (minerals, soil types, climate, etc.) and that of homogeneous geographic spaces (territories, ecosystems) (Gligo, 1986). This recommendation was made as a first attempt to promote heritage accounts at a national level.

However, the current situation has changed. The above-mentioned operational difficulties in undertaking accounts at this level make it necessary to pay more attention to subnational and local approaches, and consequently, the value of the resource gains in strength on the one hand, and on the other, so does valuation of what is understood by cultural heritage of a region.

In general, the bibliography on heritage accounts is not limited to the description and classification of goods and natural resources. It makes room for classical positions. This would seem logical since virtually the entire bibliography focuses on national issues. There are exceptions in which there is a perceived need to redefine the conceptual discussion on the subject (Naredo, 1987). In the few studies that exist on third-world countries no analysis has been done on biases either. Perhaps this is because those who carried out these studies were from developed countries.

The three experiences in the project Natural and Cultural Heritage Inventories and Accounts, mentioned in the introduction, provide suggestions and innovative conclusions.

The study on the Chichinautzin biological corridor in the Mexican State of Morelos, analyses changes brought about in the natural resources of the area. Already there appears a local resource, water, which gives the biological corridor distinctive characteristics, since the area constitutes a watershed ecosystem. To determine this condition and to evaluate it physically represents a significant contribution that defines the corridor.

The study of a temperate-cold forest in the foothills region of the Argentine province of Río Negro focuses on evaluating a series of ecosystem attributes that are usually not taken into account, such as biodiversity and tourist attrac-

tiveness. Here, as in the Mexican study, there is an effort to place a value on a local resource. In this regard we pause to make a point. The local importance of a given resource may determine the higher or lower valuation of other resources that systematically influence its functioning. Thus, if greater importance is placed locally on a scenic resource, it is logical to suppose that the value of timber in certain areas of the forest would be insignificant, since these areas are subordinate to changes in the scenery over time, although they can be physically and economically appraised.

The study of the Chilean region of Magallanes, due to its being strictly methodological, gives rise to an in-depth discussion of the description and classification of natural goods and resources. The specific and exclusive conditions of this region allow for a detailed examination of a methodological approach from a clearly local perspective. In this study preference is given to a local description and classification that establishes a global rather than a specific methodological guideline for the region, which subsequently makes it possible to locally define goods and resources.

The methodological option chosen in this case study selects biological or physical natural components that meet needs and therefore acquire value. They are grouped into three categories: man's needs, nature's requirements and, lastly, the economic interest stated in terms of

the economic value set for goods and resources. With regard to man's needs, based on studies by Manfred Max-Neef, four existential needs were determined that allow a good or resource to be described and classified from a local point of view (Max-Neef, *et. al.*, 1986). These are subsistence, identity, recreation and knowledge. Thus, a matrix is generated in which the four existential needs are placed in one ordinate and the main categories of natural components in the other.

What is interesting about the proposed method is that each good or resource can respond to one or more valuational dimensions.

Undoubtedly this classification must be viewed as an attempt to contribute to the debate, there being ample room for modification and improvement. It should be pointed out that it also represents an important contribution to the classification and, above all, the setting of priorities for the study of natural goods and resources of a region or local area.

A methodological proposal such as the aforementioned is notably useful, since it not only makes it possible to evaluate heritage from a local perspective but also, through an adequate methodology, it can contribute to the consolidation of subnational or national accounts. In the latter case, it is possible to predict that, notwithstanding consideration of an approach from below, aggregation will leave many local goods and resources out of the picture.

## IV

### The economic valuation of heritage accounts

The greatest conceptual efforts undertaken in the last two decades on the subject of heritage accounts have focused on the problem of economically valuating the various natural endowment components. These efforts have been made because many consider that the sole purpose of natural heritage accounts should be to modify national accounts.

Unfortunately, what has been lacking is a holistic concern, with interdisciplinary approaches that would allow the various values

inherent in a natural good or resource to be investigated. This has led to an insistence on the indiscriminate economic valuation of natural elements, regardless of whether these have exchange value or not. Obviously, in the face of this economic appraisal, use of economic tools in natural heritage accounts has many drawbacks. There are two serious limitations: on the one hand, the economic valuation of natural elements and goods that are not in the market; and on the other hand, for those resources that have

market prices, the restrictions that arise as a result of the very poor capacity of market prices to truly serve as environmental indicators and not merely be transmitters of value (determined by various conditions of appropriation, institutionalization, etc.), regardless of the qualities of use.

Notwithstanding these serious limitations, prior to analysing whether they can be overcome or not, we must emphasize the argument that there is a need to use economic valuation in natural heritage accounts as a useful instrument in implementing environmentally sustainable development. Its usefulness lies in the need for an instrument to allocate resources both at a sectoral and regional level. For this reason, maximum efforts must be made to clarify the possibilities of implementing these accounts.

The preparation of natural heritage accounts should, in addition, become a suitable indicator that would permit national income to be "corrected" (Leipert, 1989). This correction becomes very necessary due to the additional social costs of production that are generated by environmental deterioration.

### 1. *The economic valuation of inventories*

Various methodologies regarding heritage accounts have focused on the valuation of inventories or stock so that every so often, changes in them over time can be compared, based on constant prices. Herein lies the first problem: how do we determine these prices in order for them to be suitable indicators of the qualities of use? and how do we ascertain the multiple functions and benefits of a given ecosystem?

The following example sheds light on these questions: if a person owns a forest ecosystem, the producer only sees in it the timber from the trees, whose economic value does not depend on the time of formation nor on energy collection, but rather is shaped by multiple factors involving institutions, monopolies, wage policies, foreign trade, etc. The price of the forest does not necessarily indicate the quality of use. But —and this is crucial— the forest is not only timber: it is water-producing capacity, it is fauna, it is genetic diversity with potential resources, it is flora with pharmacological resources, it is tourism and recreation, etc.

In terms of the question of how to determine prices in order for them to be adequate indicators of quality of use, the replies have ranged from the extreme of working with net market prices to corrected market pricing, combined with the determination of values for natural elements that are not in the market.

Working with market prices does not prove to be advantageous. Undoubtedly, these prices express current generational preferences, but they do not take into account elements for future planning. On the other hand, the nature of a market good is afforded by the appropriation-appraisal process. For this reason, prices are not necessarily quantitative expressions of use values, but are rather tied to complex relations deriving from property rights, increased value and types of income. The other limitation that arises from the sole use of market prices is that it excludes a series of natural elements, goods and functions that are outside it.

It is obvious that methodologies for implementing the valuation of inventories should be based on a combination of *shadow pricing* of resources that are in the market and on the pricing of certain goods that are not in it. This is the method used in Argentina in the study carried out by the *Comisión Nacional de Política Ambiental* (the National Commission on Environmental Policy), supported by ECLAC, through the project referred to in the introduction (Suárez, 1990).

In this study, shadow prices were established that secure the necessary costs for the reproduction of a forest ecosystem in terms of the management and restrictions of the system. The procedure was based on given types of expenditures, namely, those involved in the productive function and those which are related to maintaining the ecosystemic function.

Included among the first expenditures were those of improvement of tree mass, fauna, genetic diversity and tourist potential. Among the second, those of maintaining the hydraulic and drinking water infrastructure, road infrastructure, the productive capacity of agricultural soils and other indirect benefits.

The basic idea was that these costs should generate a policy that would set prices to stimulate sustained management. However, there arises the question of how to determine these prices.

A detailed analysis of calculations of the various costs reveals significant conceptual efforts that, despite being ingenious and well thought out, are still questionable. The authors themselves, in referring to the maintenance of fauna, admit that these are undoubtedly contributions to the resolution of an important subject that still remains virtually unresolved (Suárez, 1990). However, despite this, expenditures in wildlife improvement were quite accurately calculated. Similar arguments were advanced with regard to the heritage value of genetic diversity and in terms of tourism and recreation.

The study then goes on to show the total heritage value based on calculations of the maintenance of the productive and ecosystemic functions.

The question that arises concerns the usefulness of this value. For the authors, this heritage value should generate price increases in marketable products, based on a modification of the relative price structure and, therefore, on income redistribution. But value transfers are either governed by the law of value itself or they answer to reasons that are unrelated to value (monopoly in a strict sense or action by the State) (Tsakoumagkos, 1990).

It should be mentioned that in this experience the heritage value of timber reaches 83% of the heritage value of the ecosystem under study. This figure makes for very low sensitivity of the remainder of the productive and ecosystemic maintenance functions.

Mention should be made of the fact that this exercise is called upon to have a primarily prospective benefit. The cybernetic model used is a significant effort; however, the linear nature of the cause and effect relationship—the sole possibility, considering the state of research on ecosystem attributes—limits its use.

The Argentine experience yields important insights, particularly on the difficulties in overcoming contradictions inherent in economic theories and in analysing the actual valuation possibilities of the heritage stock.

The Chilean case study in the Magallanes region involves another methodological approach as part of the project referred to. In this case, appraisal consists of comparing actual income obtained from the massive short-term exploitation of a resource versus the levels that would be achieved without the exploitation pro-

ject or with a rational exploitation project with appropriate management plans (University of Magallanes, 1989).

This methodology proposes working with two types of income, namely: actual income, calculated as gross income minus economic costs, and adjusted income, defined as actual income minus ecological and social costs. Both gross income and economic costs are determined on the basis of market prices.

The basic problem in this case lies in how to determine these ecological and social costs. The study defines them as the return and/or benefit from the resource exploitation that would be obtained with an appropriate rational exploitation (University of Magallanes, 1989). The definition is not very precise since "appropriate rational exploitation" can be interpreted in many ways. The treatment given to resources is differentiated: renewable resources have their economic and social costs determined, while the value of non-renewable resources is determined by the actual income obtained from exploitation.

The study concedes that there is a group of goods that lacks any possible economic value, but that could be valued through indirect benefit.

The Magallanes study does not place great emphasis on the economic accounting of natural resources. Rather, its emphasis on the classification, typology and multiple valuation criteria of resources clearly indicates a certain conceptual scepticism towards economic valuation.

The three studies make an effort to find answers for market distortions and deficiencies, as do other studies done in third-world areas and countries. In this sense it should be mentioned that the bottlenecks were similar to those encountered by Repetto, *et. al.* (1989) in the exercise done on heritage valuation in Indonesia, based on changes in oil and forest inventories and in erosion. In order to determine the value of petroleum and forests, net price or unit income was used, modifying values by using a correction factor to internalize price changes. In order to determine erosion, the cost per ha/year was estimated through loss of productivity of the agricultural sector. Upon capitalizing past costs it was concluded that, given the deteriorative techniques currently in use, 40% of future income is sacrificed in order to produce a present unit of income.

## 2. *The economic valuation of the fraction of growth attributed to environmental deterioration*

The theoretical and methodological difficulties in valuating inventories have gradually fostered an economic-environmental line of thinking in the sense of focusing efforts on the study of flow indicators. This does not run counter to proposals for the study of stock; in some cases it is complementary, but in others, the focus is solely on flows.

In Latin America, as part of the ECLAC project on natural and cultural heritage inventories and accounts, this option was chosen for the Mexican case study on the Chichinautzin biological corridor (Carabias, Montaña and Rodríguez, 1990).

Economic valuation puts forward as a theoretical reference the definition of income given by John Hicks, in which income represents the maximum consumption that can occur without modifying a society's or an individual's heritage. The work focused on the years 1970 and 1980, with simulations done for the years 1990 and 2000. By subtracting input costs from gross production value, economic income was obtained. Subsequently, environmental costs deriving from the various economic activities were estimated on the basis of calculating erosion, loss of forest cover, loss of water-retention capacity,

forest fires involving adult trees and saplings and loss of reproductive forest bank.

The study aimed at answering two questions of the greatest interest: the possibility of estimating what proportion of economic income environmental costs represent, and of determining what the impact of this reduction of natural endowment is on the availability of resources (water, forest, land) that constitute it.

To respond to the first question, an environmental cost coefficient was calculated for each unit of economic income. The answer to the second question was dealt with only in terms of physical balances. In this way the conceptual stumbling blocks discussed earlier were removed i.e., the difficulties in ascertaining qualities of use through economic valuation, and the existence of an historical nature which conditions use of economic parameters.

The option for this case has less contradictions and is also closely linked to the productive process, a fundamental issue for incorporating the environmental dimension into development strategies.

Nevertheless, the study poses a number of difficulties with regard to the determination of some prices. Particularly complex is how to assign value to loss by erosion. It is possible that other methods based on loss of productivity (which in fact corresponds to the decrease in stock due to loss of quality) would have been less disputable.

## V

### Improvement of conventional national accounts

It is generally agreed that conventional national accounts do not incorporate the depletion and deterioration of natural goods and resources.

The reformulation of development strategies with a view to making them environmentally sustainable will necessarily require accounting instruments to make up for this shortcoming (Lutz and El Serafy, 1988). Initiatives in this respect have been taken in various places, but, despite the interest shown by academic centres and international agencies, such as the United Nations Environment Programme

and the World Bank (Ahmad, El Serafy and Lutz, 1989), no significant modifications have occurred due to the conceptual problems already mentioned and to others discussed further on.

The method of greatest theoretical interest is the modification of the consolidation of gross domestic product accounts. In order for these to be consolidated, modifications must obviously occur at both the input and product levels. Two additions have been proposed for inputs: i) modification of the net national product to introduce "environmental plundering"; ii) deb-

iting the gross national product for "environmental services". Private consumption is modified in the product by adding the production value generated by use of environmental resources.

This method could provide the opportunity for managing the formula that states that the modified gross national product is equal to the conventional gross national product plus environmental services minus environmental damage (Peskin, 1989).

Analysis of this formula (mod. GNP = GNP + ES - ED) shows that modification is moving in the right direction: by increasing services and reducing damage, product grows as a result. In the absence of technological changes, by there being no "business transactions" for services and damage, the indicator would remain constant. Therefore, under these circumstances, it could well prove not to be a good indicator of human welfare. The other problem raised is that the maximum reduction of damage is not necessarily a social optimum, since it would involve an attendant lack of environmental services. This aspect is very controversial, especially when it is argued that, in order for product to grow and for the social optimum to be achieved, the damage could be greater.

Henry Peskin states that this method involves four basic problems:

i) Disagreement as to suitable units of measurement. The proposed system assumes that both damage and services should be evaluated in monetary terms, which, as has already been mentioned, leaves out a series of goods and functions that are outside the market.

ii) Disagreement as to the most appropriate discount rates. This point has been studied and the conclusion reached that, in fact, it is very difficult to assign discount rates in the light of the uncertainty surrounding the degree of substitution, the speed of obsolescence and technological changes (Smith and Krutilla, 1982; Smith, 1979; Markandya and Pearce, 1988).

iii) Dependence on the neoclassical economic model. The entire national accounting structure is based on neoclassical economic thinking and it is not clear that the latter is accepted by other societies with different cultural traditions where the environment could be a fundamental ethical conditioning factor.

iv) Demands that exceed the availability of information and abilities.

One of the objectives in introducing the subject of natural heritage accounts in Latin America and the Caribbean should be that national accounts be modified within a reasonable period of time. However, it should be pointed out that in France and other countries which have promoted such accounts, these modifications have still not been carried out.

Efforts in countries with less relative development have been few and far between: the Statistics Bureau of Tanzania, applying the methodology described in this chapter, undertook an interesting study on the modificatory introduction of firewood production from man-made plantations (Statistics Bureau of the United Republic of Tanzania, 1981).

Another important study is the above-mentioned one on Indonesia (Repetto, *et. al.*, 1989), where net domestic product is calculated by estimating depreciation in three natural resources: oil, forests and soils. Repetto, *et. al.*, exclude capital gains from the estimated depreciation. The reason given is that these are clearly influenced by short-term price fluctuations, which makes them extremely volatile.

The study on Indonesia also contributes background information on other significant macroeconomic estimates. It compares gross and net domestic investment estimates. The purpose of these parameters is to show that developing countries, such as Indonesia, which are very dependent on their depletable natural resources, should diversify their investments in order to preserve long-term sustainable development (Repetto, *et. al.*, 1989). This means that they should avoid financing consumption through the capital depreciation of natural resources. In the case referred to (recalculated) investment was negative in some years, which shows clearly the scant environmental sustainability of development strategies.

The experiences described leave us with various methodological lessons and still many unresolved questions. However, they have proved extremely useful in showing what the possibilities, limitations and problems are.

The sharing of these experiences, together with incipient regional efforts, allow us to infer that these problems will be present in Latin

American countries. But it is essential to make it clear that the prospects for Latin America are different. There are two factors responsible for this difference: on the one hand, the various

levels of industrialization and, on the other, the diversity in terms of dependence on renewable, conditionally renewable and non-renewable resources.

## VI

### Regional guidelines

Based on efforts undertaken in other regions and the ECLAC project on natural and cultural heritage inventories and accounts, which highlights the large volume of background information available, the contribution of conceptual elements and conclusions drawn from the three local case studies chosen, the following guidelines are proposed:

a) Natural heritage accounts should be promoted in countries that substantially modify their development strategies to fully incorporate the environment as a basic dimension that conditions the obligations and rights of citizens, and determines ways and systems for a society to interrelate with its surroundings over the short, medium and long terms.

b) In this context the objective of heritage accounts should be to become a planning and management tool for ensuring environmentally sustainable development. For this reason, it is recommended that use of these accounts be imperatively fostered in countries that are seriously embarking on alternative strategies as an outcome of the deterioration of their environment.

c) When it comes to making recommendations on account methodologies it is impossible to treat countries of the region as a homogenous group. Each country, within the context previously described, should be able to develop its own method in accordance with its own heritage of natural goods and resources, its development approach and its cultural patterns.

d) It is important to make it perfectly clear that not only is there no conflict between physical accounts and economic accounts, but that these are absolutely complementary, since the latter depend on the former.

e) The assignment of greater importance to one or another kind of account will depend on its

usefulness as a strategic tool. Nothing is gained by accumulating a large volume of statistical data and physical and economic indicators if these are not incorporated into development plans and programmes.

f) It is recommendable that a system of physical accounts be promoted first. The proliferation of natural resource inventories could lead to the unwise duplication of work. A system of physical accounts is much more than the sum of partial inventories. It means generating information on the inventory or stock of natural goods and resources, the flows associated with the variations in inventory, ecosystemic interactions, disaggregate trends, in particular, levels of disturbance or deterioration, etc. Inventories are indispensable inputs for designing those systems.

In designing a physical account system it is advisable to avoid textual transcriptions of current classifications and, therefore, we must form a conceptual structure that would allow a classification in terms of geographic, economic, social and cultural specifics.

Specifics can occur in resource classification based on a study with the broadest scope possible, including natural goods and resources, independently of their appraisal as merchandize. Study priorities should be set according to the degrees of influence on the environmental sustainability of development.

g) It is foreseeable that no significant changes may occur in devising alternative development strategies in Latin American countries. Radical changes in environmental policies are only foreseen in the most extreme situations. Nevertheless, in many countries of the region alternative development strategies are being proposed for given areas that have reached very deteriorated states in their environment. For

these areas, which can even consist of states, provinces or departments, it is recommended that such accounts be promoted. In other words, in the current historical stage of Latin America, given the deteriorated and overexploited state of certain areas, drastic change is imperative. It is here that natural heritage accounts should become a useful tool.

h) To promote accounts based on given local areas or regions will mean proposing a methodology that will include their specifics. In so doing, it is convenient not to lose sight of the possibility that the methodology proposed could be linked to a national methodology.

i) This proposal does not at all exclude promoting modifications of national accounts and/or of establishing national heritage account programmes but, on the contrary, it is one of the avenues for fostering them. An important objective that should not be forgotten is the modification and improvement of national accounts.

j) To begin natural heritage accounts on the basis of certain deteriorated areas implies the problem of storing available information and of its reliability. Deteriorated areas are usually

located in harsh and vulnerable ecosystems that are almost always far removed from major urban areas. For this reason, a decision of this nature requires the design of an efficient natural resource research programme.

k) Once physical accounts are prepared, economic accounts of the natural heritage could be set up. A word of warning is in order as to the difficulty of reading physical accounts, due to their disaggregation into the various natural elements and resources.

l) In calculating an economic account, there is always the possibility that the region or local area under study might or might not have regional accounts. If it were to lack regional accounts, the environmental issues could prove to be a factor in promoting them, and if that were to occur, we would have to incorporate the environmental dimension into them as much as possible. If traditional regional accounting were to exist, two main options would arise, namely: i) to modify the regional account system and ii) not to innovate the traditional account, but to add a "corrected account" to it that would allow it to show the differences between both.

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