

PAL REVIEW



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Review

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The preparation of natural and cultural heritage inventories and accounts

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The present article explores the difficult problem of natural and cultural heritage inventories and accounts. First of all, it defines the concept of overall heritage and then states the aims that these programmes must pursue for the countries of Latin America and the Caribbean. It then suggests some types of nomenclature or classification of heritage.

The study proposes a classification which could serve as a reference for the countries of Latin America and the Caribbean. It explains how to calculate the elements that constitute the heritage and how to situate them in relation to the national information and assessment systems. Because it is difficult to quantify and assess cultural heritage resources, this essay limits itself to an analysis of the natural heritage. The approach used is based on the need to establish three dimensions for assessment: ecological, cultural and economic, on the understanding that very few resources could be classified into all three.

The integration of natural heritage accounts into systems of national accounts is then examined and recommendations are made for the formulation of a comprehensive natural and cultural heritage programme.

For many years now, in almost all the countries of Latin America and the Caribbean, various programmes have been carried out which deal on a partial basis with the protection of the natural and cultural heritage. For the natural heritage, systems of protected areas have been created which are usually made the responsibility of national parks and reservations or institutions for protecting specific resources, such as forestry and fisheries resources. With respect to the cultural heritage, the countries have developed programmes through special institutions such as the National Cultural Heritage Institute of Ecuador, the Historical-Cultural Heritage Commission of Argentina, and agencies responsible for museums and archives, as well as the numerous initiatives taken separately in various institutions, secretariats and ministries.

There is a variety of legislation on the protection of the natural and cultural heritage in the region, focussing above all on the conservation of natural resources (countries such as Colombia and Venezuela have enacted special codes on the subject) and the preservation of historical and architectural monuments.

However, there are no comprehensive programmes for keeping or maintaining inventories of the natural and cultural heritage, nor are there initiatives of any importance for including these aspects into the national accounts although there is increasing concern about the subject, in the face of the depletion of many resources because of the high rates of extraction and the long-standing spoliation of natural resources, the institution of systems of exploitation which are at variance with the rules of medium and long-term resource conservation; the sudden implementation of a method of development which, because it has a strong acculturating effect, tends to despise and therefore neglect the cultural resources of each country; the lack of knowledge about each country's heritage endowment, and the scanty knowledge of the ecological costs to the heritage that development processes entail.

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Definitions and goals of a natural and cultural heritage programme

Several definitions of the concept of the global heritage have been put forward. The French Interministerial Commission on Natural Heritage Accounts defines it as "that collection of goods that has been bequeathed to us by previous generations and which we must also pass on to future generations without adversely altering the possibilities for its use" (France, 1979, volume I). This definition adheres to the general concept of what should be considered as heritage, but other questions arise as to what is meant by the transmission to future generations "without adversely altering the possibilities for its use". If development is the transformation of the natural environment, into an artificial one, in actual fact, then the possibilities for its future are in fact being altered. For example, the extension of the agricultural frontier is done in a number of ways, based on different systems and technologies, and its consequences obviously alter the possibilities of use of the ecosystems in the future. One form of transformation which has a low ecological cost in the light of the scientific and technological know-how existing at a given moment in history may have serious consequences for the future if, because of a new scientific or technological invention discovery, the ecological cost takes on a new and different value. Whatever definition is used for the concept of the possibilities of future use will come up against this problem.

A more general definition is that adopted by the Australian Heritage Commission (1982) which defines the natural heritage in broad terms as "those places which are components of the natural environment of Australia or the cultural environment that have aesthetic, historic, scientific, or social significance or other special value for future generations as well as for the present community". The heritage is classified into three main groups: the natural environment, the national aboriginal heritage and the built environment. The "built environment" is associated with historical

constructions of European origin (residential, religious, commercial or industrial buildings) and the national aboriginal heritage includes places of importance to the indigenous traditional culture. These two aspects, built or aboriginal, together constitute what may be called "the cultural heritage".

The definition proposed here for the concept of heritage is: that set of goods which has been bequeathed to us by previous generations and which it is our responsibility to conserve in their fundamental attributes or to transform in a suitable manner so that they may be passed on to future generations. Obviously "to transform in a suitable manner" is a relative concept which depends on the idea held at a particular time of the projected use of specific goods.

The heritage is not synonymous with a set of public goods but with a set of goods for community use, many of which may be in the private domain. The State must lay down rules and regulations for the social function of the heritage, either by regulating private use in terms of use by the community or by expropriating goods when the community's needs so require.

Some currents of thought tend to identify the heritage with goods that cannot be evaluated in economic terms. Although many heritage goods do not enter into the economic circuit there are in fact many that do. Consequently, heritage goods are classified as such, not on the basis of the type of ownership or of their incorporation into the economic circuit but in terms of a social function or purpose which is of importance to several generations.

The countries that have established natural and cultural heritage programmes have done so with different aims in view: some are directed towards learning about the goods, others towards their management or (in some cases) the preparation of heritage accounts, or simply towards protecting and preserving those

resources. The United States National Heritage Program, which was established in 1977, aims at identifying, protecting and where necessary, acquiring national heritage resources and co-ordinating Federal programmes. In France a report of the Interministerial Commission was expressly requested for the establishment of a system of natural heritage accounts. In Norway, the accounts have concentrated on fishery resources, energy and land use. In Australia, the aim has been to establish a register of places of interest, using scientific, aesthetic and socio-cultural criteria. In this case, the built environment is also included. Definitions of the natural and cultural heritage are, therefore, contingent in each case on the objectives pursued by the various national programmes.

In the countries of Latin America and the Caribbean, the aims must be geared to the dynamic situation prevailing there as regards changes in natural resources and their loss and over-exploitation. For the cultural heritage programmes, the aims must be to counteract the under-valuation of pre-Columbian and creole cultures and the imposition of foreign values which tend to reinforce this under-valuation.

The main obstacle to defining the natural heritage is the difficulty of setting the limit between what is natural and what is man-made. The artificialization to which nature is subjected in the development process is a continuum which spans the whole spectrum from minimum to maximum. It is necessary, therefore, arbitrarily to fix a point in this continuum as a demarcation line between the natural and the non-natural. In Latin America, this difficulty is made worse by the accelerated and virtually unchecked transformation of virgin or almost virgin ecosystems until very soon they have to be reclassified as artificial.

The natural heritage should include the natural goods which have undergone no changes or which have been artificialized to such a slight degree that their natural behaviour has not been changed in any significant way. To these must be added the "naturalized" goods which help to maintain the attributes of specific resources such as soil and water. These are man-made goods of

historic interest, bequeathed from generation to generation, such as land development works: terraces, drainage systems and even old country roads.

The cultural heritage would be composed of inherited goods, places of historic and pre-historic interest, points of contact between aboriginal and foreign cultures, pre-Columbian, colonial and post-colonial art, buildings and houses of historical or architectural interest, ancient industrial, mining and commercial installations, means of transport and typical villages.

Within the framework of these definitions, and on the basis of certain features which are common to the Latin American countries, the programmes on the determination of the natural and cultural heritage should be oriented towards:

a) Acquiring knowledge both of resources and systems so as to apply them in the definition of development options and in creating an awareness of how the state of resources changes according to the use that society makes of them;

b) Regulating property rights by incorporating legal instruments which take into account the social purpose that these resources fulfill, their long-term projections and, for many goods, their use to the community as a non-economic good. These instruments will include the drafting of new regulations, giving public agencies supervisory and punitive powers. Legal instruments which strengthen the State's authority to acquire heritage resources deserve special mention;

c) Establishing a system of inventories and accounts of the natural and cultural heritage in order to determine, periodically, the changes that have taken place and to ensure that the problems of heritage are taken into account in development planning, above all in the exercises aimed at harmonizing short-term with medium and long-term planning processes;

d) Disseminating information about the main problems of deterioration of natural and cultural resources and trying to ensure that the relevant registers and accounts form part of educational systems and reach the domain of public opinion.

II

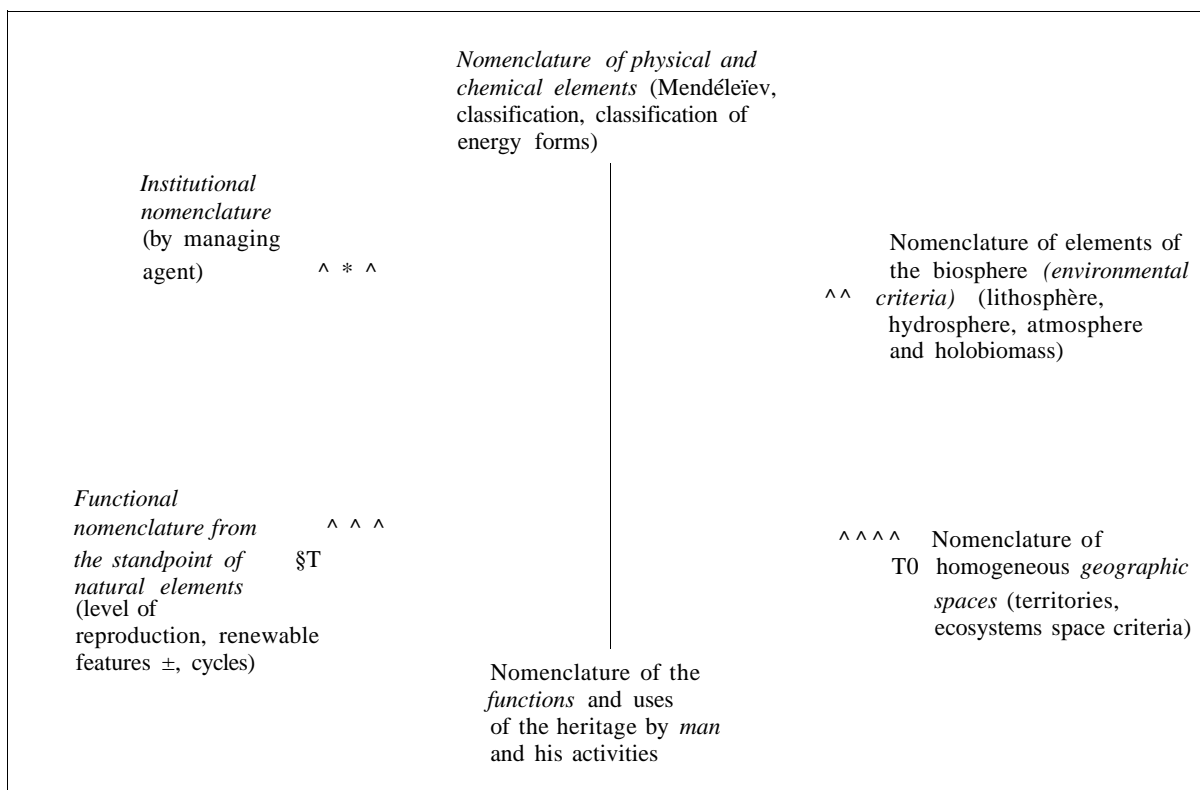
Classification of the natural and cultural heritage

On the basis of the definition of the natural and cultural heritage and its objectives, it is possible to arrive at a classification well adapted to concepts which are appropriate for each country. The programmes currently in operation give an idea of how some countries have developed these classifications. In the United States, the classic division was made between the natural and cultural heritage. As the objectives were, essentially, conservationist, in the breakdown of the natural heritage importance was given to ecological and geological resources, while landscapes and wilderness areas were also highlighted. With respect to the cultural heritage, not only was there an attempt to protect places and constructions of interest, such as archeological sites and buildings of historical or artistic value, but also arts and crafts (annex I).

The Australian register is based on criteria for determining which places or constructions are of interest. A national register of places was set up to determine their level of preservation and to formulate the relevant policies. Each criterion is explained by means of examples of places or constructions. In the division made by the Australian Heritage Commission into natural heritage, built environment and national aboriginal heritage (these last two fall under cultural heritage), scientific, aesthetic, historical and social criteria were given particular weight (annex II).

In trying to develop their nomenclature, the French authorities, as shown in figure I, summarized the six main options (France, 1979, Volume III). An analysis of these options showed the need to establish a single nomenclature which would encompass the most

Figure 1



essential dimensions, linking them with the concepts set forth in the system of accounts (annex III).

In the three examples given in the annex, several approaches and levels are suggested for the classification and grouping of these goods which make up the natural and cultural heritage.

Legal institutions and regulations governing specific aspects of the natural and cultural patrimony have existed in all the Latin American and Caribbean countries for many years. Furthermore, some of the goods in the natural heritage have been investigated by special agencies, either sectoral (energy, mining, agriculture, forestry) or comprehensive. The natural and cultural heritage programmes must not duplicate those functions, but should integrate and supplement them. For example, the mining sectoral agencies usually study specific mining resources, leaving aside those that have no current economic value. What is needed now, is to supplement the information already gathered with what now needs to be acquired in order to complete the knowledge of the heritage.

The preparation of a register or a system of accounts for the cultural heritage should be based on a series of definitions and decisions which will depend on the objectives pursued. To this end, it is proposed to explore the functioning of a classification based on two levels of analysis. It is suggested that at the first (general) level the distribution of the main biomes* should be defined, in order to understand their interaction with the ecosystem or the reaction of specific natural attributes if they are subjected to a high degree of artificialization. At this level, one can readily determine how far one particular biome rather than another constitutes "a natural heritage" and which physical and functional resources have an impact on their assessment. The French call this concept "geographical space".

At the general level, it is necessary to include "naturalized" resources, which, although they involve a high degree of artificialization, are considered part of the natural heritage because

*A biome is a system composed of biotic and abiotic components, each of which characteristically corresponds to a typical physiognomical or functional model (definition by Gast6, 1979).

they are incorporated into a natural resource and enhance it.

At another level, the elements of the biosphere would be combined with their function from the point of view of the natural elements, so as to simplify the nomenclature as much as possible.

The classifications may be broken down to the level of physical and chemical elements, but it is recommended that the line should be drawn at the ordinary resources which enter into the economic circuit, such as minerals and species of flora and fauna.

With respect to the cultural heritage, this classification is to be recommended because the determination of places facilitates action on the resources which form part of this heritage and which are to be protected. In addition to its practical advantages, the system makes it possible to include everything that the countries have already established, such as laws and regulations governing protected areas, national monuments and buildings of architectural interest.

The identification of places should not prevent the inclusion in the cultural heritage of a number of activities such as folk music, which are not localized but are carried out throughout the whole country or an entire region.

On the basis of the foregoing, a proposed classification of the natural and cultural heritage is set out below which could be useful for the countries of Latin America and the Caribbean.

1. *Natural heritage*

1.1 *Global level*

1.1.1 Main biomes

1.1.1.1 Deciduous forest ecosystem

1.1.1.2 Tundra ecosystem

1.1.1.3 Cold steppe ecosystem

1.1.1.4 Warm savanna ecosystem

1.1.1.n

1.1.2 'Naturalized' transformations

1.1.2.1 Irrigated agrosystems

1.1.2.2 Canal and drainage infrastructure

1.1.2.3 Terraced areas

- 1.2 *Specific level*
- 1.2.1 Climate
- 1.2.1.1 Rainfall
- 1.2.1.2 Temperature
- 1.2.1.3 Relative humidity
- 1.2.1.4 Wind
- II
- II
- 1.2.1.n
- 1.2.2 Solar radiation
- 1.2.3 Continental water resources
- 1.2.3.1 Rivers
- 1.2.3.2 Lakes, lagoons
- 1.2.3.3 Ground water
- 1.2.3.4 Mangrove swamps
- 1.2.3.5 Glaciers
- 1.2.3.6 Snow
- 1.2.4 Geological resources
- 1.2.5 Geomorphological resources
- 1.2.6 Soils
- 1.2.7 Mineral resources
- 1.2.7.1 Iron
- 1.2.7.2 Copper
- 1.2.7.3 Aluminium
- 1.2.7.n
- 1.2.8 Biotic resources
- 1.2.8.1 Genetic heritage
- 1.2.8.2 Terrestrial and aquatic flora
- 1.2.8.3 Terrestrial fauna
- 1.2.8.4 Aquatic fauna in inland continental waters
- 1.2.8.5 Amphibious fauna
- 1.2.8.6 Marine flora and fauna
- 1.2.9 Marine resources
- 1.2.9.1 The coastal sea
- 1.2.9.2 The sea over the continental shelf
- 1.2.9.3 Areas of special interest
- 1.2.10 Energy resources
- 1.2.10.1 Hydrocarbons
- 1.2.10.2 Coal

- 1.2.10.3 Hydroelectricity
- 1.2.10.4 Biomass
- 1.2.10.5 Wind energy
- 1.2.10.6 Solar energy
- 1.2.10.7 Nuclear energy
- 1.2.11 The landscape

2. *Cultural heritage*

- 2.1 The archaeological heritage
- 2.2 Buildings, constructions and gardens of aesthetic, historical or technological interest (churches, palaces, old public buildings, bridges, dams, mines)
- 2.3 Arts and crafts
- 2.4 Landscapes of aesthetic or historical interest
- 2.5 Built environment showing lifestyles, customs, procedures and functions which are no longer in use or in danger of extinction (small villages, fortifications, mills or presses)
- 2.6 Notable objects and collections
- 2.7 Notable urban centres

After the classification of natural and cultural heritage has been established and its components have been defined, consideration may be given to their enumeration and incorporation into the national information and evaluation systems.

The characteristics of the cultural heritage make physical and economic quantification very difficult. In some cases, such as important collections and objects, works of art and constructions of architectural value they may have a market value, but as these cases are exceptional, the cultural heritage is normally confined to a description of places, constructions, goods or activities that are difficult to quantify but can be described in detail.

Quantification of heritage goods would thus be confined to natural resources.

III

Heritage accounts in systems of national accounts

1. *Evaluation and accounts*

Because of the wealth of information and evaluations produced on natural resources, that are frequently duplicated or covered three times over, some experts believe that it is superfluous to develop an accounts system for natural and cultural resources. This point of view stems from a confusion between what the current information, prospection and evaluation systems are and what natural resource accounts should be.

When prospection and evaluation of natural resources is carried out, the concept of stocks is used and in this way information is provided, for example, on mineral resources, flora and the soil. Evaluations are usually confined to exploring the use potential. For example, soil evaluations are determined on the basis of suitability for use and current use, in order to determine the productive potential in terms of a specific technology and different levels of capitalization.

In Latin America, it is common to repeat evaluations periodically in order to determine how stocks have been evolving. So far, it cannot be said that these repeated evaluations have been done as frequently as is necessary in order to keep a close check. They are still photographs of different periods which on many occasions cannot even be compared with each other because of methodological problems (different scales and different remote sensors), while they cannot explain the balances of resources, either. They do give an approximate idea of the fluctuations in stocks, however.

The purpose of the accounts is to measure, with a given frequency, the flows associated with variations in stocks, so that the dynamic evolution of the heritage can be traced. This relation between flows and stocks may well appear to resemble the traditional assessments in the case of non-renewable resources, but the relation is much more complex in the case of renewable resources because of the deterioration and natural renewal that they undergo.

In a programme of heritage accounts, other indicators which will enhance their interpretation should be considered, such as assessment of the levels of disturbance or deterioration (for example, dumping of waste in water).

2. *The proper place of natural and cultural heritage accounts programmes*

There is much uncertainty regarding the incorporation of natural and cultural heritage accounts programmes into a system of national accounts. There are no structured and explicit systems of environmental and heritage accounting in any of the countries of the region. What we find instead is information on the environment included in the different information systems (ECLAC, 1980 and United Nations, 1980). The primary sources of natural resource information and evaluations are the different sectors of the economy and the sectors which obviously contribute the most are agriculture, mining and fishing. In some countries, information on natural resources is also generated in the industrial sector, to the extent that this sector maintains a close check on its inputs.

In addition, there are national, State, provincial or departmental agencies which are directly responsible for making surveys and assessments of natural resources and other agencies which are responsible for planning and need surveys and assessments of this heritage for this purpose.

A natural and cultural heritage programme must be intersectoral and must be located at a level which makes it possible to integrate the information provided by each sector. It must also be in a position to transmit its data to planning organizations and to those responsible for national accounts. This would mean that it should presumably be at a higher level than sectoral statistics and should even be at the level of more comprehensive information, such as

environmental statistics, studies on the status of the environment, the compilation of economic and environmental data and regional environment plans.

Its location will, of course, depend on the institutional organization of each country. In any

event, from the intermediate level recommended, the accounts must be channelled to higher levels like the macroeconomic models and the national accounts. It is particularly important to include the natural heritage accounts in long-term planning models.

IV

Criteria for preparing the accounts

1. *Three-dimensional orientation and criteria*

Concern over the deterioration of natural resources in Latin America has led to a series of initiatives aimed at creating an awareness of the dangers which threaten the natural heritage. Studies have been carried out on the general condition of the environment, as well as more specific studies on a particular endangered resource (for example, natural forests or soil erosion). Many of these studies include physical and in some cases economic quantifications.

On the whole, these initiatives have not been as successful as hoped, because they were not given the proper weight at the levels of global planning and executive management. This is due mainly to the fact that the "environmentalist sector" has presented its assessment and accounts in isolation, with the sole aim of warning about the deterioration of resources during the development process. The agencies responsible for planning development have not deemed it necessary to adopt a position which does not provide immediate help in tackling day-to-day problems.

Accordingly, the first duty is to define clearly the objectives that should be pursued in preparing heritage accounts. The heritage accounting must, first and foremost, be a tool to assist in development planning. This is done by periodically updating information on the availability and quality of heritage resources, their potential and the use made of them in the ecosystem. Since development is an integral

concept, the assessments must focus not only on physical and environmental resources but also, where possible, on cultural ones too.

Some authors contend that the purpose of preparing heritage accounts is to incorporate them into the national accounts. While this is important, such an approach could give the accounting a monetary bias which would mean setting a price on all heritage elements, thus leading to the omission of that part of the natural and cultural heritage which cannot be assessed in these terms (Farnworth and others, 1981). Multi-dimensional criteria are preferable, though monetary accounting should be done whenever possible. The right perception of the evolution of the heritage resources will make it possible to plan in such a way that the short-, medium- and long-term views are reconciled: a fundamental problem in incorporating the environmental dimension into development planning.

If the most important purpose of heritage accounts is their incorporation into the development planning process, it will be necessary to establish the links between natural resources, the economic system and socio-cultural aspects, and for this, they must be analysed in terms of these three dimensions. As there is no common denominator linking these three aspects, the heritage resources must be evaluated from three angles and an attempt made to establish the respective links. In other words, the same resource must, if necessary, be reassessed two or three times. Thus, for example, a forest may be evaluated ecologically,

as biomass; economically, in cubic metres of wood, and socio-culturally in hectares for recreational purposes, and the three assessments must all be interwoven. Hence, for example, any changes involving the exploitation of different tree species alter the ecological behaviour of the forest and affect its aesthetic aspect as regards its use for recreational purposes.

As a result, as suggested in the study by the Interministerial Commission on Heritage Accounts of France, there would be three basic areas in which to draw up accounts which must perforce be interrelated in order to give resources multi-dimensional treatment: nature, the economy and man.

If the sole aim of natural heritage accounts was to incorporate them into national accounts, it would be sufficient to link the sphere of nature with the economy by seeking to assign to the natural resource some monetary value. There are cases in which the link between these spheres is reduced to a statement of accounts on the exploitation of natural resources and the problem of evaluation is evaded, as is done by the Statistical Office of the European Community.

In the Australian report, the programme is confined to a register and a qualitative description of places and the man-made environment. In this case, the natural heritage is limited to the spheres of nature, culture and man, and only weak links are established between these.

In the United States, the sphere of nature is almost the only aspect dealt with.

2. Balances of exploitation of the natural heritage

Once the units of measurement for the three dimensions indicated above have been defined, it is possible to draw up natural heritage accounts. The difficulties inherent in quantifying the cultural heritage mean that inventories or registries are its only form of evaluation, so that the following considerations as to how the accounts are to be drawn up will refer solely to the natural heritage.

It is easy to keep physical accounts of non-renewable natural resources. In the first place it is necessary to determine the different types of reserves or resources, and here various forms of

classification are possible. The problem lies in the degree of inaccuracy involved in assessing reserves which are not exploited. In Latin America it is common to find that the information is either very limited or very inaccurate because prospection is currently carried in a very general way. Much information is maintained and handled confidentially by national or foreign enterprises.

Much effort has been made to discover and assess some resources. Specialized departments of mining ministries or special bodies such as geological and mining research institutes have made great strides forward in this respect in recent years, either because of the importance of a resource as a foreign exchange earner (copper in Peru and Chile), or because of the energy problem and the subsequent importance of oil prospecting.

As a rule, countries keep overall checks on production and consumption, so that they can deduce how long the reserves will last. The most usual ways of keeping checks on production, consumption and mineral reserves are set forth in annex IV.

Keeping accounts on renewable natural resources is much more complex. In natural ecosystems, the reserves can be modified naturally. If an ecosystem has not reached its peak, it tends to expand until some limiting factor acts upon it (law of the minimum).² Furthermore, stocks may decline when climatic or geographical conditions have changed and the optimum conditions for the peak do not exist. In this case, there is a natural backward process which can easily be speeded up by human action. The "qualitative" changes in stocks in the processes described above are very difficult to quantify.

In the systems, which have been subject to human intervention, the problems of renewable natural resources are compounded by the fluctuations which the development process creates. This is the case with forestry plantations, for example, that can grow or diminish depending on the balance between planting and exploitation.

²This law stipulates that, regardless of the endowment of resources, a biological system will always halt its growth under the impact of the most limiting resource.

Special attention should be given to changes caused in natural ecosystems through processes which apparently do not affect their conservation capacity. There are some who use the argument of general parameters of resilience and maintain that nature produces and restores the original ecosystem. For example, there is talk of the healing capacity of the humid tropics because of their high resilience. In that context, there is a tendency to believe that secondary jungle, or the altered jungles, have the same value as the original ones. Although it is true that its high resilience gives the humid tropical region a greater power of recovery, it has been proven that the original ecosystem does not necessarily reproduce itself. The time-lags between the optimum climatic conditions and the actual climate and geology and above all the ease of entry of new invading species—many of them aggressive—mean that many interventions, however slight they may be, damage the ecosystem.

There is no gainsaying that the quantification of the changes must be backed by scientific studies or by estimates based on these. In this way, the balance set out in table 1 could be drawn up for each resource, whether renewable or non-renewable. This table must be accompanied by complementary studies which determine the vulnerability, risks, irreversibility and other qualitative aspects in a scientifically indisputable manner. Furthermore, it would be very useful to show the links between a given resource and others and its role in a specific ecosystem. Thus, for example, the decline of one species of forest fauna has repercussions on the food chain of the ecosystem to which it belongs.

3. *The three dimensions of the balances*

There are resources which may be evaluated according to ecological, economic and socio-cultural criteria: i.e., according to all three of the

Table 1

MAIN LINKS BETWEEN STOCKS AND FLOWS WHICH AFFECT THE NATURAL HERITAGE

Resources	Uses
1. Stocks at the beginning of the period	
2. Increase in reserves	3. Reduction in reserves through a change in estimate of known reserves
a) Through a change in the estimate of the known reserves	
b) Through the discovery of new reserves	
4. Gross natural increase	5. Natural decline:
a) Natural growth of initial stocks (growth of the forest)	— Through spontaneous normal processes
b) Natural growth through reproduction (increase in a particular animal species)	— Through natural catastrophies
6. Increase through better technological development (construction of drainage works)	7. Reduction through use or exploitation
	a) National use
	b) Exportation
8. Imports	9. Reduction through other causes
	— Pollution
	— Different use (urbanized agricultural land)
	10. Adjustment (+ or -)
	11. Stocks at the end of the period

Source: France (1979), p. 26.

dimensions established. Others may be evaluated according to a combination of two or using only one criterion. Specific evaluation methodologies may cause a resource which is usually evaluated in one or two dimensions to have another added. It is recommended that evaluations should be selected that do not require a very complex or controversial methodology.

Mining resources can be assessed fairly easily according to physical/ecological and economic criteria. All three approaches can be used for both water and forestry resources.

Because of the great impact which it has in Latin America, the natural forest deserves special analysis. For the physical and ecological analysis, a suitable unit of assessment is the biomass of the type of forest in question, measured in kilogrammes per hectare. In this type of analysis it is very desirable to assess the vulnerability and extent of deterioration, as these concepts will help in the definition of the necessary policies. In addition, the forest must be analysed as a regulator of the water system and the climate and also as a protector of the fauna, although all these factors are very difficult to quantify. These evaluations may be included as a

supplement to the accounts in order to define the condition of the forest.

The economic assessment must be made on a physical and ecological basis. Since not all of the forest is an economic good, what is usually done is to quantify the stands in the forest that may be converted into timber, and then place a value on them. The distinction between stocks and flows is important here, because their analysis makes it possible to deduce the levels of over-exploitation and even under-exploitation (over-mature species). The current unit is the cubic metre per species and type of wood. The forest not only produces wood but also provides grazing for cattle, medicinal plants and wild fruits which must also be included in the calculation.

The socio-cultural assessment must be carried out in terms of what the forest represents for the population: for example, whether it is an area of educational, recreational or aesthetic interest. In this case the unit of measurement should be simply the surface area. Tables of visual sensitivity can also be made and classified according to their impact on the population. The method used in this case is that of carrying out surveys among the users of the forest.

V

The integration of natural heritage accounts into systems of national accounts

The incorporation of heritage accounts into systems of national accounts is of fundamental importance for the integration of the concept of the environment in development planning. National economic policy is based on the systems of national accounts: the inclusion of natural heritage assessment will therefore represent a decisive step towards the effective incorporation of the environmental dimension into planning, remembering, of course, that systems of national accounts are merely indicators of the rate of growth of goods and services and not of the well-being of the population (Huetting, 1984).

Many heritage goods fall outside the economic area of national accounting systems, while others fall within an area which covers both these accounts and the natural heritage. As Sejenovich and Sourrouille (1980) point out: "... the measurement of the costs of environmental protection and of the control of the discharge of pollutants (if there is agreement on the scope of the concepts) is included, in so far as it involves a cash outlay, in the national accounts".

What is important in this situation is that many of the natural heritage goods which are not included in the common area are directly related

with the well-being of the population. Only exceptionally can their shadow prices and the demand curve of their environmental functions be calculated (Huetting, 1980).

Accordingly, the main focus should be on expanding and completing the common area so that many heritage goods may be assessed and incorporated into the systems of national accounts. The use of some other goods, such as the atmosphere, which are considered "free goods", cannot be defined as an economic activity.

If no indicators of exhaustion or deterioration are included in the accounting of the production process, the assessment will be distorted. If, in fact, one good is produced at the expense of another environmental good or part of that good and if the cost cannot be evaluated, it is impossible to calculate a fair shadow price for the good in question (Theys, 1984).

The usual method of accounting imputes only the amortization of tangible reproduceable assets or permanent goods and not natural heritage goods, even if the latter can be evaluated economically (Sejenovich and Sourrouille, 1980).

There would be two solutions, which are not mutually exclusive but complementary. The first would be to make an economic evaluation of the

natural heritage goods and include it in the amortizations of tangible assets. The second would be to reconcile current registers of flows with heritage changes. This would involve maintaining parallel accounts for goods that are reproduceable (in an economic sense) and for heritage goods. The first account would be the current account, where initial stocks are added to the gross capital formation of the period and the amortizations are subtracted from them. As explained in the previous section the second would be a reconciliation in which the flows and stocks are physically related.

Establishing a link between systems of national accounts and systems of registers and accounts of the natural heritage would serve as an instrument for incorporating the environmental dimension into development planning, in so far as the environmental element continues to pivot upon economic policy. A different concept of development which calls for integrated planning in which the central purpose is to further the welfare of the population and ultimately of its environment and where economic policy is only a tool for achieving these ends will require a change in this strategy and the effort described above will not be needed, since the environment will be implicit in all development decisions.

VI

Recommendations for a natural and cultural heritage programme

In order to implement a programme for preparing inventories and accounts of the natural and cultural heritage, it will be necessary to define some fundamental stages and then to assess the various options for their institutionalization in the public sector.

1. *Proposed stages*

During the first stage, it will be necessary to define the national objectives pursued by the natural and cultural heritage programme and to formulate the relevant classification. During the

second stage, a national register of statistical inventories and other background information on natural and cultural heritage goods will have to be prepared. This register must include the following for each inventory: a) the title; b) its definition: whether it is a programme, a project or an institutional function; c) the institutional author; d) the geographical area to be covered, if the whole country is not included; e) levels of information; f) date of the last publication and frequency of issue.

Once the situation as regards the different natural and cultural patrimony goods is known the legal statutes governing them must also be ascertained, since in the countries of Latin America and the Caribbean there are a large number of regulations governing protected areas, national monuments, buildings of architectural interest and other goods. The effectiveness of these regulations must also be determined, since many of them are just a dead letter in practice.

The specific proposal must make it possible to formulate the programme for a register and accounts of the natural and cultural heritage. The general register must define the necessary complementary information. Once the general register has been prepared, a system of accounts specifically dealing with the natural heritage can then be elaborated.

It is recommended that the design of the system should not be general during its early stages, but that specific heritage should be selected according to the following criteria: a) importance in generating the national product (copper); b) importance in generating foreign exchange (tin); c) impact on employment of labour (water and irrigated land); d) extent of deterioration (soil erosion);

e) high ecological cost in the development process (native forests); f) strategic function (oil).

2. *Institutions through which the programme is to function*

There are many options open for the implementation of a programme of this kind, but it is important that it be given the right status in the public administration. It must be located above the sectoral levels, and this can be achieved by placing it in the central planning agency or as a direct branch of the executive or by appointing a special interministerial commission.

During the diagnostic phase, national natural resource agencies may be made responsible for the programme, if such agencies exist in the public administration (as for example the Ministry of the Environment and Renewable Natural Resources of Venezuela, the Special Secretariat for the Environment in Brazil, the National Office for Natural Resource Assessment in Peru and the National Natural Resources Assessment Institute of Chile).

Environmental agencies located in any sector or ministry can carry out this function, but to do this they need special intersectoral powers which are very difficult to institutionalize. This is the case of the National Institute for Natural Resources and the Environment of Colombia, the Secretariat of Housing and Environmental Organization of Argentina and the Subsecretariat of the Environment of Ecuador.

A sectoral agency should be responsible for running the programme. The enactment of a law stipulating the institutional mandates involved would give the programme the necessary force to make it effective.

Annex I

AREAS OF WORK OF THE UNITED STATES NATIONAL HERITAGE PROGRAM³

1. *Natural heritage*

- a) Ecological resources
- b) Geological resources

- c) Landscape (aesthetic value)
- d) Unspoilt natural sites

2. *Cultural heritage*

- a) Archaeological heritage
- b) Architectural heritage and notable urban centres

³Taken from France (1.979), Volume HI, p. 7.

- c) Zones and landscapes of historical and cultural interest
- d) Arts and crafts
- e) Notable objects and collections
- f) Popular traditional cultures (folklife)
- g) Contemporary culture

Annex II

CRITERIA FOR ESTABLISHING THE REGISTER OF THE NATIONAL ESTATE OF AUSTRALIA³

I. Criteria for natural areas

1. Scientific

- a) Representative of diverse ecosystems, land forms or features
- b) Habitats of endangered flora or fauna species
- c) Rare/outstanding ecosystems or land forms
- d) Fragile areas, vulnerable to impacts of man-made or natural disturbances
- e) Places of interest for the study of botanical, geological or geomorphological evolution

2. Aesthetic

- f) Outstanding natural or man-influenced landscapes

3. Historic

- g) Natural areas associated with early botanists or explorers or with significant scientific discoveries

4. Social

- h) Recreation and tourist values
- i) Educational value for the teaching of natural sciences

^dTaken from the Australian Heritage Commission (1982), pp. 37, 38 and 98.

II. Criteria for the built environment

- a) Buildings representative of a great creative or technical accomplishment
- b) Demonstration of a way of life, custom, process or function no longer practised, in danger of being lost or of exceptional interest
- c) Strong association with an important figure or figures, development or cultural phase
- d) Outstanding urban or rural landscapes

III. National aborigine estates

- a) Scientific sites, places which have a potential for science or the study of pre-history or which have figured prominently in research
- b) Sites involving creative activities such as painting, ceramics, carved trees, etc.
- c) Contact sites relating to the history of contact between aborigines and Europeans, such as mission stations, massacre sites, etc.
- d) Traditional sites significant to aborigine people but not necessarily to the rest of the population (these are also termed living sites, mythological sites or sacred sites).

Annex III

PROVISIONAL NOMENCLATURE OF THE NATURAL HERITAGE (FRANCE)^e

1. Continental waters

1.1 Lakes, lagoons

1.2 Salt marshes, wetlands

1.3 Estuaries

1.4 Rivers, surface waters, waterfalls

1.5 Water tables and underground waters

1.6 Glaciers and snows

^eTaken from France (1979), Vol. I.

- 2. *The sea*
 - 2.1 Continental shelf
 - 2.2 Seabed
 - 2.3 Sea water
 - 2.4 Areas suitable for marine and shellfish farming
- 3. *Atmosphere*
 - 3.1 Air
 - 3.2 Solar radiation
- 4. *Soil and subsoil*
 - 4.1 Natural non-built places. These include coastal and mountain areas
 - 4.2 Plant soil, humus
 - 4.3 Geological substratum, rocks, stripped soils
 - 4.4 Mineral resources (including sand and stone quarries)

- 4.5 Ancient rural improvement works (hed- ges, thickets, embankments, footpaths, etc.)
- 4.6 Landscapes

Biotic elements

- 5.1 Genetic heritage of wild and domestic species
- 5.2 Population of species
- 5.3 Flora and plant species
- 5.4 Wild aquatic fauna
- 5.5 Wild land fauna
- 5.6 Main biomasses
 - 561 Woods
 - 562 Meadowlands and mountain pastures
 - 563 Heaths and uncultivated places
- 5.7 Unusual or isolated ecosystems

Annex IV

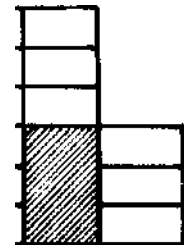
MINERAL CONTROL

1. *Reserves*
(10^x tons)

Proven	Probable	Possible

3. *Consumption*
(10^x tons)

- National production
- + Imports
- Exports
- Availability for consumption
- ± A Linking stocks
- Real consumption



2. *Production*
(10^x tons)

Production (base year)	
Recycling (base year)	
Production + recycling (base year)	
Present annual production	
Present annual recycling	
Present production + recycling	

4. *Relations*

- a) *Production*
Reserve
- b) *Present annual production + recycling*
Production + recycling (base year)
- c) *Recycling*
Total production
Etc.

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