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FROM THE LAW OF ENTROPY TO ENVIRONMENTAL MANAGEMENT: SUSTAINABLE DEVELOPMENT PARADIGMS AND POLICY IMPLICATIONS

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Clarice Strauss

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Joyeeta Gupta
Guillermo Lathrop

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INTRODUCTION

SCOPE OF THE PAPER AND MAIN OBJECTIVES

The main objective of this paper is to identify a theoretical rationale that would permit a systematic analysis of the linkages between human activities and the environment. The theoretical framework identified should lead to a coherent set of policies and instruments that could be applied in Chile, on the attempt to induce an economical and social shift towards an environmentally sustainable path.

The search for a theoretical support that systematizes the incorporation of the environmental dimension on the formulation of public policies is multidisciplinary. The multiple dimensions of the problem (ecological, social, political, economic, administrative, ethical, to mention some) made it necessary to limit the scope of analysis.

On the attempt to find a narrower theoretical support this paper founded it's theoretical framework in two basic disciplines: ecology and economics. The ecological dimension allowed for the understanding of the functioning of the natural environment and its biophysical boundaries. Environmental economics supplied a rationale that would link the ecological and socio-economic dimensions.

HISTORICAL CONSIDERATIONS

Although it is sometimes stated that the attempt to link economy and ecology, is recent, the preoccupation about the environmental constraints towards economic activities is not new. Classical economics had discussed long ago the limits of agricultural land supply. Thomas Malthus (1766-1834), was pessimistic about long run economic growth. He argued that the absolute scarcity limit of land supply would lead to diminishing returns in agricultural production, leading to a cease in population growth. David Ricardo (1772-1823) was also pessimistic about long run economic growth. He focused less in absolute scarcity of land, and more in the fact that the quality of the available land would diminish, leading to diminishing returns (Pearce and Turner, 1990:6-7) . It must be reminded that in the classical

approach, technology remained constant. The concern of some classical economists in relation to the nature's constraints over economic activities, has been neglected since the end of the 19th century with the emergence of neoclassical economics. Environmental resources (with the exception of land) were considered as non-scarce goods, and the debate over the environmental boundaries to economic activities was overlooked, forgotten for one century. The marxist, centrally planned economies, did not differ much from the neoclassical on their approach to the environment.

The birth of the subdiscipline of environmental economics occurred during the sixties, when the intensity of some environmental problems as well as the evidence that some exhaustible natural resources would not last forever at the actual rate of exploitation raised the question about the environmental sustainability of the modern, industrialised pattern of production and consumption. The awareness of this issues led some economists to search for a theoretical support that would link economics to the physical environment, explaining the major interactions between the environment and the economy. That is how some economists looked into the physics for their theoretical and methodological inspiration and, by incorporating the principles of the first and second laws of thermodynamics to their economic analysis, they generated a whole new view, giving birth to a new incipient branch of economics: environmental economics.

The increase in importance of the environmental debate during the late sixties, seventies and eighties responds to the exacerbation of the pollution problems in many areas of the globe, the effects of the population growth, and an increasing awareness of the fact that the earth is not infinite and that the environmental problems do not respect political boundaries.

ACTUAL SITUATION

It is within this context that the environmental debate grew in importance in Chile, specially during the eighties, due to the intensification of the environmental problems within the national boundaries, such as the atmospheric contamination of Santiago, the contamination of rivers and sea shore, and many other acute pollution problems. Some institutional adaptations to deal with the issue started to take place. In 1980 the Political Constitution of the Country established the rights of the citizens to live in a pollution-free environment. In 1983 the first National Conference on Environment took place. Since this meeting convoked by the "Centro de Investigación y Planificación del Medio Ambiente" (CIPMA), an environmental NGO, the scientific community have held periodically national conferences to discuss the environmental problems of the country and suggest policies and actions. In 1990, and interministerial body, the National Commission on Environment was created, and within the same reforms, the

Special Commission for the Decontamination of Santiago. Environmental competencies and attributions were conferred to the local level administration and afterwards to the recently created regional governments.

The incorporation of the environmental dimension to the government's general policies, however, is an extremely complex task, and is not fully accomplished yet. Some of the restrictions to the achievement of this objective are, on the technical sphere, the lack of a coherent set of policies and instruments; the lack of knowledge on the functioning of the natural ecosystems; and finally, the lack of accurate knowledge about the national environmental problems. On the political sphere, the main restrictions are conflicts of interests between different social actors, both within the public sphere and between the government and the economic agents. If a feasible set of environmental policies are to be implemented the political context cannot be ignored.

This research is an attempt to confront the Chilean environmental institutionality with the requirements to achieve sustainable development. It will analyse the Chilean environmental institutionality first from the point of view of its internal coherence and secondly in terms of the requirements to achieve sustainable development as proposed in the theoretical analysis.

The emphasis of the theoretical analysis, is technical, since technical knowledge is an indispensable element of any political decision. Finally, the linkages between poverty and environmental degradation cannot be ignored. The inequities on the distribution of wealth, however, are far beyond the scope of this paper.

THIS PAPER

The first part of this paper is dedicated to the analysis of the main theories on sustainable development. Firstly, it establishes the biophysical constraints to human activities, as defined by ecological and physical theories. Secondly, it presents the broad scope of interpretations on how those constraints should affect human activities (chapter 1). Thirdly, it focuses on the economic theories, analysing the most important economic paradigms on sustainable development (Neoclassical, Ecological Economics and Deep Ecology). The different paradigms and their main approaches are analyzed in terms of: i) how they define sustainability, i.e. what is to be sustained, for whom and for how long; ii) which are the conditions or requirements to achieve a sustainable path, i.e. how those conditions should affect human activities; and iii) the main policy implications of each approach (chapter 2).

The objective of comparing the different paradigms is to identify how the set of policies proposed by each of them, if implemented, would affect the interrelationship between human activities and the environment, assessing whether they are sufficient or not to attain the ecological sustainability requirements as expressed by the ecological and physical theories (as expressed in chapter 1). Finally, as a result of these analysis, this paper proposes an interpretation to sustainable development. A set of conditions to achieve a sustainable path are proposed on chapter 3. Ecological and economic requirements as well as institutional adaptations are recommended. A set of environmental principles and policies are also suggested, as well as compatible instruments for environmental policies.

The second part of this paper focuses on Chile. It analyses the Chilean environmental institutionality and how it fits within the general political administration of the country. Special emphasis is attributed to the requirement for decentralization on the environmental decision-making to the regional and local levels. It focussess in two main aspects of the public environmental institutionality, the creation of the National Comission on Environment, CONAMA, and the recent proposal of an Environmental Framework Law, the "Ley de Bases del Medio Ambiente". Finally it confronts the environmental paradigm behind the Environmental Framework Law with both i) the mainstream political-economical environment; and ii) the requirements to achieve sustainable development suggested in chapter 3.

PART I:
SUSTAINABLE DEVELOPMENT PARADIGMS

"Man's continuous tapping of natural resources is not an activity that makes no history. On the contrary, it is the most important long-run element of mankind's fate. It is because of the irrevocability of the entropic degradation of matter-energy that, for instance, the peoples from the Asian steppes, whose economy was based on sheep-raising, began their Great Migration over the entire European continent at the beginning of the first millennium. The same element – the pressure over natural resources – had, no doubt, a role in other migrations, including that from Europe to the New World. The fantastic efforts made for reaching the moon may also reflect some vaguely felt hope of obtaining access to additional sources of low entropy."

Nicholas Georgescu-Roegen (1971)

CHAPTER I

THEORIES ON SUSTAINABLE DEVELOPMENT

This chapter will introduce the environment and its interaction with the economic activities. This analysis will settle the grounds for the understanding of the biophysical constraints imposed by nature over human activities, and the theories of environmental sustainability. The profusion of theories on environmental sustainability is an indicator of the lack of consensus in defining the term. The second part of this chapter will present the wide range of interpretations of environmental sustainability, or the different theories linking the environment and the economic system, going from the biocentric approaches to the extreme technocentrism.

1.1 The Environment: Biophysical Constraints to Sustainable Development

> ***"The economic process is solidly anchored to a material base which is subject to definite constraints"***
> (N. Georgescu-Roegen, 1980:54).

1.1.1 The Environment

The environment will be understood, to some level of abstraction, as the base-system for life and the system where the natural social and economic systems interact. In relation to human activities, the environment fulfils four main functions:

1) Natural resource provider;
2) Provider of natural goods and services;
3) Assimilator of waste products, and
4) Life support base [1/].

The first two functions implies the consideration of the environment as a **production factor**, or as a "natural capital", being able to produce natural resources, goods and services. The difference between the first two functions

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[1/] While most literature usually refers to the first three functions, the recognition of the fourth function is very relevant, especially when dealing with physical planning (see Klaasen et al., 1991:107).

may not be obvious. The first deals with the function of **providing and producing natural resources** in the form of stocks and flows of matter and energy, which are extracted in order to be used in the production process. Defining the second function is more complex, since it deals with intangibles, such as landscapes and cultural heritages, which can be considered as natural goods and services "which the environment provides to support human life, contributing to the quality of life and making it pleasant and full" (Leal, J., 1990:180). Those intangibles include non-material resources such as scenic beauty, pure air, the natural sound of a water fall or of wild birds, absence of noise, etc. The third function deals with the use of the Earth as a waste sink, or assimilator of waste products, including the soil, water and air.

The capacity of the environment to exercise any of those functions is limited. There is usually a trade-off among them. Therefore, the abuse of certain functions of the environment may compromise either its capacity to provide other functions and/or its capacity to continue providing the same function in the future (both in quantitative or qualitative terms).

There are two basic and complementary streams of thought on trying to explain the factors determining the limits of the environmental functions. The first one, is based on Physics, namely the first two laws of thermodynamics. The second stream is compounded by a set of complementary ecological approaches. The two of them will be analyzed next.

1.1.2 (Bio)Physical Constraints

The necessity of explaining the interactions between the economy and the natural environment led economists during the sixties to search into the physics for an analogy that would permit them to characterize these interactions. **The first and second laws of thermodynamics, concerning matter and energy**, were of especial interest for them due to their similitude with the interactions between the economic and natural systems [2/].

i) The first law of thermodynamics:

This is also known as "the law of conservation of matter and energy". It states that the total amount of matter and energy ("*matter-energy*") remain constant in **any closed system** (nothing is created, nor destroyed, but everything is transformed). Matter-energy is an essential input to the economy. Considering the first law of thermodynamics, the difference between

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[2/] Thermodynamics is a small branch of physics. It grew as a consequence of a memoir of the french engineer Sadi Carnot, in 1824, where he studied, for the first time, the **economy of heat engines**. It was born as the "physics of economic value" (Georgescu-Roegen, 1980:52).

what goes into the economic system as inputs and what comes out, is only **qualitative**

Consequences of this law are: i) there is a limit to the total amount of matter-energy available in any closed system; and ii) the matter-energy used in the productive process must end up returning to the natural environment as waste.

In relation to the first consequence, technological improvements are able to increase the efficiency in the use of natural resources, acting in practice as if the stocks had grown in size. Therefore, some optimistic technocentrists tend to ignore almost completely this first consequence. The second consequence is more difficult to ignore, albeit the critical problems of disposing of wastes on the great urban centres, industrial areas, etc.

ii) The second law of thermodynamics: the Entropy Law

The concept of entropy entails a distinction between two kinds of energy: a) **free, or available energy**, which is the energy over which man has command, and b) **unavailable or bound energy**, which is a "chaotically dissipated energy", which man cannot use. Georgescu-Roegen illustrates it with the burning of a piece of coal: although its chemical energy remains constant, the initial free energy becomes so dissipated in the form of heat, ashes, and smoke, that it can no longer be used by man. The initial free energy has become into dissipated, bound energy.

The entropy is a measure of the total amount of bound energy. Since bound energy is energy in disorder, it is also defined as a measure of disorder. Georgescu-Roegen (1980:52) explains the Entropy law as follows:

> "In general, the free heat-energy of a closed system continuously and irrevocably degrades itself into bound energy. The extension of this property from heat-energy to all other kinds of energy led to the second law of thermodynamics, alias the entropy law. This law states that the entropy (i.e., the amount of bound energy) of a closed system continuously increases or that the order of such a system steadily turns into disorder."

It follows that, once the total amount of free energy (low entropy) of a closed system have been transformed into bound energy (high entropy), the only way of reverting the process is by bringing some free energy from outside into the system. Applying this law to all forms of life, the author states that, every living organism strives to maintain its own entropy constant. As matter, however, it cannot elude the entropy law, and the only way in which it can maintain its level of entropy is by sucking low entropy from the

environment to compensate for its own increase in entropy. Although the organism have compensated for its increase in entropy, the entropy of the whole system, consisting of the organism and its environment, has increased. He concludes that:

> "In entropy terms, the cost of any biological or economic enterprise is always greater than the product. In entropy terms, any such activity necessarily results in a deficit" (Georgescu-Roegen op. cit. pg. 53).

The first consequence of this law is that, any form of life generates 'deficit' in entropic terms, that is, it will generate less low entropy than the one it consumes.

b) Applied to the Earth as an isolated or closed system, **the entropy law would condemn life on earth to decline once the earthly stocks of concentrated energy and matter have been dissipated**. Since the Earth is not an isolated system, it is gaining solar energy which is permeating the system continuously, some level of continual resource use can be sustained on the basis of solar energy recycling (Pezzey, 1992:324; Barbier, 1989:51-55).

c) An additional consequence of the entropy law is that **full recycling is not possible**, since a part of the matter-energy used in the process will inevitably dissipate into bound energy.

The first two laws of thermodynamics are the base for the stock and flow analysis, which models the interaction between economic activities and the environment, and which will be addressed on section 1.1.4.

1.1.3 Complementary ecological concepts

Some additional concepts explaining the boundaries imposed by nature to human activities have been developed from the ecological point of view, and are used throughout the environmental literature. The most important of those concepts are:

a) **Carrying capacity**: given a finite natural resource base, a region for example, and a certain technology, the natural system is able to support a certain population of wild life, people or a certain intensity of a given economic activity. If this limit is not observed, the natural resources will be depleted.

b) **Maximum sustainable yield (MSY)**: a natural resource can be harvested safely only up to a certain level, the MSY, which is determined by the capacity of the system of reproducing that given resource (eg. fish, or wood). The non-observance of the MSY would result in the unsustainability of the resource.

c) **Assimilative capacity**: the capacity of a region to absorbe wastes (the self-purification capacity) is limited. Emissions beyond the assimilative capacity will result in a stock of wastes (pollution), which no longer can be absorbed by the environment, thus compromising other environmental functions as well as its regenerative capacity.

d) **Closing of substance cycles**: the concept of closing substance cycles is based on the assumption that, when waste is produced beyond the natural absorptive capacity of the system, the natural cycle is being "opened", there is a leakage of wastes, leading to the disequilibrium of the system. Two basic strategies are proposed to prevent those leakages: increasing the quality of the products so that they can be assimilated by the environment, and recycling the wastes in order to increase their life within the productive system.

e) **Resilience** is the capacity of a substance, person, object, system, etc, to recover its former shape or size after being submitted to stress or shock. This term was first used in an ecosystem context by the ecologist C.S. Holling in 1973. He argued that the ecosystems are never in a steady state, and that trying to maintain the stability of an ecosystem in an ever changing environment imposes increasing stress upon it. Holling used the word resilience as "a measure of the ability of the ecosystem to adapt to a continuously changing environment, being able to absorb external shocks without major structural damage" (Munn, 1990:54).

The combination of the ecological concepts explained above and the first and second laws of thermodynamics allowed for the construction of simplified models of stocks and flows representing the interrelations between the economic system and the natural system.

1.1.4 Stock and flow analysis

A model of the linkages of economic activities with its environment is shown in **figure 1.1**. This model integrates the **dynamic processes** taking place in both economic and ecological systems through the flow of materials and energy taking place between them. In this analysis, the Earth, or the ecological system, is a closed system, except for the energy it receives from the Sun. The economic system is presented as a sub-system within the ecological system. As a consequence of the first law of thermodynamics (the total amount of matter-energy remains constant in any closed system), **if the economic system increases in size, it will do it at the expense of decreasing the size of the natural system.**

Processes and stocks are differentiated in the figure. **The production process** uses man made capital (Km), labour, natural capital (Kn), which comprises both renewable and non-renewable natural resources, energy, and occupies space; it

converts those inputs into goods and services, and produces wastes and emissions. **The consumption process** converts goods and services into wastes and emissions, and uses space. **The waste treatment process** uses labour, capital, energy and space as inputs, and produces recycled materials, wastes, and emissions (100% recycling is not possible according to the second law of thermodynamics). The wastes which cannot be recycled and exceeds the absorptive capacity of the Earth, ends up in the waste (pollution) stock. **The emission abatement process** finally will convert some emissions into recycled materials or wastes. The remaining emissions, together with the natural emissions form the main determinants of the actual concentrations of substances at different locations (van Ierland, 1993:6-7).

MAIN INTERACTIONS BETWEEN THE ECOLOGICAL AND ECONOMIC SYSTEMS

Materials Balance and Stock Flow Approach

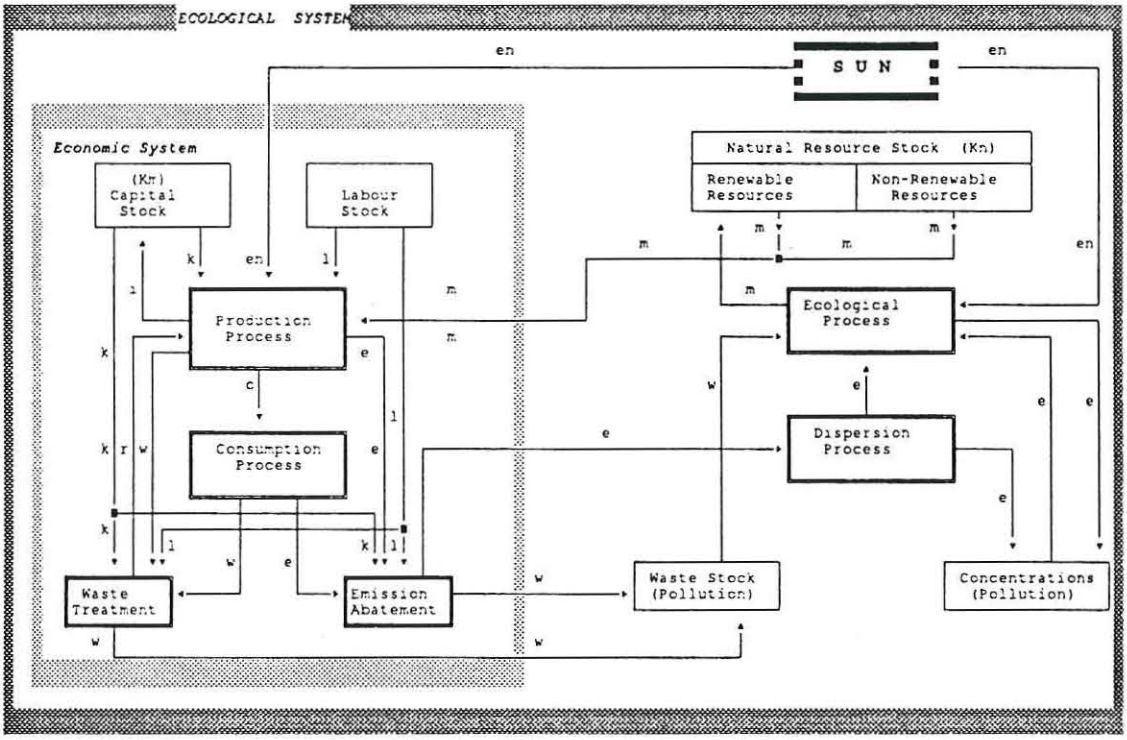

figure 1.1

Source: Ekko van Ierland, 1993:6. Slightly modified.

Flows of services are also derived from the human-made capital stocks leaving them intact. **Flows of materials** are extracted from the natural resource stocks leaving them depleted, except for the natural reposition of the

renewable resources (given that the MSY is observed).

Finally, **pollution** is a **man-made stock of bads** in the natural environment. Since the amount of matter and energy is constant (except for the energy flow being received by the sun), the bigger the pollution stock, the smaller the natural resource stock and the environmental quality.

As a result of these considerations, ecological sustainability can be defined in function of waste generation and resource consumption, thus requiring that economic activities:

a) Utilizes renewable resources at rates less than or equal to the natural managed rates of regeneration;

b) Generates wastes at rates less than or equal to the rates at which they can be absorbed by the assimilative capacity of the environment; and

c) Optimizes the efficiency with which exhaustible resources are used, which is determined, by the rate at which renewable resources can be substituted for exhaustibles and by technological progress (Barbier and Markandya, 1989:3).

Implicit to the three considerations above, is the consumption of low entropy (free energy) at rates less than, or equal to, the flow of free energy being received by the sun. The classification of the solar energy as free energy or bound energy is, to a certain extent, a function of the technological capacity to make use of that energy flow. The waste-absorptive function is a process in which the Earth transforms high entropy in low entropy, with the use of energy. If those imposed constraints are not observed, the resulting accumulation of wastes (high entropy) and the depletion of the resource base (low entropy) would lead to environmental degradation, which can also be interpreted, at a higher level of abstraction, as the scarcity of free-energy, or a high entropy.

Finally, this analysis will be concluded with some additional words of Georgescu-Roegen:

> **"The statement made earlier – that, from a purely physical viewpoint, the economic process only transforms valuable natural resources (low entropy) into waste (high entropy) – is thus completely vindicated. But the puzzle of why such a process should go on is still with us. And it will remain a puzzle as long as we do not see that the true economic output of the economic process is not a material flow of waste, but an immaterial flux: the enjoyment of life."** (1980:53)

1.2 General Interpretations on Sustainable Development

> **"We don't know if we can achieve sustainability: what we do know is that the current path is unsustainable and that, by correcting two failures (market failure and government failures) we may braise the chances of getting on a sustainable path."** (Pearce, 1992).

1.2.1 The Concept of Sustainability

Sustainability is, in first place, an ethical, moral issue. It entails an intergenerational equity issue: it is about being fair to future generations. It means that, at least, future generations should be left no worse off than present generations. As a consequence, 'allocations that impoverish future generations, in order to enrich current generations, are, patently unfair' (Tietenberg, 1992:36).

"Sustainable Development" seems to be gaining consensus nowadays. In fact, it is said that the term 'sustainable development' is being included in the jargon of development planners, the slogans of environmental activists and is becoming the 'watchword' for international aid agencies, without a clear definition of its meaning, objectives and means (Lélé, 1991:607). The reason for that "explosion" is that, the increasing awareness of the population has transformed the environmental debate on a political issue.

One of the reasons behind the lack of a clear cut definition of this concept is that different people actually **mean** different things by 'sustainable development'. A definition that would be widely, universally accepted would have to have, to some extent, a degree of vagueness and generality. An example of that fact is the most commonly accepted, used and quoted definition in the last few years, the definition of the United Nations World Commission on Environment and Development (WCED), also known as the Brundtland Report: **"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"** (WCED. 1987:43). This definition entails the moral principle of concern and responsibility toward the futures generations, but, alone, it lacks operationality.

Development is a value word. It refers to a process of directed change toward a situation that is preferable to the existing one. Defining development, thus, involves clarifying both the objectives and the means of the process.

Sustainability refers to being able to maintain, support or bear an activity

for a long period [3/]. It is used in relation to different kinds of constraints. The nature of the sustainability may be social, political, economic, environmental or, in a broader sense, the summing up of those factors. The term "sustainable development" started to be used broadly during the 80's in association with the environmental dimension of sustainability.

But, what does it means when it comes to decision-making? How can this criterion be operationalised at different levels of scale? Defining sustainability, involves, according to Lélé, in first place, defining **what** is to be maintained, **how long** will it be maintained and **for whom**. The answer to those questions is not consensual. In fact, there are several schools of thought and different approaches to this issue. They can be grouped in broad streams of though. The wide scope of interpretations on sustainability will be analyzed on section 1.2.2.

As a general conclusion, however, we can agree with Lélé in the fact that, if 'sustainable development' is presumed to be development plus sustainability, then, sustainable development could be understood as "a form of societal change that, in addition to traditional development objectives , has the objective or constraint of ecological sustainability" (Lélé 1991:610).

1.2.2 Mainstreams of thought

A rough characterization of the mainstreams of thought in relation to the issue of environmental sustainability (from now onwards "sustainability") permits the identification of three relevant distinctions, based on: i) whether the analysis is biocentric or anthropocentric; ii) its scope of concern; and iii) its "degree of greenness".

i) First distinction:

Two basic streams can be differentiated regarding the relative importance which they confer to the human beings in relation to the rest of the natural environment. The eco-centric or biocentered and the anthropocentric streams. Each one of them have different schools of thought and different approaches within those schools.

a) **The eco-centric or biocentered stream**, roughly, face the issue of sustainability as going beyond human welfare. Nature is considered to have an "intrinsic value" that goes beyond human values, and human life is considered to be as valuable as any other form of life, therefore, since 'the Earth can support a limited amount of biomass, and that the more of it that

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[3/] Oxford Dictionary.

is composed of humans or turned to humans use, the less is available for other life', **the humans will have to constrain their economic and demographic growth on behalf of other forms of life** (Johns, 1990:235). The ecological view considers that 'species and ecosystems are entities, that they have interests, and, moroever, that those interests and all interests are morally significant and that they have their own right to defend it against leading objections (Johnson, 1992:154). Human beings are regarded as taking decisions on behalf of the other living beings with whom they share the planet.

From a less radical approach, the ecological viewpoint is described as trying to search sound balances between nature and man. This approach is not for 'an optimal use of the environment for economic purpose', but for an 'optimal balance between human and non-human claims'. As a consequence, it would be necessary to regulate the influence of human economic activities over the environment (UNSO, 1990:3).

b) **The anthropocentric stream**, in contrast, is centred in human welfare. Nature is commonly considered as existing to fulfil human needs and wants. The concern for ecological sustainability is usually referred to as a concern towards the well-being of actual and future human generations. In other words, the ecological danger is faced as a threat to human welfare, since it implies diminishing, in quality or quantity the 'services' or functions which the environment accomplishes in relation to human activities (life-support system, production factor and waste sink). Limits on consumption are imposed only when they affect the sustainability of the exploitation of the natural resources (Johns, op cit., p.242; UNSO, op cit).

ii) Second distinction:

Within the ecocentred and anthropocentric streams, a wide range of approaches can be distinguished. In relation to the **scope of concern**, we can distinguish a **wide, holistic interpretation**, concerned with sustainable economic, social, political and ecological development, and a **narrow interpretation**, concerned with an 'optimal resource and environmental management over time' (Barbier and Makandya, 1989:1; Lélé, 1991:610-611). A wide range of intermediate interpretation can be found between the 'holistic' and 'narrow' interpretations.

iii) Third distinction:

In relation to the **'degree of greenness'** we can distinguish various approaches going from the 'extreme green wing' (Deep Ecology, biocentered stream) to the conventional neoclassical laissez-faire approach (*homus-economicus* centred). Each one of them entails different implications in the magnitude of the constraints being imposed by the environment over the human/economic

activities. Those constraints would go from the proposal of literally diminishing the human population on one extreme:

> "There is, I believe, widespread agreements among Greens and deep ecologists that **fewer humans** (and especially less extensive occupation of the globe) as well as equitable and drastically curtailed consumption are essential to restoring the balance of the planet" (Johns, op. cit pp.237)

to the absolute 'laissez-faire' on the other hand, arguing that whenever a natural resource is depleted it will be replaced by human knowledge, generating new technologies which will substitute the depleted resource. That is what O'Riodan and Turner calls the '**Cornucopian Technocentrism**' and Pearce calls '**the unfettered free-market philosophy**' (Pearce and Turner, 1990:14; Pearce, 1992:4).

Pearce ranges different approaches to the greening of the economy, in function of their consequences in the economic scale of growth. From less to more 'green', or from absolute non-intervention or laissez-faire to command and control approaches. He distinguishes the following five approaches:

(1) **Cornucopian Technocentrism**: this approach does not care about the depletion of natural resources, 'since technological changes will solve the arising problems';

(2) **Green Markets**: the creation of green markets (such as pollution rights), as a way of having the markets regulating the use of the natural resources by reflecting their relative scarcity.

(3) **Constant Capital approach**: this approach advocates that future generations should be left as well off as present generations, therefore, the actual stock of man-made and natural capital should remain constant or be enhanced.

(4) **Zero Increase in Scale (Z.I.S)**: advocate zero economic growth (ZEG) and zero population growth (ZPG). They suggest that zero increase in scale of growth is all that is required for sustainability; and

(5) **Negative Increase in Scale (N.I.S.)**: are the most 'radical greens', suggesting the need negative change in economic output as well as reduced population levels (Pearce, 1992:4; Johns op. cit.)

The most relevant approaches to the greening of the economy, according to its scope of concern and 'degree of greenness' can be localized in the following matrix:

Main Approaches to the Greening of the Economy

Scope of Concern / *Degree of Greenness*	Wide, Holistic Interpretation	→ → →	Narrow Interpretation
Deep Ecology	N.I.S. Z.I.G.		
↓	Institutionalists	Constant Capital	Green Markets
'Neoclassical Laissez-Faire'			Technocentrism, Free Market

Figure 1.2

The different approaches to the greening of the economy can be classified, roughly, as belonging to **three different paradigms: Neoclassical Economics, Ecological Economics and Deep Ecology**. Chapter 2 will analyse the most important economic paradigms on sustainable development. In spite of the risk of classifying those approaches as belonging to specific schools of thought [4/], for the sake of the understanding of the structure of the following two chapters follows a diagram with the three prevailing paradigms, and the most important resulting approaches (figure 2.1). The theoretical historical roots of those paradigms are indicated on the left side of the diagram.

1.3 Conclusions

The environment accomplishes four basic functions in relation to human activities: it is the base-system for life, a provider of natural resources, a provider of goods and services and a waste absorber. The awareness that the capacity of fulfilling those functions is limited generated a set of theories trying to explain the environmental boundaries, based in ecological concepts and biophysical laws.

The first and second laws of thermodynamics have been used since the seventies on the attempt to link economics to its physical environment. As a consequence of those laws, economic activities are analyzed as constantly

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[4/] Ecological economics is a subdiscipline which embraces a diversity of doctrines, as can be observed in the diagram (figure 2.4), and the different approaches which will be analized comprise elements of different schools.

using low entropy inputs and producing high entropy outputs. Economic activities are thus constrained by the existence of a finite stock of low entropy, the free energy being received by the sun and the limited capacity of the Earth to convert high entropy in low entropy. Failing to observe those constraints would result in accumulation of wastes (high entropy) and depletion of the natural resource base (low entropy).

How should the nature's biophysical constraints affect human activities is a controversial matter. Different interpretations on how should the Nature's boundaries affect human activities are read through the different theories on Sustainable Development. Those differences reflect ethic choices since, in last instance, defining environmental sustainability is a moral issue, based in values. It involves being fair to future generations and respecting the rights of other species to exist.

CHAPTER II

PARADIGMS LINKING ECONOMY AND ECOLOGY

So far, the biophysical constraints to human activities as well as the wide scope of interpretations on how they should affect human activities have been approached on chapter 1. Those interpretations can been classified in three main paradigms: Neoclassical Economics; Ecological Economics and Deep Ecology.

2.1 Main Paradigms

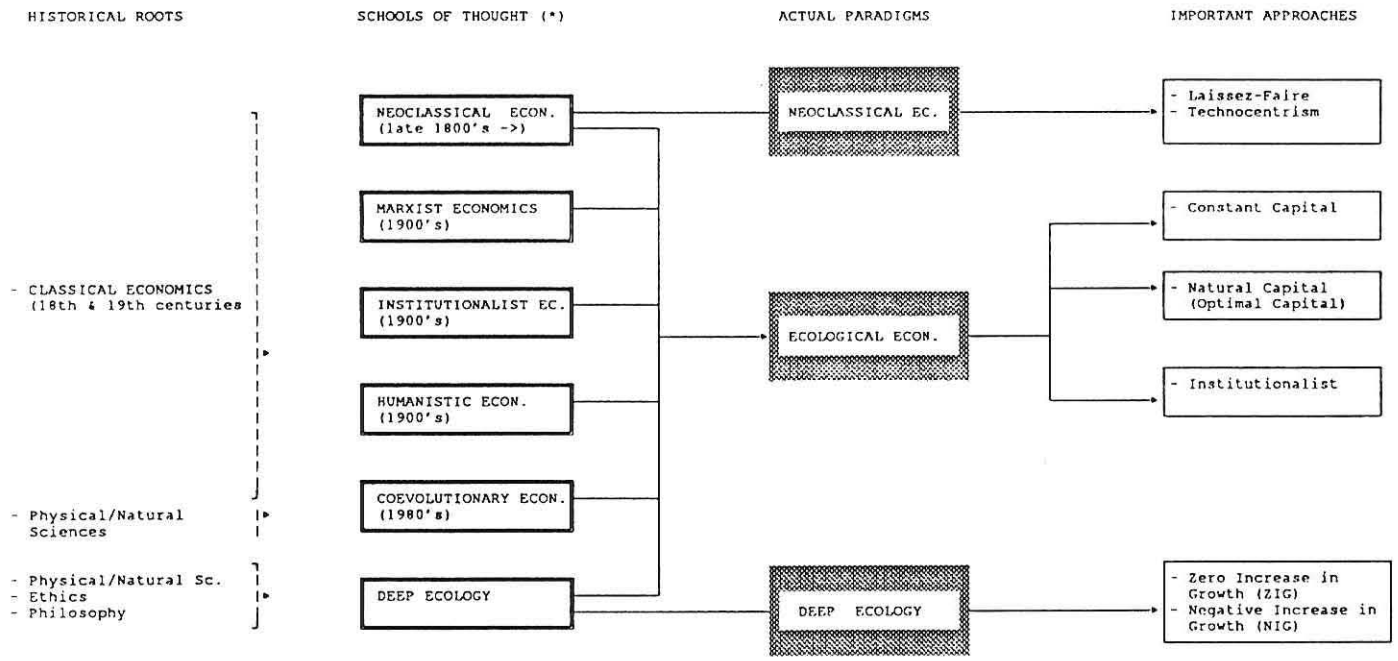
This chapter will analyze, first, the most important economic paradigms linking economy and ecology, Neoclassical and Ecological Economics. Then, it will identify four relevant approaches within those paradigms, namely, the Laissez-Faire, Constant Capital, Natural Capital and the Institutionalist approaches. Those approaches will be analyzed in terms of: i) how they define sustainable development; ii) the implicit or explicit requirements to achieve sustainability according to each approach, their main virtues and drawbacks, and finally iii) the policy implications coherent with each approach.

The extreme ecological paradigm, Deep Ecology, will not be further analyzed. The reason for that omission is that it is basically a philosophy, with no concrete strategies of action. While the radical proposals of 'zero scale in growth' and 'negative economic and population growth' are stated as a condition to the achievement of environmental sustainability, the **means** to achieve such objectives remain unclear. In addition, those proposals are not relevant to the Latin American countries environmental debate today, since the requirement for economic growth in those countries is indisputable.

2.1.1 Environmental Neoclassical Economics

Conventional Neoclassical Economics deals with natural resources as non-scarce goods (with the exception of land). Natural resources are relevant only as far as they are traded on the market. In traditional neoclassical economics only the productive factors of labour and capital are dealt with, neglecting the third factor, natural resources (Opschoor et al, 1992:67). Economic growth is defined as an increase in consumption, while economic development is defined as an 'increase in welfare'. The problem with this second definition is that 'welfare' is measured in terms of economic output. In fact GNP is usually taken as a measure of welfare.

ACTUAL PARADIGMS AND IMPORTANT APPROACHES
TO THE GREENING OF THE ECONOMY



*) The Economic Schools of Thought are based on Pearce and Turner's Diagram (1990:5)

Figure 2.1

The central premises of the neoclassical paradigm, according to Klaasen and Opschoor, are [5]:

a) **The fixed content premise**: a range of parameters are assumed to be static or given, including preferences or needs, the state of technology and the state and functionining of the environment;

b) **The maximization premise on behaviour**: individuals and groups will try to maximize their objective function, especially welfare for individuals and profit for enterprises; where welfare or utility depends exclusively on the level of consumption.

c) **The weighing premise on evaluation**: all relevant changes and consequences of economic choices can be reduced to neat balance figures and can be ranked.

Environmental Neoclassical Economics partly relaxes the first premise in relation to environmental quality and technological innovation. While economic growth continues to be defined as an increase in production, which might depend on the use of natural resources, economic development or welfare is measured not only on the level of economic output, but is considered as depending also on other factors, such as environmental quality, pollution, and natural resource stock. Welfare is regarded as incorporating future utilities through discounting. Environmental problems, pollution among them, are seen as an externality, a 'public bad' or an 'external diseconomy' [6].

In the case of renewable resource, the regeneration function of the resource is a function of the size of the resource stock and pollution levels. The highest level of extraction that can be drawn from a resource stock without compromising the existing stock is the maximum sustainable yield (MSY). If the extraction is bigger than the MSY, the resource is being depleted. The environmental stress should, therefore, bound both economic growth and population size to a maximum.

If continuous technological improvements occur, increasing the efficiency in the use of natural resources or, in other words, increasing constantly the output per unit of input, and scarce resources may be substituted by others,

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[5] See Klaasen and Opschoor, 1991:93-95.

[6] **External diseconomy** was defined by Pigou's Economics of Welfare (1920) as the production of a negative 'by-product' by one or more economic agents. 'This by-product, though unwanted and unasked for, is delivered unintentionally, and behind the back of the market. The loss experienced by the victim is not regarded as a cost-item by the originator of the external diseconomy' (Dietz and van der Straaten, 1992:100).

continuous economic growth would be possible. Therefore, the **conditions** to achieve sustainability within the neoclassical paradigm, and some relevant conclusions to policy implementation are as follows:

a) If production/consumption depends on the use of a renewable natural resource, there is a level of consumption that can be maintained forever. The highest level of extraction that can be drawn from a resource stock without compromising the existing stock is called **maximum sustainable yield (MSY)**. If the extraction is bigger than the MSY, the resource is being depleted. Technological progress may enable economic growth within the MSY boundaries, by increasing the efficiency in the use of NR.

b) Economic growth can be sustained even if the production process depletes a renewable natural resource at a rate faster than the regeneration rate <u>if</u>: i) the natural resource can continuously be substituted by man-made capital; or, ii) if there is an exogenous agent delivering technological progress.

c) If production/consumption depends on the use of an exhaustible natural resource, a constant level of annual consumption can only be sustained if 100% recycling is achieved, or if a very rapid technical progress takes place, by either continuously increasing the efficiency in the use of the resource and/or substituting it by the use of a renewable resource.

d) **Pollution** will lower the sustainable level of production/consumption by bothr its negative impacts on productivity and resource regeneration (lowering the MSY) and the costs of environmental protection measures. Pollution, thus, affects production and welfare.

e) **Irreversibilities** should pose a restriction on exploitation of natural resources.

In this model, welfare is dependent on the volumes of resource extracted, while the regeneration of the resource depends on both the stocks of the natural resources and the stock of pollutants. There is apparently a contradiction between welfare and sustainability.

In a steady state, both the stocks of pollutants and the resource stock are constant. Assuming a steady state, if the initial level of environmental quality is 'higher than or equal to the equilibrium level, a stable and sustainable economic level is possible'. If the initial levels are below the equilibrium level, then it will be unsustainable.

2.1.2 Ecological Economics

Ecological economics focuses on the linkages between ecosystems and economic systems. The premises of ecological economics are as follows:

a) The 'fixed context' premise is replaced by the **'circular interdependence'**, where the major environmental processes are incorporated, and the essential biophysical laws are taken into account;
b) **Society's values** may deviate from the sum of the aggregate individual values;
c) **A value hierarchy** exists and values are perceived as operators of human behaviour, beyond wants and welfare. Sustainability and environmental compatibility are proposed as ultimate values, implying species protection and ecologically viable patterns of resource consumption. (Klaasen et al op cit, 104-106)

In general terms, ecological economics bases a great extent of its analysis on neoclassical environmental economics. Concepts such as the maximum sustainable yield, and environmental externalities, based on Pigou's theory, are broadly employed on both the examination of the environmental problems and the instruments proposed for environmental protection. Ecological economics, however, state that natural resources are substitutable by man-made capital only to a certain extent, therefore a path that deplets the natural resources beyond a certain threshold leads to irreversible environmental processess and cannot be sustained forever.

The sub-discipline of ecological economics has its origin in different economic schools of thought, such as the Neoclassical, Marxist, Institutionalist, Humanistic and Coevolutionary economics, as shown in figure 2.1 [1/] . As a result, different approaches to the greening of the economy coexist. The next section will analize the most relevant of them.

[1/] For more information on the different paradigms in which ecological economics is rooted, see Pearce and Turner 1990:4-27.

2.2. Relevant Approaches of Environmental Economics

Between, and within, the Neoclassical and Ecological Economics different approaches arise. A clear cut classification of those approaches as belonging to one paradigm or the other is not easy, and would probably be a futile exercise, since environmental economics itself is strongly rooted in Neoclassical economics and, most approaches have picked up elements of several schools of thought, with different emphasis in one or another, different scopes of concern as well as different 'degrees of greenness'.

This section aims at analysing four relevant approaches to environmental economics: 'Laissez-faire'; 'Constant Capital'; 'Natural Capital' and 'Institutionalist' approaches. The study will focus basically on the following three aspects: **first**, how the concept of sustainability is defined; **second**, the conditions to achieve sustainability, according to the given definition; and **third**, the identification of relevant policy implications from the first and second points.

2.2.1 The Laissez-Faire Approach

The 'Laissez-Faire' approach or the 'free-market philosophy' does not define explicitly the concept of environmental sustainability. This approach considers that the free market is the best and only efficient resource allocator, therefore, environmental problems will be faced and solved by the market forces when time comes.

What is to be sustained according to this approach, is clearly the economic system. The short term is the most important concern, since the preoccupation towards the maximization of profits or 'efficiency' in the resource allocations will almost always favour the present in detriment to the future: the private cost-benefit analysis is biased toward the present, since the higher the discount rate, the less will be the value of a future yield foregone today. **Even very low discount rates will make the value of a future yield negligible when the time horizon is too long**, as is the case with the preservation of nature. As an inevitable consequence, the short term or the present maximization of benefits will be emphasized. The moral concern about the welfare of future generations relies on the blind belief that technological improvements will cope with environmental problems.

The concept of economic efficiency however, affects the environment in more ways than just being biased in favour of the short term. The traditional economic approach also has a bias in favour of transforming natural capital stock into man-made capital stock. The reason of this preference is that a

superficial view of the comparative **rates of return** of natural and man-made capital would favour the increase of man-made capital at the expense of the environment, given that the two forms of capital are substitutes (Pearce et al., 1988:17). A deeper analysis would reveal environmental benefits which are not being accounted and which in fact are contributing to human welfare in general, and to the greater efficiency of the economic system in particular. Examples of those, are the intangibles, such as the landscapes, or the absence of noise, or even in other sphere, the prevention of natural catastrophes, such as floodings.

CONDITIONS

The conditions to achieve sustainability within this approach would be three-fold: i) the absence of market failures; ii) that the natural capital and man-made capital would be perfect substitutes; and iii) increasing and sustainable technological improvements, that would permit human beings to substitute natural resources by man-made capital *ad infinitum*.

The first condition have been proven to be highly improbable, in any economic system, not to say impossible, since it would only occur in the presence of a 'perfect market' and, is common knowledge that perfect markets represent only a negligible part of the economic system. Natural and man-made capital are substitutes only to a certain extent, as will be discussed in more detail when analysing the natural capital approach. Finally, the third condition is based more on "faith" than in scientific evidence, since facts have shown that human intervention in certain ecosystems have generated, in many cases, irreversible situations in spite of the existing technology. Endless examples of environmental problems or 'undesired side-effects' of economic activities can be listed, at different levels of scale, so as to prove the fallacy of the premise that technology alone, without imposing any type of constraint to the actual pattern of natural resource depletion, will solve the existing or projected environmental problems.

POLICY IMPLICATIONS

The policy implications of this approach are summarized as a non-intervention policy: no regulations, no governmental intervention in the free market forces, and a private 'technological treadmill', described by Pezzey as a **"never-ending and highly uncertain race to acquire better knowledge and tools to make up for continual resource depletion and environmental degradation"** (Pezzey, 1992:354).

The conclusion after analysing this approach is that it aims at the sustainability of the economic system only. Its bias towards the present

maximization of economic benefits leads to a non-sustainable rate of natural resources exploitation provoking, finally, the degradation and depletion of the environment, and as a consequence, the unsustainability of the economic system itself, the ultimum 'object of sustainability concern' in this view. The conditions required to achieve sustainability in this approach are clearly unfeasible, and even the most extreme neoliberal governments have, to some extent, been obliged to exert certain level of intervention in order to guarantee some degree of environmental quality within its national boundaries.

2.2.2 The Constant Capital Approach

The basic premise of this approach is that future generations should be left no worse off than present generations. The Constant Capital approach has two interpretations: a wide interpretation, which will be analyzed here, and a narrow interpretation, which will be analyzed in the next section as the 'Natural Capital Approach'. The reason for dividing this approach in two is that the difference between both interpretations is extremely relevant in terms of policy implications: the basic difference is about what is to be maintained so as to ensure that future generations will not be worse off than current generations.

A definition for SD within this 'broad approach' is given by the United Nations Statistical Office as follows:

> "sustainable development means that economic activities should only be extended as far as the level maintenance of **man-made and natural capital** will permit it" (UNSO, 1991:27, emphasis is added).

A broader interpretation to the concept is given by Repetto in the following terms:

> "Sustainable development [is] a development strategy that manages all assets, natural resources and human resources, as well as financial and physical assets, for increasing long-term wealth and well-being. Sustainable development as a goal rejects policies and practices that support current living standards by depleting the productive base, including natural resources, and leaves future generations with poorer prospects and greater risks than our own" (Repetto, 1986, quoted in Pearce et al., 1990:4)

Implicit in this approach, is the idea that **man made capital and natural capital are perfect substitutes**. The basic assumption is that the future generations would inherit a combined capital stock (natural and man-made), and that the total value of that capital should not be smaller than the one of the current generations, therefore, a depleted resource (eg. oil) should be

compensated by an investment generating the same income. Pearce summarises this approach as follows:

> "The broad interpretation of sustainable development is consistent with running down environmental wealth as long as man-made capital is substituted for it, and as long as the 'trade-off' is fully informed in terms of the right prices for the two forms of capital" (Pearce, 1989:3)

CONDITIONS

The basic condition to achieve sustainability in this view is to maintain (or increase) the existing capital stock. This statement admits, at least, two interpretations:

i) The first interpretation is that the physical capital stock must remain constant, or increase; and

ii) The second interpretation is that total value of all capital stocks (man-made and natural) must remain constant.

The first interpretation is referred to renewable resources, and has little relevance when applied to exhaustible natural resources, such as oil or minerals, since any amount of extraction will necessarily diminish the physical stock size. This interpretation brings up the problem of how to sum up completely different things, such as the amount of tropical forests, the quality of the ozone layer and the number of hospitals.

The second interpretation **allows for a declining physical stock over time**, since a declining in physical stock would be accompanied by an increase in the economic value of the existing (remaining) stock, whose value would thus, remain constant. One of the operational problems of this interpretation is how to attribute economic value to the natural assets, specially when they do not have marketable prices, and how to interpret all the economic values of multifuctional resources, such as the value of avoiding future catastrophes [8/] (Pearce et al., 1988:10-11).

Other version of the constant economic value concept is the view that a constant capital stock can be interpreted as one where the price of the stock

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[8/] Endless examples of the neglect of those functions can be found in the history of the urbanization process of many cities, such as the depletion of the watersheds in Jakarta, the acute flooding problems of many cities in Brazil due to the excessive impermeabilization of the soil in critique areas, or the urbanization of Mapocho's riverside in Santiago, which in addition to the urbanization of the surrounding hills generated several floodings in Santiago during the eighties. What would have been the value of avoiding those catastrophes ?

remains constant over time. The idea is that the price would reflect the relative scarcity of a the natural resource: higher prices would reflect scarcity and lower prices would reflect abundance. This may occur with non-renewable resources, which have uncertain reserves. It may also have some degree of validity to renewables, when the flow of harvest gets to be affected due to a decrease in the stock: as an example, when as a result of a continuous excessive harvest, the capture of a certain fish becomes more difficult and as a result, the absolute amount of capture decreases, that decrease in the flow of capture will certainly be reflected on prices. This is not likely to occur, however, with some types of renewable resources, like fuel-wood, since prices may remain constant until the flow of harvest diminishes drastically .

POLICY IMPLICATIONS:

It is difficult to define explicit policy implications when the interpretation of the concept itself is not clear yet:

> "In general there is no easy interpretation to the idea of a constant capital stock. Some combination of an equal value rule with indicators of physical stocks to allow for critical minimum stocks (which in turn , might qualify as 'sustainability indicators') appears appropriate, but the issues have yet to be resolved." (Pearce et al. op. cit p.11).

What is clear, however, is that natural resources depletion would be allowed as far as its value would be substituted by man-made capital. There is no consideration in this approach about a threshold beyond which natural capital can no longer be depleted, on a security bases. The issue of non-substitutability of some functions of the natural environment, such as the life support function, the aesthetic functions of a landscape, etc, are not taken into account as well.

As a general conclusion, **this approach does not address the issue of environmetal sustainability in its full dimention**. It definitely will not lead to the necessary protection of the natural systems. It allows present generations to take important and irreversible decisions on the amount of natural capital that should be bequeathed to future generations, such as the substitution of natural capital by man made capital, on the basis of the **preferences of actual generations**. Since we will never be able to ask future generations whether they would trade off, for example, the genetic diversity or the aesthetic functions of the environmet, for a greater amount of man made capital, **an ethical and risk aversion attitude should lead us to avoid irreversible environmental looses**. In order to do so, a narrower approach is required.

2.3.2 The Natural Capital Approach

The Natural Capital approach is a narrower interpretation of the Constant Capital approach. It is defined as 'involving the maximization of the benefits of economic development, subject to maintaining the services and quality of natural resources over time' (Pearce and Turner, 1990:24).

This approach considers that:

i) natural capital and man-made capital are **substitutables only to a certain extent**: some functions of the natural environment cannot be substituted by man-made assets, such as the life-support system, aesthetic functions and biological diversity, among others;

ii) there is a **threshold**, or a minimum level of natural assets that must remain constant. Depletion of the natural assets beyond that threshold would lead to **irreversible** environmental processes that would end up in an ecological catastrophe, 'a breakdown in the integrity of the whole system', affecting the recovery rates as well as the resilience of the system;

iii) **scientific uncertainty**, or lack of understanding about the functioning of the natural systems should induce a cautious attitude in relation to trading off environmental assets for man-made capital in order to avoid irreversible looses (Pearce et al. op cit, p.50; Barbier et al., 1989:2)

Considering three above mentioned aspects (unsustitutability of some environmental functions; irreversibility and uncertainty), the Natural Capital approach advocates that, within a risk-aversion attitude, sustainability implies **the non-depreciation of the existing natural capital stock**. If future generations are to remain at as well off as current generations, the natural capital stock is to remain constant, or increase.

The rationale for maintaining the natural capital stock constant or increasing is consistent with:

a) **Intragenerational equity**: a constant or rising capital stock seems to be consistent with the issue of intra-generational fairness or justice to the socially disvantaged (both between and within countries), especially for countries where the population depends directly on natural resources, such as firewood or untreated water supplies. The equity function seems to be less obvious in developed countries, where the access to environmental assets might be biased towards the rich, since it seems to be a high income elasticity for environmental goods.

b) **Intergenerational equity or justice between generations**: natural capital qualifies as a "primary good", or "a good with the characteristics that any rational being would always prefer more of it to less" [9]. Since natural capital and man-made capital are substitutes only to a certain extent, and natural capital is subject to irreversibilities, fairness towards future generations implies maintaining the natural capital stock constant over time.

c) **Aversion to risk arising from our ignorance**: since we don't know important aspects of the multifunctionality of the environmental subsystems, and considering the irreversibilitiy of some environmental processes, a risk aversion attitude is a sound position to be taken.

d) **Resilience to stress and shock**: resilience is the capacity of a substance, object or system of resuming its original form after shock or stress. Both man-made and natural capital contribute to the resilience of an economy with respect to external shocks (such as climatic variations) or stresses (such as international crisis). The greater the natural capital stocks, the greater is the resilience of an economy (Pearce at al., 1988:11-17; Munn, 1990:54-55). Man-made capital contributes to the resilience as well, but it will lack the diversity feature of natural capital [10].

e) **Economic Efficiency**: a superficial view of the internal rates of return of man made and natural capital would suggest that man-made capital is economically more efficient than natural capital, favouring the increase of man-made capital at the expense of natural capital. As discussed elsewhere in this paper, this approach is not considering the value of the multiple functions of the environment [11].

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[9] Rawls' definition of primary good, quoted in Pearce et a., 1988:15.

[10] Man-made capital intensive technologies have made Developed economies display a greater resilience if compared to poorer countries, which rely basically on natural capital stock for the resilience of their economy. This greater resilience however, may be illusory, **'in the sense that technologies being utilised are** utilizing global common property resources, notably the atmosphere and the oceans to receive pollutants, and the evidence of stress in those systems are not under discussion' (Pearce et al, op cit.)

[11] This view is known as the **trade off approach**. It considers that the increase in well being has to occur at the expenses of the natural capital stock: there is supposed to be a trade off between welfare, and the natural capital stock, since welfare is defined in function of an increase in consumption. In opposition to this view is the **complementarity approach**, where the 'standard of living' is positively correlated to the natural capital stock, and economies with low levels of natural capital can improve its welfare only through increases in its natural capital, until they reach the minimum threshold necessary to sustainability (Pearce and Turner, 1990:46-47).

Optimal Capital Stock

Some authors advocates for an optimal capital stock instead of the existing capital stock at the moment in which the decision is being taken. The authors supporting this view [12/] argue that maintaining the existing stock may not be sufficient to achieve sustainability, since **'existing stocks may be regarded as being below optimal stocks in many developing countries'** (Pearce et al., 1988:8). The definition of that 'optimal stock' given by the authors, however, is based mainly on economic considerations. While the 'optimal capital stock', thus defined, succeed in determinig an economic optimum, **it fails in determining both an environmentally optimum, and a safety threshold.**

The definition of the 'optimal stock' is adopted from Neoclassical environmental economics, which defines the **optimal steady state stock** as "one for which any small increase in the stock will yield benefits just equal to the discounted costs of achieving the increase" (Pearce et al., 1988:7; Pearce and Turner, 1990:53-58). Determinig the 'optimal steady state', according to this definition, requires a **cost benefit analysis** in order to determine the benefits and costs related to the changes in stock.

The most important drawbacks of this approach are related with the calculations of the benefits of maintaining a given stock of natural capital. While the calculations of the costs are relatively straight foward: environmental protection costs plus the oportunity cost or the foregone benefits associated with the non-exploitation of a given natural resource, the calculations of the benefits associated with the maintenance of the stock will hardly reflect the value of the multiple functions of the environment. This difficulty arises for two basic reasons: i) limitations on the knowledge of the functioning of the natural systems and, consequentely of the impacts of human interventions, and ii) difficulties associated with valuing in monetary terms environmental functions.

The valuation problems arises basically because most of the environmental services and goods are not traded on markets. When market values are available, on the other hand, they only reflect a fraction of the value associated with the resource: as an example, the market value associated with the loss of a natural forest is reduced to the value of the timber contained in the forest, while the life supporting function and the biodiversity associated with the existence of such forest will not be accounted. When market prices are not available at all, the valuation problems are even more difficult to tackle. Different methods of measuring preferences are actually proposed, but there is no consensus on the validity of such methods in determining social preferences.

[12/] Pearce, Barbier, Markandya and Turner.

In short, while the **optimal capital stock approach** might be an efficient method for dealing with managed natural resources, it becomes short when the **multiple functions** of the environment have to be taken into account, especially the life supporting function, given the limitations of the CBA in dealing with multiple objectives, and the problems which arise at the moment of assessing and valuing the environmental looses and gains in monetary terms.

The use of that kind of purely economic rationale **fails** in conducing towards a sustainable path, since it can easily lead to the definition of an 'optimal capital stock' **below the ecological safety threshold**, leading to irreversible loses which will be accounted to too late. That kind of approach can only be implemented successfuly if complemented with safety standards or norms of environmental quality. The **benefit curve**, thus would be shifted upwards, as the value of the multiple functions of the environment are taken into account. That would increase the benefits associated with each unit of costs of environmental protection, and would shift the 'optimal level' of man made capital (Kn) towards the environmentally defined optimum.

Defining an **optimal capital stock**, in environmental terms, would require, thus, an assessment of the **ecological sustainability** of the existing natural capital stock. Knowledge of the natural environment and of its functioning will be required in order to overtake such assignment and define acceptable levels of natural capital stocks. When this assessment is not possible, at least the maintenance of the existent natural capital stock should be guaranteed.

CONDITIONS:

The conditions to the achievement of sustainability deriving from this approach are more restrictive than the Constant Capital approach's, since the emphasis of the sustainability is shifted from the total capital stock constancy to the non-negative change of the natural capital stock existing at the moment in which the decision is being taken:

> **"We summarise the necessary conditions as 'constancy of the natural capital stock'. More strictly, the requirement is for non-negative change in the stock of natural resources such as soil and soil quality, ground and surface water and their quality, land biomass, water biomass, and the waste assimilation capacity of receiving environments"** (Pearce, Barbier and Markandya, 1988:6)

According to this approach, the maintenance of the essential ecological processes and life support systems, as well as preserving genetical diversity are considered among the conditions for sustainable development. This is the approach which was expressed in the Brundtland Report, and is also the one

adopted by the Netherlands Environmental Policy Plan:

> "If needs are to be met on a sustainable basis the Earth's natural resource base must be conserved and enhanced" (WCED, 1987:57)
>
> "Sustainable development requires that the functions which the environment can supply now or in the future must be maintained as well as possible. The roll-off of environmental problems to other areas, to other scale levels and/or to other generations must be prevented." (The Netherlands, 1989:12).

The above conditions can be operationalized by observing the following long term biophysical constraints:

> i) renewable natural resources should be harvested within their natural and managed rates of regeneration;
> ii) non-renewable resources should be extracted at a rate that would permit renewables to be substituted for them (that would allow a zero rate of exhaustion of the 'composite resource' in the long run); and third
> iii) wastes should be emitted only within the assimilative capacity of the environment (Barbier and Markandya, 1989:4).

The maintenance or enhancement of the natural capital is the basic condition for sustainable development. Environmental degradation is defined in function of:

> i) the flow of waste in excess of assimilative capacity of the environment; and
> ii) the flow of renewable resources harvested from the environment in excess of the (managed or natural) biological productivity of these resources, plus the flow of exhaustible resources extracted from the environment.

These conditions were expressed mathematically by Barbier and Markandya [13/] as follows:

$$S = f\ (\ [W - A]\ ,\ [(R - G] + E]\ )$$

Where:

S = rate of degradation
W = flow of waste
A = assimilative capacity
R = flow of renewable resources harvested
G = capacity of biological productivity
E = flow of exhaustible resources extracted from the environment.

[13/] Barbier and Markandya, 1989, p.4-5, 11.

Therefore, the minimum condition for an economic growth path to be sustainable over the long run would be that:

$$W = A \qquad \text{and}$$
$$R + E = G$$

The narrower interpretation of the Natural Capital approach or the "optimal capital stock", 'should think in terms of optimal rather than exiting capital stocks as the basic condition for sustainability' (Pearce et al., 1988:9). This view requires that existing natural capital stocks be **constant or increasing**. Determining the optimal capital stock will requires engaging in a **cost-benefit analysis** of changes in the stock of assets. Considering hte limitations associated to CBA, this approach can only succeed when attached to norms and standards defining a 'safety threshold'.

A permanent system of monitoring the state of environmental conditions, as well as Environmental Impact Assessments are a pre-condition to generate the necessary information for the assessment and evaluation of the natural capital stock.

POLICY IMPLICATIONS

At the macro and micro economic levels, this approach would suggest three basic policy implications:

1) Incorporating the natural capital into the System of national Accounting. That means deducting the depreciation and depletion of the natural capital from the macroeconomic indicators.

2) Valuing the natural capital, in economic, monetary terms;

3) Incorporating environmental costs into the cost-benefit analysis.

The Policy objective of the three macro-proposals is to achieve an economic system that would respect the following ecological constraints:

> i) emitting wastes within the assimilative capacity of the environment;
> ii) harvesting of renewable natural resources observing the natural and managed MSY of the environment, by reducing/rationalizing the use of natural resources;
> iii) extracting non-renewable resources at a level at which renewable can be substitute for them.

The narrower interpretation of this approach, or the optimal capital stock, requires determining the 'stock that should exist', or the optimal steady

state of stock of natural resources. This interpretation can only succeed in assuring the preservation of the natural capital stock if safety thresholds are enforced, beyond which no further depletion would be allowed.

As a general conclusion, the Natural Capital approach takes fully into consideration the biophysical constraints to economic activities. The policies proposed, however, aims basically at interfering with the free market mechanisms when necessary in order to avoid the "cost-shifting" or environmental externalities: the incorporation of the environmental costs into the private cost-benefit analysis (CBA) aims at having the economic agents internalizing ecological costs, or having the 'polluters paying for their pollution'.

While market based instruments are emphasized by this approach as the most efficient way of protecting the environment, they certainly become short as a mean of defining environmentally safe thresholds. It also becomes short when dealing with the spatial dimention. This point will be analized in more detail on the chapter 3.

While this approach addresses the issues of inter and intragenerational equity the policies proposed concentrates mainly on economic aspects. The institutional and organizational aspects are not dealt with directly, as if they were taken for granted. Policies directed to the generation of the information required to assess the environmental conditions are not addressed as well. The generation of information such as a physical accounting system cannot be taken for granted. Important institutional building is required in order to deal with environmetal dimention of development. The Institutional Approach, which will be analized next, addresses the institutional requirements as well as the need for the use of normative instruments and political instruments in addition to the market based instruments for environmetal protection.

2.2.4 Institutionalist Approach

The institutionalist approach shares, to certain extent, the 'Natural Capital's approach definition on **what is to be sustained**: in this approach, natural capital is not considered as substitutable by man-made capital. In fact, thresholds for unsustainability or 'safe minimum standards' of environmental quality are proposed. The coincidence in 'what is to be sustained' can be observed in Opschoor's definition of SD, he states that development is sustainable:

> "if the environmental impacts do not impair the present and future functioning of resource generation systems, waste absorption systems

and the systems supporting flows of other environmental services and goods, and when use of non-renewable resources is compensated for by at least equivalent increases in supplies of renewable or reproducible resources" (Opschoor et al., 1992:56).

For the institutionalists, however, this is a necessary but not sufficient condition to achieve sustainable development. The institutionalist's is a **holistic approach**, when compared to the 'Natural Capital': the institutionalists are for a comprehensive approach of environmental problems, where cultural and institutional aspects are to be analyzed explicitly within the framework of the economic theory applied; where 'cultural' refers to norms, values and beliefs governing individual and societal pattern of behaviour, and 'institutional' stands for the set of formal and informal relations between individuals and the organization of the society in general.

The need for a comprehensive approach is based on the fact that the processes of economic and population growth as well as technological changes affecting the environment are driven by ideological (cultural) and institutional structures or systems (Opschoor 1992:59-60). As a consequence, in this approach, the institutional aspects are not only "conditions" to achieve sustainability, as suggested by Pearce, Barbier and Markandya, but they are an integral part of the problem itself [14].

The issue of values receive special attention: the continuity of human life and the re-creation of community are 'two ultimate values in a hierarchy which puts values beyond wants and needs beyond preferences'. When dealing with the environmental dimension those two values implies: environmental compatibility, or the principle of coevolutionary sustainability.

The **coevolutionary sustainability** principle states that we are part of a system, which is composed for several subsystems which interact among themselves. Some of the subsystems are: i) population; ii) technology and economy; iii) organizational and administrative structure of the society; iv) culture/ethics; and v) the environmental base. When incompatibilities among those subsytems arise, a processes of multiple adaptations within and between the subsystems have to occur. A successful process of mutually compatible adaptation, leading to changes in several subsystems, is a requirement for survival. This 'successful process' is what the institutionalists consider as the basic condition for 'ecological sustainability' (Opschoor et al., 1992:58; Klaasen et al. 1991:109).

Therefore, in addition to **equity** and **efficiency**, the institutionalists postulate a third criterium, **the coevolutionary sustainability**, and a fourth

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[14] see Pearce et al. 1988:6

criterion, which is the **inter-species equity**, or the requirement of care for other species (Opschoor et al., 1992:58). In relation to the "cost-shifting" or externalities of environmental costs, institutionalists are explicitly for the use of non-market instruments in addition to the traditional market-based instruments derived from the 'Pigovian Taxes', they propose the use of regulations as a mean of dealing with the 'cost-shifting tendencies'.

CONDITIONS:

The conditions to achieve SD are referred to in terms of "institutional adaptation", aiming at: i) controlling growth; and ii) redirecting it. The economy would have to constraint its growth in function of certain threshold values. That requires that **the level of economic growth be subjected to societal control**, which might result in changes in the overall pattern of consumption. The societal control can take many forms. **Extending the powers of the state** into areas such as economic planning and pricing policy is one of them. Institutional building proposals are formulated as well, international institutions which would regulate internationally shared environments, the establishment of some 'Ombudsman-type' organization representing the environmental rights of future generations is also suggested (Ospchoor et al. 1992:63-65).

POLICY IMPLICATIONS

The main policy implication of this approach is presented in terms of **"desired institutional adaptations"**[15/] required in order to:

1) **First**: restricting economic growth. Since the acceleration of economic growth is partly imputed to the combination of the increasing 'labour-saving technology' and a 'full employment policy', a **Green Keynesianism** is proposed, or a technological shift towards labour intensive technologies.

2) **Second**: poverty alleviation at the global level is a requirement, therefore economic growth is expected to occur in LDC, as well as a change in the prevailing distributions of income and access to resources. National and international institutions are required to change this unequal pattern.

3) **Third**: the reduction of the world market insecurities and competition is proposed as a condition to restrict economic growth.

Specific institutional 'adaptations' are proposed at different levels of scale: from the global or international scale down to the local level.

[15/] See Opschoor and van der Straaten 1992:63;

2.3 Conclusions

Actually two prevailing paradigms on environmental sustainability can be distinguished: Environmental Neoclassical Economics and Ecological Economics. Those paradigms, although having common roots in the Neoclassical Economics school of thought support different premises on the functioning of the economy, the environment and human behaviour. They give rise to different approaches to the greening of the economy, which are translated in different policies and different instruments of environmental policies.

The most relevant economic approaches to environmental sustainability are the Laissez-faire, Constant Capital, Natural Capital and Institutionalist approaches. The first two approaches are considered as not fully addressing the issue of sustainability. While the first relies in technological improvements to solve all environmental problems the second allows natural capital to be traded off indefinitely by man-made capital failing to establish a security threshold of natural capital. The Natural Capital and Institutionalist approaches do address the issue of environmental sustainability in its full dimension. They support the idea that natural capital and man-made capital are substitutes only to a certain extent, therefore, they cannot be traded off indefinitely. They support the idea that a minimum threshold of natural capital must be established. How to define this threshold is still an unsettled matter.

The Natural Capital approach have a narrower and pragmatic approach when compared to the Institutionalists. It addresses social aspects such as the issue of intergenerational equity however, at the policy and instrument level it concentrates basically on the economic sphere, neglecting to a certain extent the institutional and organizational aspects. The Institutionalists have an holistic approach to the sustainability. They focus on the requirement for institutional adaptations in all levels of scale as a necessary condition to achieve sustainability. While the Institutionalist's objectives may seem to be too ambituous and maybe not very practical in the short run, they represent the real chance of achieving the necessary shift towards a sustainable path in the long run.

CHAPTER III:

AN OPERATIONAL DEFINITION FOR SUSTAINABLE DEVELOPMENT

In the last chapters the most important approaches to sustainable development have been presented, setting the basis for the elaboration (in this chapter) of the operational working definition that would be considered as the most adequate set of theories to guide the management of the environment at any level of scale. This chapter's proposal will be basically inspired on both the Natural Capital and Institutionalist's approaches. That choice is, evidently **based on values**, since defining **what is to be sustained** is an ethical decision, dealing with moral issues such as intra and intergenerational equity. Finally, this chapter will propose a set of environmental principles, policies, and instruments for environmental policy, coherent with the proposed approach to the issue of environmental sustainability.

3.1 This Paper's Approach to Environmental Sustainability

> *"Suppose we are economists and want to maximize the load that a boat carries. If we place all the weight in one corner of the boat it will quickly sink or capsize. We need to spread the weight out evenly, and to do this we invent a price system. The higher the waterline in any corner of the boat, the higher the price for putting another kilogram in that corner, and the lower the waterline, the lower the price . This is the internal optimizing rule for allocative space (resources) among weights (alternative uses). This pricing rule is an allocative mechanism only, a very useful but unintelligent computer that sees no reason not to keep on adding weight and distributing it equally until the optimally loaded boat sinks, optimally, to the bottom of the sea." (H.E. Daly, quoted from Folke and Kåberger, 1991:288)*

This paper considers that man made capital and natural capital are not perfect substitutes. The depletion of the natural resources beyond a certain threshold can lead to irreversible processes that may endanger the life supporting function of the Earth. Although the market mechanisms do increase the efficiency in the allocation of scarce natural resources, imposing a limit in **scale** is a different issue. Therefore, this paper will not support the idea that the market is the best allocator for natural resources. Daly's analogy to the Plimsoll line illustrates the reason.

In defining sustainability this paper will take into consideration the ecological and physical constraints, as expressed in chapter 1.1, as well as the principles of non-substitutability; irreversibilities; and risk aversion, as stated by the Natural Capital approach supporters (see section 2.2.3).

Consequently, this paper supports the idea that the natural environment should not be traded off indefinitely in favour of economic growth.

Considering the lack of knowledge of the functioning and interactions of the natural systems, this paper adopts a risk aversion attitude, and proposes that that environmental sustainability must be defined in function of the maintenance and enhancement of a given natural capital stock. Taken into consideration that the existing natural capital stock may already be degraded or depleted (eg. the existence of air or water pollution, deforestation, soil pollution, etc), the natural capital stock to be maintained will be defined as the the one that should exist in order to enable a sustainable path. The definition of the 'optimal or acceptable natural capital stock', however, will not rely on the neoclassical steady state stock theory. Defining an optimal capital stock, will require an assessment of the ecological sustainability of the existing natural capital stock. Knowledge of the natural environment and of its functioning will be required in order to overtake such assignment and define both optimal and acceptable levels of natural capital stocks. Acceptable levels will be defined as the one respecting the minimum security threshold. **When this assessment is not possible, at least the maintenance of the existent natural capital stock should be guaranteed.**

When it comes to the issue of human nature, this paper will assume that human beings, as individuals, are more than just rational and egotistic 'utility-maximizers', with no ethical or social values, as assumed by the neoclassical conventional theory. **Human preferences will be considered as dynamic, interdependent and partially learned via culture**, as stated by both the Humanist and Institutionalist Paradigms (Pearce and Turner, 1990:11). In fact, individual or private preferences and collective preferences coexist in the same persons and are both expressed by individuals as well as by social organizations. This approach to human nature implies that human beings are capable of altruistic attitudes. **Accordingly, environmental policies must address the issue of influencing individual preferences towards environmentally friendly choices.**

A hierarchy of values beyond wants and needs beyond preferences will be considered. **Needs, in contrast with 'wants' cannot be traded off without threatening survival. Adequate levels of environmental quality are needs,** since its absence threatens the continuity of life in the long run, and the quality of life in the short term (health, aesthetical functions, and the quality of environmental services in general, etc).

This paper will adopt an anthropocentric approach, since it will be, inevitably biased towards human welfare. In spite of the anthropocentric view, it will not be reductionist: nature will be considered to have both instrumental and intrinsic value. That means that, besides the instrumental

value of nature in relation to human activities, the rights of other living beings to exist should be respected both on ethical basis and as a necessary condition to achieve long run sustainability.

3.2 Conditions to achieve sustainability

The conditions to achieve environmental sustainability will be classified, according to its nature, in the following four categories: i) ecological/ economical; ii) political; iii) equity; iv) institutional and v) cultural.

3.2.1 Ecological/economical conditions:

The ecological/economical conditions can be summarized as the requirement for non-negative change and/or enhancement of the stock of natural resources, in their quality and in the waste assimilation capacity of the environment. That means that 'economic development be subject to maintaining the services and quality of natural resources over time' (Pearce and Turner, 1990:24). Those conditions are related to the observance of the constraints [16/] which the environment imposes to human activities in order to continue performing (sustain) its functions as a life support base, production factor, provider of natural goods and services and waste assimilator. The observance of these constraints can be summarized as:

a) the utilization of the renewable resources at rates less than or equal to its natural or managed rate of regeneration;
b) utilization of non-renewable resources at a rate that would permit renewables to be substituted by them; and
c) the generation of wastes within the absorptive capacity of the environment.
d) the maintenance of the resilience of the ecosystems, by avoiding environmental stress or shocks in spatially determined areas; and
e) the observation of the carrying capacity of spatially determined areas with respect to both human settlements (location, size and densities) and economic activities.

While the conditions a) and b) seem to be feasible in the medium run, condition c) appears as an ideal one. The idea is the **closing up of cycles**: every unit of waste which is produced beyond the absorptive capacity of the environment breaks the natural cycle and increases the 'waste stock' or pollution stock. While the complete elimination of pollution is not a

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[16/] Constraints imposed by the biophysical limits of the natural systems: carrying capacity; maximum sustainable yield; assimilative capacity; resilience and entropy (see chapter 2.1.1).

realistic goal, considering the laws of thermodynamics, **acceptable levels of pollution have to be defined**.

The observation of those conditions would impose both qualitative and quantitative constraints to the economic growth.

When it comes to **spatial implications**, at the regional and local level planning, the maintenance of the resilience and the observance of the carrying capacity of a certain region should impose, for instance, restrictions to the size and pattern of human settlements as well as restrictions to the location of economic activities. While the breaking up of cycles occur at every levels of scale, the effects of it can be tackled, with a high degree of efficacy and efficiency at the **local level**, where the problem of disposing of wastes is generally dealt with.

3.2.2 Political conditions

The political conditions have to be with both the political will of tackling the environmental problems, and the capacity of harmonize conflicting interests of the different social actors, privileging efficient negotiated solutions over imposed, and less effective, regulations.

3.2.3 Equity

The issue of intergenerational equity has been addressed as the requirement that future generations should be left at least as well off as present generations in terms of both natural capital and man-made capital. The issue of **intragenerational** equity has to deal, in the first place, with **poverty alleviation** as a necessary condition to achieve environmental sustainability, and with a fairer distribution of wealth and equity on the access to environmental amenities, goods and services.

3.2.4 Institutional

Institutional reforms and institutional building is required, at different levels of scale, in order to deal with the **institutional and administrative failures** which are actually promoting an unsustainable path. Opschoor mentions among the causes for environmental unsustainability government failures. Two types of government failures are identified: policy failures, and administrative failures.

Administrative failures "refers to a range of problems within the organization of government at the various levels, leading to inadequate policy formulation and/or inadequate policy implementation" (Opschoor, 1992:34). Examples of administrative failures are:

i) **rigidities** due to entrenched traditional division of labour within administrative organizations;
ii) **insufficient integration between agencies and departments**;
iii) **lack of instruments or powers** to achieve policy objectives; and
iv) lack of instruments or powers to ensure policy implementation within the economic processes.

Policy Failures occur when prevalent policies are based on past decisions in which environmental problems were not given sufficient weight. This is often the case with **sectoral policies** where sectoral interests and powers have predominated over, or excluded ecological considerations, or when those policies were formulated prior to the existence or perception of environmental problems; secondly, when policy is directed at stimulating economic growth 'per se'; and thirdly when national or international institutions fail in developing **institutional checks on market failures** (Opschoor, op cit.).

3.2.5 Cultural

The cultural conditions refers to modifying the 'norms, values and beliefs of governing the individual and societal pattern of behaviour' towards environmentally friendly choices and attitudes.

3.3 The issue of environmental management

3.3..1 Three paradigms

A distinction should be made between environmental 'protection', 'management' and 'ecodevelopment'. Those different perspectives are analyzed by Folke and Kåberger (1991:279-283 [17]). **The environmental protection paradigm** is presented as basically treating the environment as an economic externality. This approach advocates for the legalization of the **environment as an economic externality**. It is defensive or remedial in practice, and concentrates on both damage control or setting limits to harmful human activities. It relies mainly in governmental intervention to set those limits, through the establishment of standards and the institutionalization of EIAs. Resource depletion and ecosystem services are not pondered in policy making as serious limiting factors for economic activities. Their view of economic development and nature can be expressed as a trade off between nature and welfare.

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[17] Folke and Kåberger based their analysis on Colby, ME 1990. Environmental Management in Development: the Evolution of Paradigms. World Bank Discussion Papers 80. The World Bank, Washington, D.C..

The **resource management paradigm** proposes that all types of capital and resources (biophysical, human, natural, infrastructural and monetary) be incorporated into calculations of natural accounts, productivity and policies for development and investment planning. The interdependence and multiple values of the resources are taken into consideration and the management of global commons is emphasized. Ecosystem processes are recognized rather than just stocks of physical resources. The stabilization of the world population as well as reduction in the scale of human activities is seen as a condition to achieve sustainable development. This is the perspective of the Brundtland Report and of the World Resources Institute.

Ecodevelopment proposes the restructuration of the relationships between society and nature, searching for synergy with ecosystem processes and functions. They emphasize that planning and management must be 'embedded in the total environment of the ecosystem under consideration, including all the actors concerned, meaning that global awareness must be matched by local responsibility for action' (Folke and Kåberger, 1991:283). The term **eco** is used for both ecology and economy, and **development** is used instead of protection or management, as a way of upgrading the relationship between ecology, economy and social concerns in the designing for sustainability.

Those paradigms go from a reductionist economicist analysis of the natural environment to a more holistic analysis. While the reductionist environmental neoclassical paradigm (environmental protection) fails in tackling the environmental problem in its whole dimension and in identifying the structural failures, it succeeds in proposing a set of efficient instruments for environmental protection. Those instruments can be efficient in correcting the cost shifting problems, however, they may **not** display the same degree of efficacy in leading towards a sustainable path, since they fail to determine an environmental security threshold, as illustrated by Daly's analogy.

The environmental management paradigm has a more comprehensive approach. It can be identified with the ecological institutionalist approach. While still proposing the utilization of the economic instruments for environmental protection they are aware of the importance of taking into consideration the ecological processes and the global common property. The institutional dimension is also taken into consideration as environmental planning and management are emphasized.

The ecodevelopment paradigm approaches the sustainability problem from a structural point of view. It can be situated somewhere between the Ecological Institutionalist approach and Deep Ecology. Their proposal of restructuring the relationship between society and nature is probably the only one able to succeed on assuring a sustainable path on the long run. Facing the immediate environmental problems, however, requires a more pragmatic attitude, since a

structural change as the one proposed is a long and difficult process. Therefore, while the restructuration of the relationship between society and nature should be promoted through environmental awareness and education, environmental management and environmental protection policies have to be implemented without further delay in order to avoid further depletion of the natural environment.

3.3.2 Environmental management

> **This paper defines environmental management as the elaboration, implementation and monitoring of a set of policies, programmes plans and projects (which will be referred to as "actions"), aiming at the achievement of environmentally sustainable development.**

According to this working definition three **spheres of action** are delineated:

> i) **elaboration** of policies, programmes, plans and projets;
> ii) their **implementation and monitoring**; and
> iii) the **choice** of the set of instruments, consistent with the environmental policies, which will make possible the efficient and effective implementation (ii) of the proposals of point i).

Those instruments can be classified, according to their nature as: economic, legal or regulatory, technical, political and educative instruments (this point is analyzed in more detail in section 3.5). The **choice** of the set of instruments to be used (in either phase i or ii) are tightly interrelated with sustainability objectives as well as with the policies proposed. In fact, objectives, policies and instruments must be in consonance with each other. The adequate choice of the of instruments which will be employed will determine, to a large extent, the effectiveness and efficiency in the achievement of the proposed goals.

The **actions** oriented towards the achievement of environmentally sustainable development can be divided in three main categories:

> a) Restoration : recuperation by controlling or diminishing the non-desirable environmental effects of actions or interventions which occurred in the **past**, aiming at the achievement of a desired environmental quality or standard.
>
> b) Preservation: in the sense of maintaining the actual stock of natural capital, its quality and its regenerative capacity, by diminishing or controlling non-desirable environmental effects or impacts of present actions or interventions, while searching for synergetic alternatives between human interventions and the functioning

of the natural ecosystems.

c) Rationalization of the use of the Natural Resources: or using the resources in the most efficient and effective way, aiming at **maximizing the benefits** of the utilization of environmental capital and services while respecting the condition of non-negative changes in the quality and stock of natural capital, its regenerative capacity as well as respecting the environmental's carrying capacity and resilience.

The actions of "Preservation" and "Rationalization", as described above, aim at the maintenance, over the long run, of the actual level of natural capital stock. The action of "Restoration", on the other hand, goes beyond the maintenance of the actual environmental state, proposing the recuperation of the already damaged environment, when necessary in order to achieve acceptable levels of environmental quality, thus allowing a sustainable path. Restoration actions aims at correcting undesired environmental effects of actions which took place in the past, such as the recuperation of a polluted river, a polluted soil or, the reforestation of a depleted forest. Restoration actions are usually far more expensive, complicated, slow and less effective than the preservation and rationalization actions.

The achievement of the goals 'preservation' and 'rationalization' in the use of natural resources will require: i) the use of **environmental indicators and standards**; ii) the use of **normative instruments** such as the imposition of constraints in the use of natural resource stocks; and iii) the use of **economic instruments** such as charges, subsidies, shadow prices or lowering the discount rates [18]. Those instruments will be analyzed in more detail in the section 3.5.

Local Governments must materialise the actions proposed in 'a', 'b', and 'c' in specific activities. The possibilities of action of the municipalities are given by the following factors, which may act either as restrictions or potentials:

a) its legal competencies and attributions;
b) its political representation;
c) the availability of qualified human resources;
d) the availability of **information** (for both planners and local citizens);
e) the instruments of environmental protection available for the implementation and monitoring of the environmentally-related actions;
f) the budget available for direct and indirect environmental protection actions; and
g) the degree of social support from the local population.

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[18] See James, Nijkamp and Opschoor 1990:41.

3.4 Policy implications

> *"Environmental policy is essentially also a risk strategy which serves to minimize the mismatch between economic development and ecological sustainability under uncertain future conditions. In a way analogous to business behaviour one could assume that an environmental management agency is a specific type of entrepeneur whose final goal is to maximize ecologically sustainable economic development" (James et al, 1990:34).*

A distinction should be made between general policies which, in spite of generating environmental impacts (as a side effect), do not intend to generate them explicitly, and environmental policies, which are explicitly directed to the protection of the environment and to promote a shift towards a sustainable path. These last type of policies are guided by environmental principles.

3.4.1 Principles guiding policies

Environmental principles are concerned with more than just allowing the maintenance of economic growth on the medium or long run. The principles proposed by this paper to guide environmental policies are the following:

i) Precautionary principle: the precautionary principle has to do with a **risk aversion attitude**. When the extent of the environmental impact of a certain action cannot be properly estimated due to lack of knowledge, and there are good reasons to think that the proposed action may affect the environment beyond acceptable levels, an alternative action might be proposed in order to avoid the risk. The precautionary principle aims at avoiding unnecessary risks that may provoke irreversible environmental looses.

ii) Equity principle. The equity principle has to do with two main spheres: **First**, it has to do with a better distribution of wealth and welfare, at different levels of scale: better distribution between countries, and within countries. 'Within countries' has to do with both a better regional distribution (between regions), and a better distribution between the people, within the regions. The association between poverty and environmental depletion has been stressed in almost all international forum in the last years. This sphere of action, however, will be considered as part of the general policies which do have important environmental side-effects, but which are not 'environmental policies'. This paper will be aware of those interrelations, but will not address them directly, since the objective of this paper is to address the environmental policies, as stated above.

Secondly, it has to do with the **avoidance of environmental cost-shifting**. Environmental cost-shifting occur at different spheres: a) between people in

the same period of time and place, through the process of production and consumption; b) to other areas; c) to other period of time; and d) to other species.

a) **The "polluters pays principle"** (PPP) usually refers to the requirement for the internalization of the undesired environmental side-effects (costs) by the agents provoking them. The idea is that by internalizing the environmental costs in their benefit-cost analysis, the actors involved will be encouraged to undertake environmentally friendlier (and less expensive) alternatives.

b) **The cost-shifting to other areas** should also be avoided, such as the 'export' of hazardous wastes from rich countries to poorer countries or to the transboundary pollution affecting both other countries, other regions or the global common property (atmosphere, ocean, etc).

c) **The cost-shifting to other period of time, or to future generations**. This principle is addressed as **intergenerational equity**.

d) **The cost-shifting to other species**, or the 'inter-species equity' principle. This principle has to do with respecting the rights of other living beings to exist.

iii) Participation principle. This principle is based on: i) the assumption that human beings are capable of altruistic attitudes and choices, concerned with social welfare and not only with maximizing he's or her's own utility; and ii) the **democratic principle**, or the belief that human beings have the right to participate on the decision-making processes affecting his life.

iv) Preventive principle: policies should emphasize prevention of environmental problems to avoid the need to future restoration expenditures. Restoration is not only more expensive, but sometimes very difficult to achieve, or even impossible.

v) Efficiency principle has to do with increasing the efficiency in the use of natural resources, or maximizing the output per unit of natural resource input.

3.4.2 Policies proposed

The environmental policies proposed next may not be implementable simultaneously. Both conflict of interests or competition for scarce resources may determine the need to priorize them, which is a political task, involving different social agents. The most important environmental policy implications derived from this paper's approach to sustainable development as

well as from the proposed environmental principles are grouped, according to their nature as follows:

i) Economic Policies aim at promoting an economic shift towards a sustainable path by incorporating environmental principles within the economic decision making, by incorporating the natural capital within the economic analysis. Environmental economic policies occur at both at the macro and micro economics levels:

a) **At the macroeconomic level**, the accounting of the environmental costs in the System of National Accounting (SNA), aiming at obtaining macroeconomic indicators of environmental sustainability (the Environmentally Adjusted Net Domestic Product, EDP, which would be net of environmental depreciation and looses, and the Environmentally Adjusted National Income ENI, which would account for further health and welfare aspects of environmental impacts).

b) **At the microeconomic level**, the consideration of the environmental costs in the cost-benefit analysis as a procedure to avoid cost-shifting. The inclusion of environmental cost in CBA require, in most cases, an environmental impact assessment, EIA, at the project and programme levels, in order to determine the extent of the environmental impact of the proposed activities, on the one hand, and whether they are acceptable or not in environmental terms.

c) **Valuing** the environmental goods and services in monetary terms is a necessary condition in order to assess and evaluate the changes in the natural capital stock at both the macro and micro economic levels. In doing so, the multiple functions of the environment should be taken into account.

d) The use of **shadow prices** or **lowering the discount rates** should be used in a cautious manner, since an indiscriminate lower discount rate has a double effect: it diminishes the bias against the future value of environmental assets, however, low discount rates will also stimulate a greater economic activity in the present and therefore, a greater use of environmental resources.

e) **A system of physical accounting** of environmental assets and flows must be implemented in order to follow up the state of the environment at different levels of scale.

ii) Regulatory or normative policies: the establishment of environmental standards and norms are essential in order to define the boundaries of acceptable environmental quality and produce indicators of environmental quality. Market based policies alone cannot define the critical limits that may lead to irreversible environmental looses.

iii) Administrative policies: institutional Building and adminsitrative adaptations are a necessary requirement in order to have the necessary institutional/adminstrative support to protect the environment at different levels of scale.

iv) Political policies: the consideration of the environmental as a political variable and the necessary political flexibility to generate negotiated solutions among the different agents, with conflicting interests, is an essential government policy.

v) Education and propaganda policies aim at the generation of environmental awareness and the promotion of changes towards environmentally friendly attitudes as well as social participation.

vi) Demographic policies towards the decrease of population growth and further stabilization of the world population is a necessary requirement. At the regional and local levels, policies that will discourage further **emigration** towards human settlements with already undesirable high population densities should be implemented.

vii) Research and technology policies aim at providing incentives to the research and implementation of environmentally friendly technologies and recycling of waste products.

3.5 Instruments of environmental policy

Once 'acceptable levels' of environmental quality are socially defined, the choice of a package of effective instruments that would lead to those acceptable levels at the minor cost is the next step. The instruments of environmental policy can be classified, according to its nature in the following categories:

1) Economic, or market-based instruments for environmental protection;
2) Regulatory or Normative instruments;
3) Technical;
4) Political; and
5) Education and Propaganda.

3.5.1 Economic instruments

The economic instruments for environmental protection, or market-based instruments are based on two neoclassical premises: the Pigouvian's theory of externalities and on the 'maximizing premise of behaviour'. It aims at minimizing the environmental costs shifting, by having the polluters paying

for the environmental damage which they are causing. The idea is that, according to the weighing premise, the profit maximizer human being will consider the environmental costs associated with his economic activities in his cost-benefit analysis. The increasing environmental costs, thus internalised, should incentive a change towards environmentally friendlier (and less expensive) technologies.

Opschoor and Vos describe economic instruments as affecting estimates of costs and benefits of alternative actions open to economic agents, through monetary incentives, with the effect of "influencing decision making and behaviour in such a way that alternatives are chosen to lead to an environmentally more desirable situation than that in the absence of the instrument" (Opschoor and Vos, 1989:12). They are **non-coercitive**: actors are still free to act as they estimate more beneficial for them.

A sharp distinction between economic and regulatory instruments is not always possible. There are some overlap between both of them: market creation is usually seen as regulatory due to the institutional arrangements attached to it. On the other hand, regulatory instruments usually have a monetary component, thus affecting decision-making. Considering the existence of such a 'grey area', Opschoor and Vos (1989:14) define economics instruments as having in common the following elements:

i) The existence of financial stimuli;
ii) The possibility of voluntary action;
iii) The involvement of government (related) authorities;
iv) The intention of (directly or indirectly) maintaining or improving environmental quality by applying the instrument.

According to the authors, economic instruments are divided into five categories:

1) **Charges**: they can be interpreted as 'the price to pay for pollution'. They have both an incentive and a redistributive function. The incentive function operates when the charges are high enough so as to influence decision-making. The redistributive function works when the revenue collected is used to correct or prevent environmental damages. Five types of charges are identified: i) **effluent charges**, or the charges paid for discharges into the environment; ii) **user charges**, such as uniform tariffs; iii) **product charges**, laid upon products which are polluting the environment; iv) **administrative charges**, such as control or authorization fees; and v) **tax differentiation**, leading to favourable prices of environmentally friendly products.

2) **Subsidies** stands for various forms of financial assistance,

acting as an incentive towards environmentally friendlier behaviour. Different types of subsidies attached to changes in technology or in the levels of pollution are i) **grants**, or non-payable financial assistance; ii) **soft loans**, with interest rates below the market rate; and iii) **tax allowances**, by allowing artificially accelerated rates of depreciation or tax exemptions.

3) **Deposit-refund systems**: a charge is laid on a potentially polluting product. The charge is refund when the product is returned to a collection system, thus avoiding pollution.

4) **Market creation**: artificial markets involving "pollution rights" can be created as a mean of giving incentive to the reduction of the emissions as well as the recycling of residuals. This instrument is criticized for "giving permission to pollute".

5) **Financial enforcement incentives** is to be considered as a legal rather than an economic instrument. Non-compliance is punished, either ex-ante or ex-post. Financial enforcement incentives can take the form of **non-compliance fees**, imposed on polluters who do not comply with certain regulations (ex-post), or **performance bonds**, which are refunded when compliance takes place (ex-ante).

While the economic instruments may succeed in stimulating technological changes and environmentally friendly attitudes, they alone, cannot assure a non-negative change in the natural capital stock, since this decision is left to the individual economic agent, who will decide whether further depletion is convenient or not for him, in face of his private cost-benefit analysis.

Economic instruments for environmental protection, when compared to direct regulation, are considered to be the more efficient and effective in protecting the environment, 'as they guarantee that abatement takes place at minimum social costs and also provide incentives for the development of clean technologies' (van Ierland, 1993:271). However, among the important drawbacks in the use of economic instruments are: i) **unwanted distributional** effects; ii) administrative problems for implementation; and iii) the fact that they cannot assure that the level of abatement that takes place be enough so as to guarantee non-negative changes on the natural capital stock. The issue of imposing a limit on **scale**, is is dealt through regulatory instruments.

3.5.2 Regulatory or Normative instruments

Opschoor and Vos (1989:12) define regulatory instruments as institutional measures aiming at **directly** influencing the environmental performance of

polluters. Regulatory or normative instruments are characterized as **coercitive** and non-flexible. They respond to the 'command-and control philosophy': the polluter has no choice: he has to comply or face penalties.

Direct regulation is the traditional and predominant approach to environmental protection and management. Regulations can be applied to processes or products, by limiting the discharge of certain pollutants or limiting activities to certain times or areas, through **licensing, setting of standards, zoning**, etc.

This 'command and control' approach operates basically through: i) imposition of standards; ii) licensing; and iii) monitoring. The basis for establishing those standards and controlling its compliance is the existence of some form of legislation.

The imposition of **standards** regards the control of emissions, discharges, concentrations, harvesting of natural resources, etc. Licensing and monitoring are means of enforcing the observance of the established environmental standards. The establishment of acceptable levels of environmental quality or **standards** originate **indicators** of environmental quality, which can be controlled and monitored by governmental or private administration.

Physical planning instruments are a special type of direct regulation. In contrast with economic instruments, direct regulations can be explicitly spatially differentiated. It can regulate the levels of emissions taking place in a specific region or locality, as well as establish standards and spatially defined levels of emissions. This characteristic makes those instruments especially appropriated to deal with problems in which **location** is an important factor.

As an example, spatial differentiation on the tolerated levels of emissions, discharges, concentrations, etc, and/or the hours or periods when they are allowed, can be established through **zoning**. This instrument of spatial planing allows to regulate the **location** of polluting activities, by either permitting or excluding certain activities in certain areas and/or periods or hours. This is an essential instrument to regulate activities that otherwise would not respect the carrying capacity of the area, seriously affecting its resilience. This instrument can also prevent the shifting of environmental problems to other areas, such as the pollution or depletion of underground water, air pollution, etc.

Some of the **important drawbacks** for the implementation of an environmental policy basically relying on direct regulations are pointed out by Opschoor and Vos (1989:24) in the following terms: "**direct regulations are increasingly**

felt to be static, inflexible and suboptimal in terms of environmental and economic efficiency". A second important drawback is the general tendency towards deregulation, or the reduction of the importance of government on important decision making processes.

An example of the inefficiencies of the inflexibility of direct regulation, are the pollution licences. They are usually granted for a long period of time, while environmental quality and abatement technologies are constantly changing. Once the polluter owns a license, he is not encouraged to react flexibly to environmental technological improvements. The stimuli factor can be obtained by adding to direct regulations the use of economic instruments of environmental protection. The introduction of **negotiation** within the process of direct regulation is being applied in many european countries as well. The idea is to obtain negotiated agreements that would flexibilize the regulation process, by diminishing the number of regulations by substituting them for voluntary agreements. This will make the whole process less expensive and will speed up its enforcement. When voluntary agreements are not accomplished, direct regulations will be established.

3.5.3 Technical Instruments

Technical instruments stands for the different spheres of knowledge and techniques to: i) **assess and evaluate** the existing environmental quality as well as the impact of human activities over the natural systems; ii) **abatement or restoration techniques** to deal with non-desired environmental effects product of past human interventions; and iii) **technological improvements** aiming at preventing non-desired environmental effects of the present productive/consumption processes.

On the **preventive** or assessment sphere, plays an important roll the Environmental Impact Assessments (EIA). The realization of EIA's relies on the existence of an environmental law, which will impose the realization of an environmental impact assessment prior to the approval and implementation of certain specified projects or programmes which are assumed to endanger the environment when overtaken without judgment. **Environmental Impact Assessment** techniques have been developed in order to determine ex-ante the environmental impact of human activities. An environmental impact assessment should: i) identify unacceptable impacts, thus exerting a **veto power** to certain activities which will provoke unacceptable impacts. In this case, alternatives which may not provoke unacceptable impacts should be proposed; ii) when the environmental impact of the proposed action is within the acceptable boundaries, the calculation of the environmental loses through an EIA set the basis for the internalization of the environmental costs by incorporating those costs on the private (or social) cost-benefit analysis.

The idea is that the environmental impact assessment must generate a Declaration of Environmental Impact. This declaration must be on an accessible language, and are to be made accessible for the general public which will be affected by the project, if implemented. This public declaration sets the grounds for social participation on the decision-making process through negotiation. It must be stressed that this process has to occur before the implementation of the project, and must be a condition for its approval [19/] .

Important **drawback** to the EIAs is the fact that an environmental impact assessment is usually **quite expensive and not necessarily accurate**, since the forecasts of the future impacts relies on estimates, often based on imperfect models of the functioning natural environment. The uncertainty around the real functioning of the environment sets grounds for subjective interpretations of the results. Those factors have been used to minimize the importance of EIAs.

The fact is that the more we know about the functioning of the natural environment, the more accurate the EIAs will be. On the other hand, past experiences with similar projects are analyzed and the establishment of multidisciplinary groups aim at obtaining a comprehensive and reliable forecast. In spite of the imperfections of those techniques, they are an important and valuable instrument for environmental protection and management.

3.5.4 Political Instruments

Negotiations are often used in conjunction with regulatory instruments. This procedure is based on the internalisation of environmental awareness and responsibility into individual decision-making, by applying direct and indirect pressure and persuasion, in a process of negotiation and voluntary agreements between government and economic agents. This is a very flexible procedure, and often very effective and efficient. Even though negotiations are not economic instruments, a monetary component is present since financial penalty is usually imposed when agreements are not reached (Opschoor and Vos, 1989:13).

Negotiations are not restricted to the sphere of government and economic agents. Social pressure can be exerted on both government decisions and omissions regarding the environment, as well as over economic agents. Political organizations, NGO's, and social organizations in general exert an important roll in exerting pressure and thus promoting important changes on the production and consumption processes. The local level of the

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[19/] For further information on Environmental Impact Assessment techniques see: Jacob Duek (editor),1980; R.E. Munn (1979) and José Leal (1990).

administrative sphere offers an adequate instance for promoting bottom to top decision-making.

3.5.5 Education and Propaganda

Education and propaganda instruments aim at generating environmental awareness, which in turn will provoke changes in individual preferences towards environmentally friendly options and attitudes. The educational component should be directed at both children and adults. The municipalized schools as well as the local level social organizations offer the necessary social infrastructure to initiate a national campaign on environmental education. Special target groups can be defined in function of the local specificities. An effective target group is women, due to their roll on both selecting the products which will be bought for daily consumption in the household and disposing of the domestic waste.

Propaganda is an important factor in determining the relative strength of different groups on a negotiation process.

3.6 Conclusions

This paper supports the idea that the environment cannot be traded off indefinitely in favour of economic growth objectives. A necessary condition to conciliate economic activities and environmental sustainability is the integration of economy and ecology, defining ecological principles and guidelines.

Economic instruments for environmental protection are considered as the most cost-efficient mechanism for the allocation of scarce natural resources, however they fail to establish a limit in scale on the utilization of those resources or, in other words, they fail to define a minimum threshold of natural capital which should be preserved in order to assure the sustainability of the ecosystems. In order to establish a limit in scale, normative instruments and negotiation processes are the only possible way to conciliate conflicting interests and therefore increase the chances of achieving sustainability.

PART II:

CASE-STUDY: ENVIRONMENTAL INSTITUTIONALITY IN CHILE

"This is a story about four people: Everybody, Somebody, Anybody, and Nobody. There was an important job to be done and Everybody was asked to do it. Everybody was sure Somebody would do it. Anybody could have done it, but Nobody did it. Somebody got angry about that because it was Everybody's job. Everybody thought Anybody could do it, but Nobody realized that Everybody wouldn't do it. It ended up that Everybody blamed Somebody when actually Nobody asked Anybody." (unknown source, quoted from Dietz et al. ed., 1992)

INTRODUCTION

This study will scrutinize the environmental institutionality in Chile aiming to detect the environmental paradigm adopted by the Chilean public institutions. It will assess the government's proposal first in terms of its internal coherence and secondly in the light of the conditions required to achieve sustainable development proposed in chapter 3.

Regarding the structure of the environmental institutionality this study will analyze, in general terms, how it fits within the government apparatus. Two main aspects will be analyzed in more detail: the creation of the **National Commission on Environment**, the "Comisión Nacional de Medio Ambiente" (CONAMA) and the recent proposal of an **Environmental Framework Law**, the "Ley de Bases del Medio Ambiente". This paper will scrutinize the environmental paradigm behind the Environmental Framework Law. In doing so, it will take into account how the legal proposal fits within the general political environment. Special attention will be given to the devolution of decision-making power to the regional and local levels of scale (decentralization).

Important aspects of the analysis of the paradigm behind the legal proposal are: 1) the implicit definition of sustainability; 2) the conditions considered to achieve a sustainable path; 3) the environmental principles considered; 4) the environmental policies proposed; 5) the instruments for environmental policies proposed and their consistency with the policies proposed and the general institutional framework; and 6) the competencies and attributions conferred to the administrative governmental agencies, both sectoral and spatially.

This paper supports that the different spheres of the Chilean institutionality do not coincide on their approaches to the environmental problem. It states that there is a basic contradiction between the paradigm behind the Environmental Framework Law proposed by the National Commission on Environment, CONAMA, and the general political environment. While the proposed Environmental Framework Law has an Institutionalist inspiration the general Neoliberal political environment priorizes the economic growth objectives and is closer to the "Environmental Protection Paradigm",

considering the environment basically as an economic externality. This contradiction is expressed twofold: first, the legal text has an holistic approach to the environment and relies basically on command-and-control policies which are not duly supported by administrative reforms and which, consequently, are of difficult implementation; and second, it fails to explore the economic instruments for environmental protection, which are in consonance with the prevailing economic paradigm.

CONSTRAINTS:

This analysis will be subject to at least three important constraints: first, the embryonic stage of the environmental institutionality in Chile; second, the non-existence of an environmental policy; and third, the impossibility of realizing a field work and interviewing the agents which are participating in the elaboration of the legal framework. While the first and second constraints are product of the initial stage of the environmental institutionality building and the consequent lack of policy definitions, the third constraint prevents from obtaining direct feedbacks from the agents in charge of the elaboration of the environmental law. Hopefully, this task will be addressed in a future stage of this research in Chile.

CHAPTER IV

ENVIRONMENTAL INSTITUTIONALITY IN CHILE

This chapter will provide general information about the Chilean political administration as far as they are relevant for the analysis of the environmental institutionality, with special regard to the issue of territorial decentralization. It will present some historical aspects of the Chilean environmental institutionality and how it fits within the general government's apparatus. Finally it will focus on the creation of the National Commission on Environment, CONAMA.

4.1 General Institutional Considerations

This section will define what will be understood by "institutionality" and will give some general information about Chile's political environment today. Next, it will analyze the political administration structure, namely, the different territorial levels of political administration and the issue of territorial decentralization. This preliminary information will, hopefully, give the framework required to the analysis of the most relevant aspects of the environmental institutionality, which will be approached next.

4.1.1 Defining institutionality

While analysing the environmental institutionality in Chile, this paper will adopt Opschoor's comprehensive definition, understanding by institutions:

> **"the set of formal and informal relationships between individuals, the organization of societies in terms of customary or instrumental behavioral patterns, political organizations and economic systems, etc" (1992:33).**

The term, covers both formal and informal "arrangements" and social conventions and patterns of conduct, including allocative mechanisms, such as the market and market regulating structures, the plan, and parliamentary budget decisions; rights, both formalized and customary; organizational structures; etc (Opschoor and van der Straaten, 1992:70).

This paper will distinguish five basic aspects of the institutional

arrangements which strongly affects the relationship between the environment and human activities in Chile:

i) The **political dimension**, dealing basically with power relationships, considering both the nature (source) and distribution of power in the different levels of scale;

ii) The **legal dimension**, dealing first, with the set of norms and regulations controlling and delimiting the actions of the social agents, and second, with the power relationships reflected through the legal framework, which settles the **competencies and attributions** of the different social groups within a society;

iii) The **administrative dimension**, dealing with the division of labour between the different governmental agencies, as well as the coordination among them, both horizontally and vertically;

iv) The **economic dimension**, dealing with the general economic environment, especially with the existence of a free-market philosophy and second, with the formulation of both general economic policies and environmental economic policies. The second ones aim at estimating the ecological costs linked to the economic processes as well as at the development of environmental-economic indicators. This would allow to integrate the environmental dimension within the economic decision-making processes (internalization of environmental externalities), either by the public and private agents.

v) The **cultural dimension**, dealing with values and preferences, learnt through the socialization process, specially through education and propaganda (i.e. equity, aesthetic values, environmental concern, etc).

A comprehensive analysis of the environmental management paradigm in Chile requires the examination of those five dimensions. Due to limitations on the availability of the information, however, the following analysis will rely mostly on **the legal and administrative dimensions**. References to the economic, political and cultural dimensions will necessarily be done as they are indispensable to the understanding of the problem, although without pretending to analyze those dimensions.

4.1.2 General Political Environment

An important information, required to the understanding of this analysis is referred to the Chilean political-economical environment. Chile has opted for

a market-oriented economy. The environmental management proposals, therefore, ought to be in consonance with that reality. While addressing the 4th Scientific Conference on Environment, the representative of the Ministry of Government [20] declared that the central point to be settled clearly on the general environmental law is **"how to maintain a stable and sustained economic growth, while guaranteeing the right of people to live in an pollution-free environment"** (Luksic, 1992:134). This statement represents explicitly and briefly the government's priorities. While the **central objective, economic growth,** is to be accomplished, the constitutional right for a clean environment should be guaranteed.

4.1.3 General aspects of Chile's political administration

Power relations and legal competencies and attributions are materialized throughout an **administrative network**. Government agencies are thus defined and implemented in order to exert certain functions, relying on certain attributions conferred by law. The way in which those competencies are materialized in the administrative network can be politically defined, roughly, as centralized or decentralized. The term decentralization is used sometimes to refer to territorial deconcentration. A distinction is thus required.

Decentralization and Deconcentration

Decentralization will be understood as the devolution of power, from a higher hierarchy government level to a lower level. This process can occur both sectoral and territorially. Sectorial decentralization is the devolution of competencies or decision-making power from the central administration to sectorial agencies which are legally differentiated from it, which are not hierarchically subordinated to it nor is submitted to its control. **Territorial decentralization** is understood as the legal transference of competencies to local entities independent from the central administration. When such "independence" do not exist, i.e., the transference of competency occurs within the same governmental entity, located at a different spatial level, this transference is considered as a **deconcentration process** (see Pérez, 1992:58; Rufián, 1992:6-7) [21]. Hereafter the term decentralization will be used in the territorial sense.

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[20] Zarzo Luksic, Jefe de gabinete del Ministerio Secretario General de Gobierno.

[21] An example of territorial **deconcentration** are the Regional Commissions on Environment. They represent the National Commission (CONAMA) at the regional level. They are part of the National Commission: although physically located at a certain region they are hierarchically **dependant** from the central level.

Chile has been, traditionally, a centralized country. Historically, the most relevant political decisions have taken place in Santiago. The legal institutionality has settled that issue by defining the country as a "unitarian State", whose territory is divided into regions [22/]. Actually, the constitution has created Regional Governments, however, the maximum authority at the regional level is directly nominated by the president of the Nation, thus characterizing a process which is closer to a deconcentration than to a real decentralization.

Territorial levels of political administration

The political administration of the country is divided in three spatial sub-levels: 13 regions, 51 provinces and 335 "comunas", which correspond to the lowest administrative territorial subdivision.

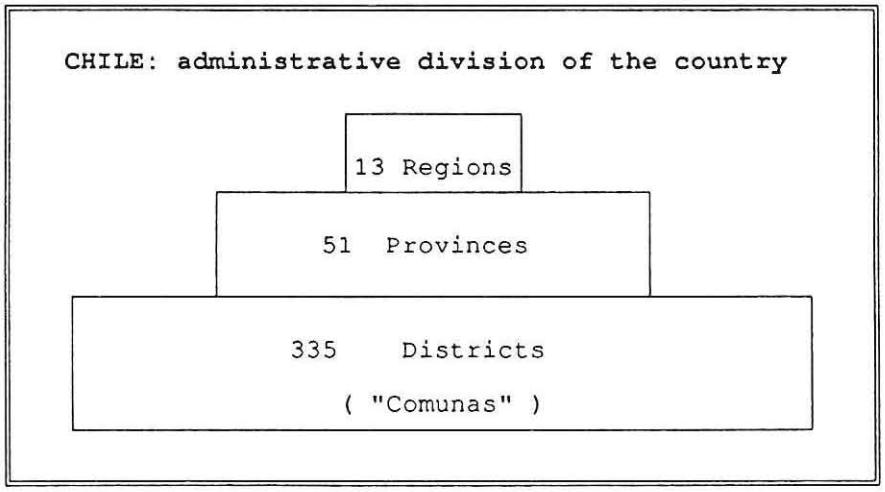

Figure 4.1

Government and Administration

For the effects of **government**, the territorial structure comprises only the region and the provinces. **The government instances are characterized by an administrative deconcentration.** They represent the President of the Republic, they have competencies of control and coordination of services and they are entitled to the use of public force within the territory under their jurisdiction (Rufián, 1990:13). In other words, they are a deconcentration of the central government at the territorial level (the transference of competencies occurs within the same administrative entity), the nature of their power is a vertical transference from the centre. It is the centre

[22/] Article 3 of the Political Constitution of the Republic, according to the Constitutional Reform of 1991.

'governing' the territories through spatially deconcentrated agencies with the object of increasing the administrative efficiency of the government apparatus.

The municipalities, which are in charge of the local administration of the "comunas", are conceived as an administrative structure. In contrast with the governmental structures the administrative instances responds to a decentralization process. They are independent entities, and their power is originated from an direct electoral process. The municipality, therefore, represents the interests of the local community at the local level as well as at other instances, when necessary. Paradoxically the entity which represents the local community, being (partially) directly elected by its members, do not constitute an instance of government, but conforms only an administrative structure.

4.2 Relevant aspects of Chile's environmental institutionality

This section will analyze the historical backgroound of the Chilean environmental institutionality, making a distinction between the sectoral agencies with environmentaly-related competencies and the recent explicitly environmental agencies.

4.2.1 Historical background

Although the re-birth of the comprehensive concept of environmental sustainability is very recent, dating only from the seventies, the preoccupation for the protection of some important natural resources can be found in the Chilean legislation since the early 20th century. In 1907 a Decree created a Natural Forestal Reserve [23]. In september 1916 the law No. 3133 [24] regulated the emissions of industrial establishments (including mining) and established the obligation to neutralize them. Control mechanisms

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[23] In 1907 the Decree No. 1540 ("Decreto Supremo") created the Natural Protected Forestal Reserve of "Malleco". Unfortunately, it was never published.

[24] The Law No. 3133 was published in the "Diario Oficial" of 07/09/1916 with the title: "Neutralización de los Residuos Provenientes de Establecimientos Industriales".

were also established and the disposal of unsafe solid or liquid wastes in the water courses was forbidden (CONAMA 1992). If this law had been duly enforced a great part of the actual pollution problems would have been avoided.

Since 1916 hundreds of environmentally-related legal texts have been enforced. The National Commission on Environment (CONAMA) identified and published recently a set of **more than seven hundreds** environmentally-related legal texts actually in force in Chile (CONAMA, 1992), conferring environmental competencies and attributions to different governmental agencies. **A great part of the amazing quantity of laws actually in force were not even properly known by the agencies in charge of enforcing them.** In fact, a profusion of laws are actually in force. Those texts have, in general, a resource-oriented and problem-oriented environmental protection approach. In other words, they focus on specific natural resource protection and/or on specific environmental problems resulting in a fragmented, partial and sectoral orientation.

As a result of that legal framework environmentally-related competencies and attributions were conferred to different ministries and governmental agencies according to their main sphere of action. Environmental competencies and attributions were thus sectoral distributed, with little or no coordination among the different governmental agencies and with a partial approach to the environmental problems, often reduced to single sectoral approaches. Superposition of competencies and attributions occur in some cases, and omissions in others.

The increasing international environmental awareness during the last three decades and the exacerbation of several national environmental problems gradually increased the national environmental awareness until they became a relevant political issue during the eighties. The acute atmospheric problems of Santiago (where roughly 40% of the Chilean population live and also where most political and economical decisions are taken) and the contamination of the rivers and seashores of the Central Region were, together with the international awareness, among the most important catalysts of the recent national process of environmental awareness.

The First National Scientific Conference on Environment which took place in La Serena in 1983 [25/], was an important expression of the increasing environmental concern of the scientific community from outside the government system. The **Political Constitution of 1980** established in article 19 the right of the persons to live in a pollution-free environment and the responsibility of the State to guarantee this right. It also established the mechanisms to enforce it (Lavin, 1993:23). In spite of the Constitution, the

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[25/] This Conference was convoked by the Centro de Investigación y Planificación del Medio Ambiente, CIPMA, an environmental NGO.

first explicit attempt to face the environmental issue organically from the public sphere occurred in 1985, when the military government created the **National Commission on Ecology** ("Comisión Nacional de Ecología"), which was dependent on the Home Affairs Ministry ("Min. del Interior"). This Commission was in charge of the elaboration of the General Environmental Law whose creation was determined by the 1980's Constitution. The draft proposed by the Commission was highly criticized by several sectors of the government, by the productive sectors (entrepreneurs) and also by the political sectors opposed to the government. As a consequence of such consensus, rather unusual in those days, the law was not even submitted officially for approval [26/] (Solari and Undurraga, 1993:34). In general, the role of the National Commission on Ecology was marginal.

The first serious attempt to tackle the environmental issue organically from the public sphere occurred inmediatly after the re-establishment of the democracy in 1990. The lack of coordination between the sectoral agencies and the fragmented approach to the environmental problems made manifest the need for a coordinatory body and an environmental legal framework, which would be able to address the serious environmental problems of the country. In that year the **National Commission on Environment, CONAMA**, was created, substituting the former Commission on Ecology. The state of environmental emergency of Santiago as well as the fragmented approach to the environmental issue can be observed by the fact that the Commission for the Decontamination of Santiago was created in April 1990, a fewer months **before** the creation of CONAMA. In 1992 CONAMA submitted the draft of the **"Ley de Bases del Medio Ambiente"**, which is actually being discussed by Parliament. The environmental institutionality in Chile is, therefore, still incipient and in process of definition.

The government's environmental policy has not been defined yet. The reason for that omission is that no governmental agency is entitled, yet, to propose an overall environmental policy. The general environmental law, if approved, will entitle CONAMA with the competency of proposing such policy to the President of the Republic (art. 46). Thus, no explicit environmental policy is expected to be available before the Environmental Framework Law is approved. The **absence of an environmental policy** is therefore a consequence of the incipiency of the process and constitutes a serious constraint to the analysis of the Chilean environmental institutionality.

[26/] The military "Junta de Gobierno" substituted the Parliament during the military government and was in charge of the approval of new laws. The general environmental law proposed by the National Commission on Ecology was never formally submitted to the "Junta".

4.2.2 Environmental institutionality within the general political administration

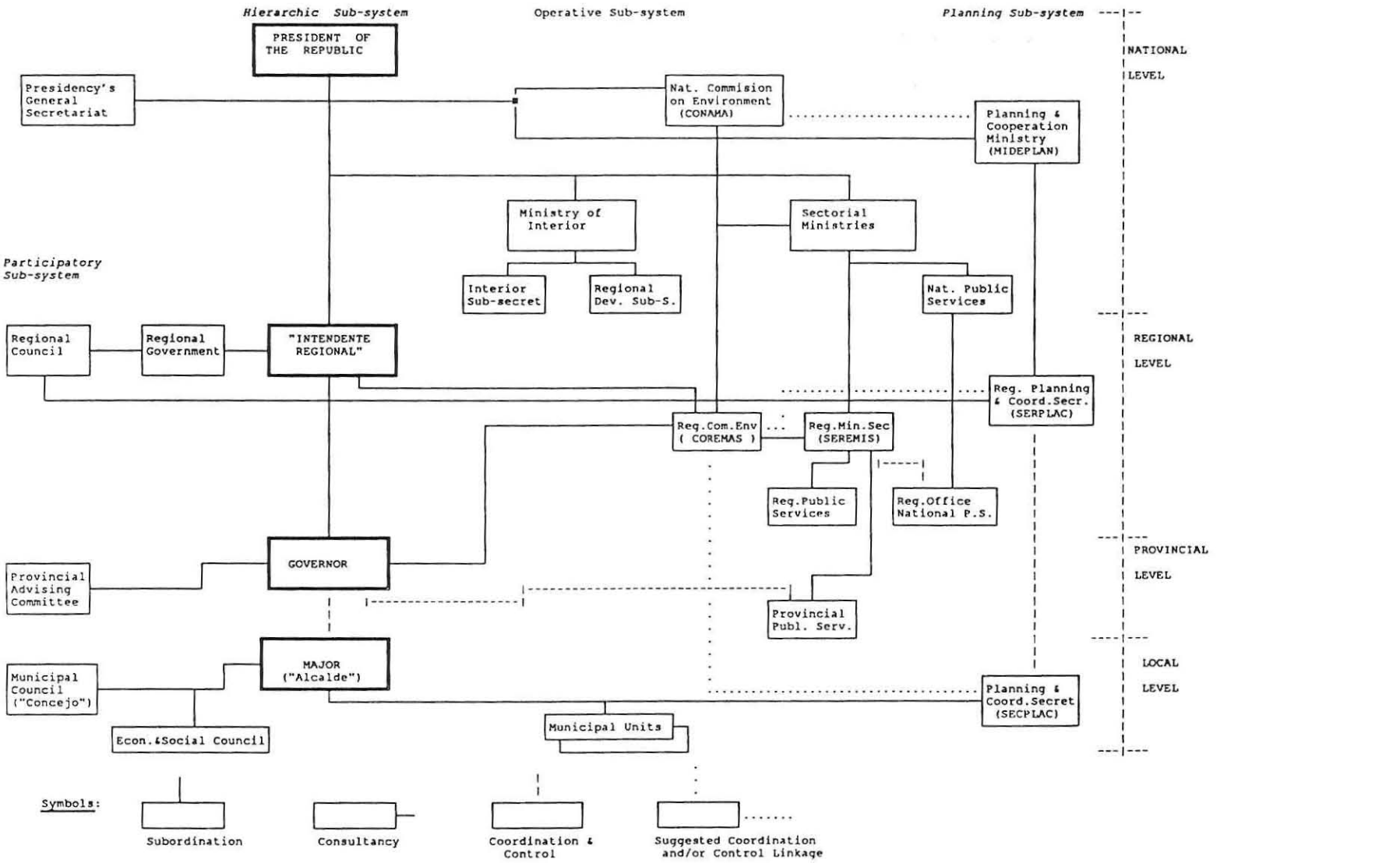
A distinction should be made between two groups of government agencies which have environmental competencies: the first is composed by the different sectoral agencies which have environmental competencies and attributions related to their main sphere of action, such as health protection, protection of natural resources such as forests, fishing, etc. On the second group are the governmental and administrative apparatus which deals specifically with the environmental issues. As stated above, the environmental institutionality as such is very recent.

On the first group the Ministries which have relevant environmentally-related competencies and attributions conferred by law, according to Solari, are: **Health, Public Works, Agriculture, Economy, Mining, Housing, Transportation and the Ministry of Defense** (Solari and Undurraga, 1993:37). Those ministries have normative environmentally-related competencies and generally rely on deconcentrated agencies for the implementation and control of different actions such as project approval, permission grants, control of the accomplishment of standards, etc. It must be noticed that the Ministry of Planning (MIDEPLAN) is not considered within the environmental institutionality, neither are the Ministries of Home Affairs or the Ministry of Finance. The analysis of the environmental competencies conferred to the sectoral agencies is a complex task and is beyond the scope of this paper.

On the second group, the most relevant environmental institutions within the public sphere are the **National Commission on Environment (CONAMA) and its regional deconcentration (COREMAS) and the Commission for the Decontamination of Santiago**. The next sections will focus on the main aspects of the Chilean new environmental institutionality, namely, CONAMA and COREMAs. The creation of CONAMA, its insertion within the government apparatus as well as its competencies and attributions will be analyzed in more detail in section 4.3. The proposed Environmental Framework Law will be analyzed in chapter 5. Follows a diagram with a simplified structure of the Chilean's government and administration system, including CONAMA (figure 4.2). It must be noticed that no coordination linkages exist between CONAMA and the Ministries of Planning and Home Affairs.

SIMPLIFIED STRUCTURE OF THE GOVERNMENT AND ADMINISTRATION SYSTEM OF THE COUNTRY

Figure 4.2 (Modified from ILPES/DIDESCO/PNUD, 1992)



4.3 The National Commission on Environment CONAMA

An overall look at the chilean **environmental administration** revealed a historically centralized and sectoralized administrative structure. The existence of a profuse and disperse environmental legal texts transformed, to a certain extent, the environmental protection responsibility in **"everybody's job"**. The need to create a special coordinator body to deal with the environmental issues was finally faced with the creation of the Environmental Commission on Environment, "Comisión Nacional de Medio Ambiente", CONAMA.

CONAMA, is an inter-ministerial Commission which was created in June 1990, fewer months after the reestablishment of a democratic government in Chile. It was required the task of studying, proposing, analysing and assessing all issues related with the protection and conservation of the environment [27]. It is the highest environmental authority at the National level.

The National Commission is deconcentrated at the regional level on the Regional Commissions on Environment, COREMAs. The region is the lowest territorial deconcentration of the CONAMA, its representation at the local level is not considered in spite of the fact that the Municipalities do have environmental competencies and attributions and might become important instances of environmental management.

4.3.1 Internal Structure of CONAMA:

CONAMA is constituted by a President; a Board of Ministers; an Operative Committee and a Technical and Administrative Secretary. The Board of Ministers is the maximum instance within the Commission. It is composed by the following Ministers: Health, Economy, Agriculture, Mining, Housing and Urbanism, Transportation and Telecommunications, and National Goods ("Bienes Nacionales"), whose Minister is also the President of the Board. In spite of their environmentally-related competencies some other ministries were not included as members of the Board. **The most important omissions** up to 1991 were: Public Works, Planning, Education, Finance ("Hacienda"[28]) and Home Affairs ("Interior").

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[27] The Decree No 240 from the 5th of June, 1990, on its first article creates the National Commission on Environment.

[28] The ministry of "Hacienda" is the one in charge of the formulation of the economic policies. A higher degree of coordination between environmental policies and economic policies should, therefore, require the active participation of "Hacienda".

The Operative Committee is highly representative of the different sectors involved in environmental issues however it does not have the decision making power which relies in the hands of the Board of Ministers. It is composed by the Technical and Administrative Secretary of the Commission, who chairs the Committee, representatives of the ministries composing the Board of Ministers, and representatives of the ministries of Interior, Foreign Affairs, Finance ("Hacienda"), Defense, Public Works, Education, Planning, a representative of the General Secretary of the Presidency, the National Commission on Energy and a representative of the "Corporación de Fomento de la Producción".

4.3.2 Modifications to be introduced by the Environmental Framework Law

The general environmental law, actually in discussion by the congress introduces some modifications on both 1) the **structure** and 2) the **competencies** of CONAMA.

1) Modifications to the structure of CONAMA: The proposed **structure** of the Commission will be as follows: CONAMA will be composed by: i) a Directive Council of Ministers; ii) the Executive Secretary; iii) a Consultive Council; and iv) the Regional Commissions on Environment.

i) The **Directive Council of Ministers** will the maximum authority of the Commission (substituting the actual Board of Ministers). The Ministers which will constitute the Council as well as its Chair Minister is to be decided by the President of the Republic. It may eventually reproduce the actual composition, or include Ministers which actually are not included in the board, and whose participation in the definition and implementation of environmental policies are extremely relevant such as Planning, Public Works, Finance ("Hacienda") and Education.

ii) The **Executive Secretary** is also nominated by the president of the Republic. He is in charge of the administration of the Commission. He is the chief of the Service and its legal representative.

iii) The **Consultive Council** acts as an instance of participation of the community on the national environmental main forum. The Consultive Council is chaired by the Chair of the National Commission, and composed by representatives of the academic community, NGO's, entrepreneurs, and workers, plus a representative of the President of the republic. The Consultive Council's competencies are defined in terms of "formulating opinions", whenever required by the Directive Council, on matters related to the projects of law referred to environmental quality and emissions standards. They can also exert other functions required by the Directive Council. The degree of participation of the national community through the Consultive Council is very limited and definitely sub-optimal. Its political importance, however, cannot

be denied: in a democratic system, with free information, the proposed council can certainly exert political influence over the national decisions.

iv) The **Regional Commissions on Environment**, COREMAs, are a deconcentration of the national Commission at the regional level. The structure of the CONAMA ends at the regional level and the mechanisms of coordination with the Municipalities are not clear (see figure 4.2). The creation of the COREMAS is a first, although timid step, towards the territorial decentralization of the environmental decisions. Among the attributions of the COREMAs is the approval of the environmental impact assessments (EIA).

The Regional Commission is composed by: the **Intendente** (directly nominated by the President of the Republic), who chairs the Commission; the **director of the COREMA**, who is nominated by the Directive Council of CONAMA; the **Governors** of the provinces of the region (nominated by the President of the Republic); and the **SEREMIS** or regional ministerial representatives of the ministries conforming the National Commission (nominated by their respective Ministers with the approval of the Intendente). **All the agents participating in the COREMA are vertically nominated from the centre. The final decision thus, even though taken physically in the region (administrative deconcentration of decision) is politically on the hands of the centre.**

The political pressure that the affected regional/local population can exert over the regional environmental authority (in the case of an Environmental impact assessment, for instance) is undermined by the nature of its power. The "Intendente", is the maximum authority of the COREMA. Being directly nominated by the President of the Republic he does not represent the regional community but the central government in the regions. Such an authority can be too fragile to face the multiple political pressures which he may receive to approve development projects which, although not desirable from the point of view of the environmental impacts it may provoke on the region, are considered as important (desirable) from the central government's economic point of view, or from strong economic groups' point of view.

2) Modifications to the competencies and attributions of CONAMA: The competencies and attributions are conferred to CONAMA by the new law are summarized in the following box. Specially important are the ones of proposing the environmental policies to the President of the Republic as well as the of acting as a national consultive and coordinatory body in environmentally related issues.

CONAMA's Environmental Competencies and Attributions (according to the proposed Env. Law, "Ley de Bases Sobre el Medio Ambiente", article 46)	Main Issue
a) To propose the environmental policies to the President of the Republic;	- Policy formulation;
b) To act as a national consultive, analytical, communication and coordinatory body in environmentally-related matters;	- Consultive, coordination and communication;
c) To organize, direct and maintain a national system of environmental information oriented towards the public management;	- System of environmental information;
d) To analyze the studies and proposals from the different ministries, services and organs with public environmental competencies , aiming at the elaboration of studies, reports and proposals concerning the environment;	- Assessment of sectoral studies and proposals;
e) To coordinate, in environmentally-related issues, the different ministries, organisms, enterprises and public services, and look for its adequate accomplishment;	- Coordination of the public sector;
f) To promote coordination on the activities of environmental supervising and control;	- Coordination of env. control;
g) To propose to the President of the Republic projects of law and administrative acts related to environmental issues;	- Proposal of environmental laws;
h) To collaborate on the preparation, approval and development of educational programmes oriented to create a national environmental awareness towards the preservation, conservation and protection of the environmental patrimony, as well as the promotion of the participation of the community on those issues;	- Collaboration on educational and environmental awareness programmes;
i) To coordinate the organism with competencies in matters related to the international aid towards environmental projects, and act as national technical counterpart in projects with international support;	- Coordination of international cooperation;
j) To interact with the international organizations;	- International dialogue;
k) To approve the activities plans of both the CONAMA and COREMAs;	- Approve own programme;
l) To regulate the functioning of the Environmental Protection Fund.	- Regulate use of Funds.

Box 4.1

4.4 Conclusions

The creation of a Coordinatory Commission on Environment instead of creating an environmental ministry seems to be an **efficient** approach to the environmental problems: it avoids duplication of administrative structure, and situates the environmental decision making within the different ministries, instead of trying to impose them from the outside. It involves all the productive sectors on the elaboration and/or discussion of the environmental policy. Considering the complexity of the environmental issues, due to its multidisciplinarity and the existing conflict of interests, the existence of a coordinatory and negotiation instance is essential.

On the issue of **territorial decentralization**, the Regional Commissions are a sub-optimal solution, since their members are nominated from the centre, failing thus to devolve environmental competencies to the regional actors. The Regional Consultive Council is partially elected by the Municipal Council, however, it has no direct decision-making power. Its attributions are confined to the sphere of giving suggestions. The participation of the regional and local communities on the formulation of regional and local environmental policies is not contemplated in the law.

CHAPTER V

THE ENVIRONMENTAL FRAMEWORK LAW: AN IMPLICIT PARADIGM?

In order to cope with the fragmented approach and the lack of coordination to the environmental problems a new legal framework is being proposed: the "Ley de Bases del Medio Ambiente" actually being discussed by Parliament. This new framework would respect to a great extent the existing sectoral competencies while aiming to approach the environmental dimension as a whole. The following discussion will assume that the draft of the law will be approved by Parliament.

This chapter will infer the environmental paradigm behind the law as well as how it fits within the Chilean political environment. Finally, the legal framework will be examined in the light of the conditions required to achieve sustainable development proposed in chapter 3. Considering the absence of an explicit environmental policy this paper will also try to infer important policy elements behind the proposed Environmental Framework Law ("Ley de Bases del Medio Ambiente"). This analysis may be fragile since the policy elements detected might have not been conscious while elaborating the legal text. Although fragile this analysis is justified on the basis of the necessity to understand the guidelines (organic or not) which are orienting the government's environmental decisions in Chile today.

The lack of a clear policy definition prior to the elaboration of the law will be reflected on the existence of some inconsistencies between the different spheres of action established. The same can be said in relation to the environmental paradigm behind the text: although important Institutionalist elements can be found, they do not seem to emerge as product of a conscious and consistent policy orientation.

5.1 The Implicit Concept of Sustainability

Although important elements can be inferred from the reading of the legal text, the environmental paradigm behind the legal proposal do not emerge clearly. Some questions to be answered in order to determine the implicit concept of sustainability are: what is to be sustained, and which are the "conditions" required to achieve sustainability.

On the question of **"what is to be sustained"**, the legal text refers to two different dimensions, namely natural and man-made components of the environment. On the natural components, the first article the law refers to

the existence of "**basic components of the environment**", whose degradation (present or future) implies a risk for the equilibrium of the ecosystems conforming. The legal text, however, goes far beyond the commitment for maintenance of the "basic components of the environment". It reflects an **holistic** approach to the environment. Environment is defined, broadly, as "everything that naturally surrounds us and which permits the development of life" (art.1,a). In consonance with that definition the Environmental Framework Law seeks to protect (or maintain) the cultural, historical and archaeological patrimony; landscapes and sites of special beauty; human settlements, etc. In other words, it considers the maintenance of both man-made and natural capital, this last one defined as "basic components of the environment".

The commitment to maintain the cultural patrimony in general, is expressed in article 16, where those aspects are mentioned as a criteria for measuring environmental impacts of human actions when undertaking EIA. In fact, the impact over cultural patrimony and landscapes are considered together with the impact over natural protected areas, human settlements, impacts of the health of the population and socioeconomic impacts. This holistic approach to the issue of environmental sustainability places the Chilean's definition of sustainable development (as read through the legal text) close to the **Institutionalist's** comprehensive approach, which stresses the cultural and institutional dimensions.

In common with the Institutionalists is also the assumption that human beings are capable of altruistic attitudes. This fact can be observed by the emphasis given to the environmental education, promoting environmental awareness and therefore a change in attitudes. In contrast with this view the Neoclassical **environmental protection** paradigm (which is closer to the general political environment) reduces the environment to an economic externality and assumes the human beings to be egotistic profit-maximizers.

Territorial considerations:

The recognition of the need to protect the environmental patrimony has an implicit territorial impact, since the environmental patrimony is, by definition, territorially located. The acknowledgment of the multiple values of the environment (such as beauty, historical and cultural values), in contrast with the reductionism to the economic value, is a good starting point to generate territorially differentiated environmental policies since it **settles the grounds for a regional and local definition of environmental sustainability** subject to the national definition. Those grounds are to be found on the recognition of both the cultural differences and the specificities of the environmental patrimony of the different regions.

5.2 Conditions to Achieve a Sustainable Path

Three important conditions to achieve a sustainable path are stated in the legal text. The first one belongs to the ecological sphere: i) the law explicitly states the need to **preserve the basic components of the environment**. Environmental damage is defined as the loss or degradation of any "basic component of the environment", whose degradation is assumed to represent a risk for the equilibrium and proper functioning of the ecosystems conforming it, affecting any form of life or the quality of life of the human beings (art. 1,q and r). Any activity which provokes "serious environmental damage" is subject to legal prohibition (art.40). Accordingly, EIAs are to assess the danger of irreversible processes as consequence of human interventions (art.16,k).

On the cultural sphere, two additional conditions are stated: ii) the preservation of the cultural heritage and iii) a cultural shift towards environmentally friendly attitudes, promoted via education. Those conditions are expressed in the legal text first, by establishing the obligation to promote environmental values through the educational process, and second, by the inclusion of the cultural patrimony as an element to be protected through the EIA. Those two conditions illustrate the relevance of the cultural dimension in the Chilean environmental paradigm, as expressed by the legal framework.

The importance given to education and the promotion of environmental values is also an indication of the human nature assumption behind the legal text. Human beings are considered as being able to demonstrate altruistic attitudes and concern for the social welfare, as well as for the bequest of future generations.

5.3 Environmental Principles

No **environmental principles** are adopted as such by the legal text. The purpose of defining principles is to **guide future decisions upon matters which have not been explicitly regulated**. The purpose of a framework law ("Ley de Bases") is not to regulate all aspects of environmental management but to provide a legal framework or, in other words, to settle guidelines for future decisions, therefore the importance of defining environmental principles within this type of law is undisputable. In fact, the non-definition of environmental principles constrains to a large extent the scope of the law. Although some environmental principles are certainly behind the law (either consciously or unconsciously), since they are not expressed as so they cannot be extended to other cases which are foreseen by the law.

Two important principles however are present in the law, although not mentioned as such. The first one is the **principle of conservation of the biodiversity and of the natural resources**: art. 25 states that the use of the natural resources should not endanger its conservation nor the biodiversity linked to it. The second is the **principle of environmental responsibility**: the law establishes the legal figure of **environmental offense** affecting whoever violates the norms of environmental quality, conservation or environmental protection established in the law. It also establishes the obligation to repair the environmental damages when possible and in some cases the indemnization for the environmental loses (art.66-72).

Some of the environmental principles which guided the formulation of the law, but were not stated as principles (and not necessarily present in all aspects of the law) are the following:

i) Preventive principle: it was behind the imposition of environmental impact assessments, EIA, prior to the approval of certain projects which, potentially, may provoke undesirable environmental impacts. The EIA aims at the prevention of unacceptable environmental damages. The establishment of emission standards, and also the "management plans" (see section 4.2.5), are guided by the preventive principle.

ii) Precautionary principle: it was behind defining the need to assess the risk of **irreversibilities** linked to project implementation. This is a criteria for the rejection of an EIA, on the same grounds as possible risks for human health (art.16).

iii) Democratic principle: it was behind the promotion of the participation of the community in protecting the environment (art.5; art.22) [29]. Some drawbacks of the participation process have already been analyzed on section 4.3.2.

iv) Equity principle: Sustainability *per se*, entails an **inter-generational equity** concern: it is about being fair to future generations (as expressed by Pearce) as it implies the avoidance of cost-shifting to other generations. Through the legal text, the concern towards the **bequest** of future generations is implicit. It is expressed in terms of preservation of the natural assets (protecting the basic components of the environment) as well by the protection of man-made capital, cultural assets, monuments and places with special aesthetic value, etc. It is not expressed as a principle however.

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[29] Article 5 states that the agencies of the public administration have the obligation of promoting and facilitating the participation of the community on environmental protection activities.

The intra-generational equity principle is partially presen in art.4, which states that whoever damages the environmental patrimony should repair it, if possibly physically, and should also pay an indemnization according to the damage provoked. Other **Intra-generational equity** aspects, such as poverty alleviation and equity in the access to environmental goods and services are not present in the legal text, although the **vicious circle of poverty and environmental degradation** are frequently stressed in the political environmental debates (both national and internationally). In fact, the proposal of establishing taxes or charges to the use of scarce natural resources within the decontamination or prevention plans whenever exclusion is possible ("whenever it is viable to impute a cost to its use") as stated on article 39, **suggests a certain lack of preoccupation to the possible distributive side-effects of the indiscriminate application of such a measure** (unless they are interpreted as being implicit on the term "viable", which is not clear).

The **equity** in the access of the environmental services and goods is another aspect which is not observable through the legal framework. The differentiation in the quality of the environment of poor population and wealthier population is still to be tackled. The **interspatial equity** crosses both the **territorial** dimension and the **distributive** dimension, in terms of both income and access to the natural resources and differentiation on the distribution of environmental goods and bads between and within regions and localities.

The avoidance of **interregional cost-shifting**, such as the issue of transboundary pollution; or the concentration of environmental costs on specific areas of the national territory (due to the economic base of such territory); or the relocation of polluting activities to other areas within the national boundaries (export of pollution) is an important aspect which cannot be found in the legal framework [30].

5.4 Political Principles

The importance of the **political principles** behind the text cannot be ignored. The political principles, although not expressed on the law either, were thoroughly analyzed by either government and non-governmental actors involved in the process. Follows a summary of the political principles mentioned on the 4th Scientific Conference on Environment.

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[30] They might occur, since the decisions on the approval of the EIA are not on the hands of the locally elected authorities, but on the hands of centrally nominated authorities, as stated above.

POLITICAL PRINCIPLES BEHIND THE ENVIRONMENTAL LAW

In addition to the environmental principles analyzed on section 4.4.3, there are important political principles orienting the legal text. Those principles are in charge, to a certain extent, of linking the legal dimension with the political reality, thus avoiding the elaboration of a legal framework which would be dissociated from the country's political reality and therefore, never fully implemented. Although the environmental principles were not analyzed during the 4th Scientific Conference on Environment, the political principles were mentioned in several occasions, by different government actors.

Z.Luksic mentioned the following political principles:

i) **transparency principle**, or the clear establishment of the rules so as to assure legal security to the different sectors involved, such as the clear establishment of the EIA criterias;

ii) **the principle of cooperation, coordination and regulation**, between the government and the other sectors involved; that will require a legal national body in charge of coordinating the different agents; in relation to the cooperation, it is proposed that the norms and politics elaborated by CONAMA be previously discussed with the other actors involved, namely, productive sectors, NGO's, universities, etc; regulation, however is competency of the government;

iii) **decentralization principle**, which implies both the decentralization of the EIA decisions to the regions, and the necessity of the participation of the regions on the design of the environmental policies [31];

iv) the **"base law"** principle: the proposed general law is a framework law, or a "base law" ("Ley de Bases"), which means that it does not pretend to comprise every single issue, but it rather aims to establish the **basic principles**, while referring to other laws, such as the "Codigo Sanitario" or the Traffic Law; and

iv) the **graduality principle**, which finally appeals at a realistic attitude, avoiding the elaboration of a legal text which may not be enforced (Luksic, 1992:134-137).

The proposal of ambitious goals, such as the achievement of environmental ideal situations on the short run, are considered to be political, economical, administrative and technically unrealistic. The government has, though, adopted a political risk-aversion attitude, which is expressed through the establishment of realistic and gradual goals [32].

Box 4.2

5.5 Environmental Policies

Since the government's environmental policy has not been defined yet this section will infer some relevant elements of environmental policy present (or absent) in the legal text as well as their territorial implications. The policies suggested will be confronted both with the country's general political-economical policies, in search of political consistency, and with the policies proposed in chapter 3.

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[31] The participation of the regions on the elaboration of environmental regional policies is not considered in the legal text's draft.

[32] See CIPMA, 1990:22,23,32,131,136 and 176, to mention some of the occasions where different actors, representing both the government and non-governmental actors approached the principle of graduality as a guiding principle for the environmental policies in Chile.

The most relevant policies expressed throughout the law are three-fold: i) in the ecological sphere, policies towards the preservation and restoration of the environment seem to guide the text, although not always organically; ii) on the socio-cultural sphere, there is a clear policy towards the creation of environmental awareness; and iii) on the administrative sphere prevails the mainstream policy of preventing the increase in the size of the government's apparatus.

5.5.1 Ecological policies

The presence of policies aiming at the restoration and preservation of the natural resources are present throughout the legal text, although attempts to increase the efficiency in the use of those resources are not observable. Environmental protection is defined as the group of policies and measures oriented towards the improvement of the environmental conditions, as well as the prevention and control of its degradation (art.1). Different policies and measures aiming at those goals can be observed:

i) Restoration: the establishment of the legal figure of "Decontamination Commission", aims at the recuperation of acceptable environmental standards in areas which sometimes reaches levels of pollution considered as environmental emergency according to the international standards as in the case of the air pollution levels of Santiago during winter time. Some areas, where the natural absorptive capacity has clearly been overpassed are declared as "saturated areas" (art. 33). This is a recognition that the use of some areas of the territory has occurred without respecting its **carrying capacity**. The "saturated areas" receive special remedial treatment from the "Decontamination Commission".

ii) Preservation: the legal text focuses more on the preventive policies, than in remedial ones. Thus, the relevance given to the imposition of EIA prior to the approval of certain projects. The "management plans", and "prevention plans" (art.31-33), are also preventive policies, although those are presented as isolated measures, related to the regulation on the use specific natural resources or restricted to specific areas, respectively.

On the sphere of preventive policies there are also the **establishment of standards and norms**, such as emission standards aiming at protecting the basic components of the environment, and the conservation of the environmental patrimony (art.26, art.37) [33].

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[33] Conservation of the Environmental Patrimony is defined as the use of the Natural Resources in such a way as to assure its permanence and regenerative capacity (article 1,g).

5.5.2 Socio-cultural policies

The socio-cultural policies are summarized as the requirement for preserving the cultural assets and the promotion of environmental values through educational processes (art.7).

5.5.3 Administrative policies

The administrative reforms proposed are in consonance with the government's policy to avoid the increase in the size of the government's apparatus. The proposal is basically to limit the administrative adaptations to their minimum expression. The environmental administrative policies present in the law observes to a great extent the political "graduality principle". That means avoiding drastic administrative modifications, and trying to adapt the existing sectoralized administrative structure to the new requirements, with the aid of a coordinatory body, CONAMA. **The reluctancy to generate deeper administrative reforms respond to the prevalence of the mainstream liberal policy, which supports the steady decrease of the public apparatus.**

Although some emergency administrative instances, such as the "Commission for the Decontamination of Santiago" have been created in order to face environmental emergencies, apparently the proposed reforms are still insufficient to face the demands of an efficient overall environmental management, specially on the preventive sphere. If the general environmental law is approved, important administrative reforms would have to be implemented in order to face some of the command-and-control regulations proposed, or the legal framework might be "by-passed" by the absence of an adequate administrative infrastructure. The enforcement of the EIA, for instance, will require the existence of trained personnel within the public sector, at all levels of scale.

5.5.4 Drawbacks:

No general environmental economic policy implications are suggested. While economic activities are to be "subject and restricted" by the general environmental law (art. 6) environmental economic policies, such as modifying the System of National Accounting, or including environmental CBA on project appraisals are basically not contemplated [34]. The way in which the environmental constraints are expected to affect the economy is basically by the imposition of certain limitations through regulatory, command and control measures.

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[34] The imposition of environmental impact assessments (articles 13-16), however, sets the basis to the incorporation of environmental costs on private or social CBA.

In terms of environmental management, the approach of the legal text is basically a regulatory approach, based on command-and control policies. Very little references to avoiding environmental cost-shifting can be found, and economic instruments for environmental protection (based on Pigouvian taxes) are not the main focus of the instruments proposed. Economic instruments are mentioned only in relation to the "prevention and decontamination plans" (art.36-39).

The virtual absence of economic policies for environmental protection occurs within a context of a **market economy**. It is difficult to conceive that a predominantly regulatory environmental policy can succeed within a context of a liberal, market oriented economy, where economic growth is an undisputable priority.

The need for regulatory measures to protect the environment has been stressed throughout chapter 3, and is not under discussion so far. However, the need to integrate organically the economic policies and the environmental management policies appears as a must if the later is to succeed. **Considering the Chilean's liberal political-economic context, if the environmental protection strategy is to succeed, it has to act, as far as possible, within the market mechanisms for environmental protection. Command and control policies should be reserved to guarantee a security threshold of environmental quality, so that "the boat" will not sink, according to Daly's analogy.**

Although not properly stressed in the legal text, it is not surprising that the *praxis* of environmental decontamination strategies, in consonance with the current political-economic paradigm, relies increasingly on political and economic instruments. The use of negotiation processes as well as positive and negative economic incentives, are often being suggested within the decontamination strategies [35].

There is no mention of the inclusion of the environmental considerations within the government's **general economic policies**. Those policies, although not intending to, do have important environmental impacts, **unevenly distributed through the territory**. In other words, the environmental side-effects of the government's economic policies over the different regions of the territory is not being considered.

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[35] The use of economic instruments is considered in art.36, in relation to the prevention and decontamination plans. However, no general economic implications are proposed.

5.6 Instruments of Environmental Policy

The instruments for environmental policy, explicitly contemplated as such on the legal text (art.7-41) are the following:

5.6.1 Education

Education is the first instrument for environmental policy mentioned in the law. It aims at the promotion of environmental values, knowledge and abilities, in order to prevent and solve environmental problems. The environmental issues should be incorporated in the curricula of the formal education in all its levels as an integrative element of different disciplines (art.7).

5.6.2 Research

The budgets assigned to scientific research and technological development and social development must contemplate an environmental item (art.8).

5.6.3 Environmental Protection Fund (Fondo de Proteccion Ambiental)

A special fund is created with the objective of financing projects oriented to the preservation, conservation and protection of the environment. This fund has the competency to promote the preparation and presentation of projects at the **regional and local levels** (art.9-11).

5.6.4 Environmental Impact Assessment (EIA)

The obligation of the submission of both public and private projects to an EIA established on articles 13-24 of the law. The approval or rejection of the EIA is deconcentrated to the Regional Commission on Environment. A definition of the type of projects subject to the EIA is detailed on art.15, while the **criteria** to evaluate the environmental impact of the project is established on art.16.

Those **criteria** denote a holistic approach to the issue of sustainability. They include **ecological considerations**, such as the magnitude of the impact, its location, the amount of emissions and waste it will produce, and its effect over the conservation of the natural resources; **aesthetic, cultural and historical considerations**, such as alterations of the landscapes, historical monuments, sites with cultural value, sites of special interests for its uniqueness, etc; **social considerations**, such as the translation of human settlements, the risk over human health, and socioeconomic impacts in general; and finally, considerations over the reversibility or **irreversibility nature** of the impact.

5.6.5 Norms of Quality, Preservation and Conservation of the Environment

The environmental norms are based on the principle that 'the use of the natural resources should not endanger its conservation nor the biodiversity linked to it' (art.25). The norms address the "basic components of the environment", with the objective of protecting and preserving the environment, conserving the environmental patrimony, the existence of an environment free of pollution, and the quality of life and health of the population (art.26).

The norms will be established by law (Decreto Supremo, D.S.). Their elaboration is competency of the Ministries in charge of the different matters. The CONAMA must suggest, facilitate and coordinate the elaboration of the norms of environmental quality (art.27). A system of protected areas should be administered and supervised by the government, which will also incentive the creation of private protected areas (art.28).

An **inventory** of the wild species of the flora and fauna should be created by the government agencies, aiming at the elaboration and enforcement of regulations related to their harvest, capture, hunting, trading and transportation. The ultimate objective of the inventory is the conservation of the biodiversity. It is also established that a specific law should regulate the *amenagement du territoire* ("ordenación territorial") as well as the land use (art.30).

5.6.6 Management, Preventive and Decontamination Plans

The "**management plans**" aim to "assure the conservation of the renewable natural resources on a specific area" (art.31). The competency to request a management plan relies on the sectoral agency in charge of regulating the use and exploitation of the natural resource. The management plan include considerations such as control and use of water and soil; scenic value; protection of wild life; evaluation of the condition of the resource; regenerative rates of the resource; genetic patrimony; cultural patrimony and environmental monitoring (art.32).

The implementation of the "management plans" are thus dependant on the requirement, by the sectoral government agency in charge of protecting a specific resource, such as water, or forest. It is resource-oriented instead of territorially-oriented. That means that it does not intend to preserve the ecosystems of a certain area, but only **target resources**. No general criteria to require "Management Plans" is specified. The use of economic instruments for environmental protection is not considered at the management plans level.

"**Preventive plans**" are compulsory for the generators of emissions located in certain areas of the territory in which the authority determines them to be

necessary. The objective of those plans is to assure the enforcement of the emission standards in those areas (art.33).

"Decontamination plans" are established by the authority in the areas of the national territory which are declared as "saturated areas". The objective is to assure the enforcement of the environmental quality norms. Those plans are subject to the approval of CONAMA after the report of the Regional Commission.

Both prevention and decontamination plans may include **emergency measures** when the levels of contamination are considered as an imminent danger for human health. Those measures may include the interruption of the individual or social rights which may contribute to the generation, maintenance or exacerbation of the emergency, or which may endanger human life or health.

Preventive and decontamination plans may use both regulatory and economic instruments for environmental protection. It must be stressed that this is the only instance in which the use of economic instruments is considered in the legal text. **The use of economic instruments for environmental protection is considered only on specific areas, pre-determined by the authority.**

An overall analysis of the instruments for environmental policies suggests that **the legal text emphasises a regulatory, command-and-control path which may not match the chilean political and economical paradigm.** When the legal dimension does not reflect the political dimension, it can easily be *by-passed* by reality. The inclusion of market-based, economic instruments for environmental protection, as well as political instruments, in connection with the establishment of environmental standards, seems to be more in consonance with the actual chilean path.

5.6.7 Territorial Considerations

The proposal of **"preventive" and "decontamination" plans** have a positive territorial effect, namely, they allow the authorities to focus on critical areas, and empower them to undertake special measures without further delays, thus accelerating the required actions increasing their efficiency and effectiveness. This will certainly benefit the areas which are suffering from specially serious environmental problems. Somehow, it is lacking an overall preventive strategy both at the national and regional levels, emphasising the use of economic incentives towards the research and use of environmentally friendlier technologies.

5.7 Political versus Legal Paradigm ?

A first general observation in relation to the environmental paradigm behind the general environmental law, is that it has strong **Institutionalist elements**: the holistic approach to the environment, including the cultural and historical patrimony; the human nature assumption, considering man as capable of altruistic attitudes an social concern; the interest for the global commons, manifested through the incentive for the creation of natural protected areas; and the preoccupation towards the preservation of the "basic components of the environment", whose degradation may endanger the sustainability of the ecosystems conforming it.

Other institutionalist characteristic is it's strong reliance upon normative, command-and-control policies. The use of economic instruments for environmental protection is restricted to areas, pre-determined by the authority, where special "preventive" or "decontamination plans" are to be implemented.

The proposal of the legal text, however, occurs within a general political-economic **liberal paradigm**. And here is where some structural contradictions arise. Two of those contradictions deserve being mentioned. Both are product of the difficulties of matching an Institutionalist approach with a prevailing liberal, market-oriented general policy.

5.7.1 First Contradiction

The first contradiction is the modest, meagre, proposals of institutional reforms. In contrast with the Institutionalist proposals, based on structural institutional reforms, the chilean proposals are extremely timid. The main institutional reforms proposed are:

i) On the administrative sphere, the creation of CONAMA, and its deconcentration at the regional levels;

ii) On the normative sphere, it is more ambitious, proposing the creation of a set of norms of environmental quality, as well as implementing the obligatority of the Environmental impact assessment, EIA, prior to the implementation of certain actions; and

iii) On the cultural sphere, educational reforms aiming at the creation of environmental values;

The reluctancy to propose drastic administrative reforms are in consonance with the general political liberal paradigm, which support the steady reduction of the size of the public administration apparatus. The

administrative reforms proposed, however, will hardly be enough to face the future requirements product of the enforcement of the command-and control policies proposed. This basic contradiction leads to two possible scenarios: either the new regulations will never be fully implemented due to administrative failures, or in other words it will be "by-passed" by reality, or, the administrative reforms required to enforce the law will finally be proposed and implemented. The second scenario do not seem very likely to occur on the near future.

5.7.2 Second Contradiction

The second contradiction, is related the little relevance given to the economic instruments for environmental protection. As mentioned in section 3.5.1 and 3.5.2, direct regulations are inflexible and sub-optimal in terms of environmental and economic efficiency (Opschoor and Vos, 1989:24), while economic instruments tend use the resources more efficiently, guaranteeing that the abatement takes place at a minimum social cost and at the same time, provide incentives for the development of clean technologies (van Ierland, 1993:271). An environmental policy in consonance with the prevailing liberal, market-oriented philosophy, should rely first on the use of economic incentives, and save the use of command-and-control policies to the sphere of defining the necessary norms that would delimit the **minimum threshold** beyond which human activities can no longer deplete the environment without putting in danger the environmental sustainability of the ecosystems or, according to Daly's analogy, defining the Plimsoll line, and making sure that the 'optimally loaded boat' will not sink.

This contradiction with the liberal environment, however, is clearly being *by-passed* by the *praxis* of the environmental protection policies being enforced by the Decontamination Commission of Santiago, which relies on both normative and economic instruments for environmental protection. The legal proposal of economic instruments, however, are limited to special areas pre-determined by the authority and do not constitute a wide-spread practice.

5.7.3 General Conclusions on the Legal Framework:

Besides the apparent conflicts of the proposed legal framework with the general mainstream political paradigm, some important achievements and drawbacks of the legal text deserve to be mentioned:

Positive aspects:

i) It is the first general legal approach to the environmental issue: it establishes a general legal framework and defines an environmental institutionality at the national and regional levels.

ii) It establishes the idea of the existence of 'basic components of the environment' whose depletion or degradation would endanger the environmental sustainability. This notion is close to the concept of a minimum threshold of natural capital.

iii) It establishes an important preventive instrument, the Environmental Impact Assessment, EIA, prior to the approval of certain actions which may endanger the environment.

iv) It settles certain environmental principles, such as the principle of environmental responsibility, establishing criminal responsibility for the performance of actions which, by not observing the environmental law, may threaten the integrity of the environment.

Drawbacks:

i) The lack of definition of the government's environmental principles, policies, objectives and targets is an important barrier to the formulation of a fair critique of the existing situation. This omission, apparently, is a matter of time. However, the absence of this document situates many of the above observations on the nebulous sphere of relativity. An explicit policy definition may rectify many of the critiques exposed above. It may also confirm them.

ii) The **lack of coordination between the definition of environmental policies and economic policies** is a serious barrier to the long run objective of environmental sustainability. The incorporation of the environmental dimension to the general economic policy sphere is essential to achieve a sustainable path. This is expressed also through **lack of emphasis on both economic and political instruments** for environmental protection, which in fact are being implemented (economic incentives and negotiation processes);

iii) **Weak decentralization** of the environmental competencies and attributions at both the regional and local levels. No real competencies are conferred to the regional and local communities so as to allow their participation on the definition and implementation of both the national and regional/local environmental policies.

iv) **Sectorialization**: the historical sectorialization of the environmental competencies tend to remain, although with a supra-coordination exerted by the National Commission on Environment. Even though the sectorialization is not a bad in itself (it can be very efficient in some specific cases), the sectorialization, as implemented historically, tends to obstruct a general approach to the environmental problems.

v) **Lack of comprehensiveness** on the approach of environmental problems. The policies observed are usually problem-oriented or sector-oriented. It is difficult to conceive a comprehensive Regional-oriented policy within the framework proposed.

vi) The contradictions between the institutionalist aspects of the legal text and the mainstream liberal policies result on inconsistencies between the environmental policies proposed and the administrative reforms required to implement them.

5.7.4 Territorial Considerations:

On the sphere of **economic policies**, the macroeconomic and monetary policies produce territorially differentiated effects over the environment of the regions. This occurs as in function of the heterogeneity of the economic base of those regions. The regional and local environmental impacts of economic policies is especially important considering that the regional economies rely strongly on their natural resource base [36]. Consequently, the environmental impacts of the general macroeconomic policies should be assessed in order to avoid policies which will stress, unnecessarily, the natural resource base of the regions and localities. A necessary condition for that, is that the agents in charge of formulating economic policies consider the environment, as a vital variable within their analysis. **Coordination among the agents formulating economic and environmental policies is essential.**

Finally, the greater the degree of decentralization environmental decisions, the easier will be for the regions to have access to the restoration of their environment when necessary to recover acceptable standards of environmental quality.

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[36] The most relevant environmental problems of the chilean regions are associated with the exploitation of their natural resource base, according to the regional environmental management group report at the 4th Scientific Conference on Environment, which took place in Valdivia, on May 1992 (CIPMA, 1992:93).

CHAPTER VI
GENERAL CONCLUSIONS OF THE CASE-STUDY

This study will conclude with an overall assessment of the Chilean environmental institutionality done through the analysis of the major challenges it has to face, both on the political and ecological spheres. Follows the three most important challenges to be addressed.

6.1 Political Challenges

The incipient Chilean environmental institutionality faces today two significant political challenges: the first one has to do with compatibilizing the government's general policies and the environmental policies; the second is related with the decentralization of the environmental decision-making to the regional and local levels.

6.1.1 First Challenge

The overall political conditions challenges the environmental institutionality to perform a very difficult task: to compatibilize the prevailing free market philosophy and economic growth objectives with the Constitutional rights of the people to live in a pollution-free environment [37], which implies observing the environmental constraints imposed by nature.

In relation to this point, the legal framework seem to come short. It relies mainly in regulatory instruments, which are cohercitive and fails to explore the economic instruments for environmental protection, which uses the market mechanisms to induce a shift towards environmentally friendlier attitudes. The use of normative instruments should be used in combination with economic instruments and negotiation processes. No visible attempts are found in order to compatibilize an environmental law which relies basically on command-and-control proposals and the liberal economic paradigm. This contradiction is reflected in the administrative sphere through the insufficiency of the administrative apparatus so as to control the enforcement of the law.

In order to compatibilize ecological constraints and economic growth the environmental concern must be an active part of the economical policies. This integration means a shift towards environmental-economical policies, such as

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[37] As already mentioned, Zarzo Luksic, a representative of government stated that the central point to be settled by the environmental framework law was 'how to maintain a stable and sustained economic growth while still guaranteeing the rights of the people for a pollution-free environment'.

integrating the environmental costs in the system of national accounting (at the macro-economical level) and having the economic agents internalizing the ecological costs of their actions at the micro-economic level.

The *praxis* of environmental management, however do not ignore the general political context. This fact is observed through the report on the 4th Scientific Conference on Environment [38]. In the report, the environmental management functions of the government are defined as "trying to combine market freedom with political democracy", and "economic growth with environmental protection" (CIPMA, 1992:82). The political function of the government is defined as 'resolving conflicts between the social actors (which compete for the use of scarce environmental resources), while inducing consensus and compromises leading to the settlement of the problem' (Geisse, 1992:29). The issue of **negotiation** on the solution of environmental problems and the role of the State as mediator between the parties was stressed throughout the report.

6.1.2 Second challenge

A second political challenge faced by the legal framework is the decentralization of the environmental decision making. The right of the regional and local communities to participate on the decision-making processes which affect the quality of their environment is not under discussion so far. The need to accelerate the process of decentralization of the decisions affecting the quality of the environment to the regional and local levels is an important issue on the chilean environmental-political debate today. It is at the regional and local level, where those problems are finally materialized on the day-to-day life. The supporters of the decentralization argue that the environmental protection policies and decisions should be decentralized to the regional level, since the population has, necessarily a greater commitment to the defence of the vital spaces of their own environment, than the commitment expressed by centralized decisions (Sabatini, 1992:170).

The participation of the regional communities, although stressed in several sections of the law, is not backed-up by devolution of decision-making power from the centre to the regions. This fact is quite clear when referred to the EIA process. The authorities have the obligation to promote participation in the EIA processes (art.5; art.22) and the local community is compelled to

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[38] The "4 Encuentro Científico Sobre Medio Ambiente" took place in Valdivia, on the 6th, 7th and 8th of May, 1992. During that meeting, the issue of environmental management in Chile was discussed by different social actors which participate on the environmental process, such as representatives of the government, politicians, entrepreneurs and representatives of the academic and scientific community.

participate on the process of discussion and approval/rejection of the project. The requirement for participation, however, is not duly supported by **empowering** the affected population with attributions to influence the decision-making, which in last instance, relies in the hands of the regional authority. Their "participation" is restricted to the sphere of giving "suggestions" to the regional authority, who may (or may not) take them into consideration. In fact, although the decision over the acceptance of an EIA report (approval for the realization of the action) is taken at the regional level, through the COREMAs, the real decision-making power remains in the centre, where the constituents of COREMA are nominated.

Finally, in spite of fragile and sub-optimal instances of participation conferred by law, they are a step forward and they may still generate some important results considering the strength of the actual re-democratization process, and the increasing environmental awareness of the population.

The incipient decentralization of the environmental decision making prevents the regions from exerting adequately their democratic moral rights, not fully translated into legal competencies and attributions. The lack decentralization can produce differentiated treatments to the degree of protection of the environment of the different regions, according to their political presence on the centre, where the decision making processes occurs.

6.2 Ecological challenges

The third challenge, not really addressed by the Chilean environmental institutionality yet, is related to the need to implement a comprehensive approach to the environment, taking fully into consideration the biophysical constraints which nature imposes over human activities.

The **ecological conditions** to achieve sustainable development, as expressed through the law are isolated and inorganic. An overall policy definition is necessary in order to generate a shift, from the actual situation of isolated attempts to avoid the depletion of the natural capital towards an organic approach. An organic approach to the environmental sustainability is understood as being comprehensive, considering the environment in its full dimension instead of focusing mainly in fire fighting policies. A first condition for an organic approach to the environment is "knowledge". The relative lack of knowledge of the environmental patrimony calls for the promotion of a system of information of the natural and cultural patrimony, both at the regional and local levels, aiming at the creation of a system of physical accounts that would be the basis for the generation of environmental economic indicators at the sub-national level.

A comprehensive approach means consciousness of the boundaries imposed by Nature:

i) The utilization of the renewable resources at rates less than or equal to its regeneration rates;

ii) The utilization of non-renewable resources at a rate that would permit renewables to be substituted by them;

iii) Emitting wastes within the absorptive capacity of the environment; and

iv) Respecting the resilience of the ecosystems by avoiding environmental stress or shocks in spatially determined areas, which may lead to irreversible environmental processes.

Finally, a comprehensive approach to the environment means consciousness of our constant need for sources of low entropy. It means a real commitment to decrease the system's contribution to increase its own entropy. It means therefore a permanent search for a more efficient use of the natural resources, searching for the closing of substance cycles, for the reduction of the waste production and the respect for the carrying capacity of the territories. It means a shift towards environmentally friendlier technologies and therefore a shift in the consumption pattern. It means avoiding environmental-cost shifting in all its expressions: both socially and territorially.

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