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costs.

Year	Groundwater production (litres x 10 ⁶ /day)	Unit cost of groundwater production (US\$/m ³)	Groundwater withdrawal (litres x 10 ⁶ /day)	Production cost (US\$/m ³)	Groundwater supply (litres x 10 ⁶ /day)	Production cost (US\$/m ³)	Total
1984	730	0.131	730	95.9	0	95.9	95.9
1985	730	0.137	730	100.1	0	100.1	100.1
1986	730	0.142	730	103.8	0	103.8	103.8
1987	730	0.148	730	107.9	0	107.9	107.9
1988	730	0.152	730	111.6	0	111.6	111.6
1989	730	0.159	730	115.8	0	115.8	115.8
1990	730	0.164	730	119.4	0	119.4	119.4
1991	719	0.169	719	121.7	0	121.7	121.7
1992	708	0.174	708	123.4	0	123.4	123.4
1993	697	0.180	697	125.4	0	125.4	125.4
1994	686	0.185	686	126.9	0	126.9	126.9
1995	675	0.191	675	128.7	0	128.7	128.7
1996	664	0.196	664	129.9	0	129.9	129.9
1997	653	0.201	653	131.5	0	131.5	131.5
1998	642	0.206	642	132.5	0	132.5	132.5
1999	631	0.212	631	133.9	0	133.9	133.9
2000	620	0.217	620	134.6	0	134.6	134.6
2001	558	0.223	558	124.4	0	124.4	124.4
2002	496	0.228	496	113.0	0	113.0	113.0
2003	434	0.234	434	101.4	0	101.4	101.4
2004	372	0.239	372	88.7	0	88.7	88.7
2005	310	0.244	310	75.7	0	75.7	75.7
2006	248	0.249	248	61.9	0	61.9	61.9
2007	186	0.255	186	46.0	0	46.0	46.0
2008	124	0.260	64	32.2	0	32.2	32.2
2009	62	0.266	138	16.5	0	16.5	16.5
2010 to infinity	0	0.271	200	46.4	0	46.4	46.4

Year	Groundwater withdrawal (litres x 10 ⁶ /day)	MWSS supply (litres x 10 ⁶ /day)	Production cost (US\$/m ³)	Groundwater production (litres x 10 ⁶ /day)	Total
1984	730	0	95.9	730	95.9
1985	697	33	91.6	697	91.6
1986	664	66	87.3	664	87.3
1987	631	99	82.9	631	82.9
1988	598	132	78.6	598	78.6
1989	565	165	74.3	565	74.3
1990	532	198	69.9	532	69.9
1991	499	220	65.6	499	65.6
1992	466	242	61.2	466	61.2
1993	433	264	56.9	433	56.9
1994	400	286	52.6	400	52.6
1995	367	308	48.2	367	48.2
1996	334	330	43.9	334	43.9
1997	301	352	39.6	301	39.6
1998	268	374	35.2	268	35.2
1999	235	396	30.9	235	30.9
2000	200	420	26.3	200	26.3
2001	200	358	26.3	200	26.3
2002	200	296	26.3	200	26.3
2003	200	234	26.3	200	26.3
2004	200	172	26.3	200	26.3
2005	200	110	26.3	200	26.3
2006	200	48	26.3	200	26.3
2007	200	0	26.3	200	26.3
2008	200	0	26.3	200	26.3
2009	200	0	26.3	200	26.3
2010 to infinity	200	0	26.3	200	26.3

*Unit cost of production rises steadily for groundwater withdrawal (depletion cases) [14].
 †Unit cost of production is constant at 0.137 US\$/m³ for groundwater withdrawal (conservation cases) [14].
 ‡Unit cost of production is 0.23 US\$/m³ for MWSS supply, from Table A2.
 /Note: Output is the same in both depletion and conservation cases.

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Economic degradation, conservation and allocation of water resources

Armando Llop

Economic stagnation and hyper-inflation, in part the result of the need to service huge foreign debts, have taken their toll on the infrastructure and government institutions of Latin America. Both have been starved of financial resources. In some ways the water sector has been affected more than others because water and the environment are seen as free public goods which can be used without regard to cost. Even though internal financial resources are limited there are still opportunities to address the water and environmental problem at the national level, and some recommendations are made in this regard. Nevertheless, major inputs from the developed countries will be needed because the protection of environment and water resources is both a national and global issue.

In recent years the growing burden of servicing external debt has tended to aggravate the economic situation in Latin America. This situation has arisen at a time when we observe a reduction in the rate of growth of the gross domestic product (GDP), which reached barely 0.6% in 1988. According to the information provided by IDB [2], the total GDP of Latin America increased by 12% between 1980 and 1988, but the population increased by approximately 90% during the same period. Consequently, in the first eight years of the 1980s the per capita GDP of the region actually decreased by 7%. This took place after an increase of almost 40% in per capita GDP during the 1970s. While investment has been affected more than consumption - which reduces the region's long-term potential - consumption in 1988 was 9.3% below its 1980 value.

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The position of Latin America in terms of international trade has undergone a slight improvement in recent years, not only as a result of larger volumes of exports, but also because there has been a change in the composition of those exports.

Although export activities have shown some improvement, there has been stagnation in internal demand in various countries. This is tantamount to saying that internal consumption has increased at extremely low rates, but it has in fact decreased if this variable is defined in per capita terms. Another factor that has had a negative impact on Latin American economies is the increase in international rates of interest. This has seriously aggravated the burden of servicing external debt, which is a heavy one in this region.

Other variables of macroeconomic importance, such as employment, wages and inflation, have exhibited negative trends during the 1980s as well. The unemployment rate has been much higher, on average, than during the preceding decade. The evolution of the real minimum wage for Latin America has shown a decrease of 13% from 1980 to 1987. Inflation for its part, has also had an impact on the region. Beginning in 1985, the struggle against inflation has been one of the firmest objectives for the countries of the region. Notwithstanding this fact, in 1988 15 countries of the region had inflation rates higher than those observed in 1987. Only in Chile and Mexico

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have inflation rates slowed down, whereas in Argentina, Brazil, Colombia, Peru and Venezuela there have been considerable increases in those rates.

Gross domestic investment in the region has shown a negative trend since the mid-1970s. More recently one can observe growing fiscal deficits due in large part to the general decrease in economic activity. Although there is no information available, it seems clear that 1989 and 1990 have shown no increase of any kind and instead have been marked by a worsening of the economic crises.

Finally, the current-account balance, which is the difference between current fiscal income and current expenditure, has been negative in half the countries of the region.

According to information provided by IDB [2], external financing has decreased considerably. The figures indicate that in 1988 there was practically no net input of foreign capital to Latin America. This continues the pattern from a year earlier (1987) in which there was a drastic reduction in net inputs of capital.

The process of economic degradation

The economic stagnation that Latin America has experienced during the 1980s shows all the manifestations of economic degradation, a process identified by Tweeten [4]. The manifestations of that process may be summarized as follows:

- (i) persistent deficits in the government's budget and in commercial accounts, with the nation living beyond its real means;
- (ii) accumulation of debt, both internal and external, caused by the public and private sectors – the debt becomes very large in comparison with national income; debt servicing becomes intolerable, and it is impossible to pay it;
- (iii) growing inflation resulting from the expansion of the supply of money above the increase in real productivity (the monthly rise in the general level of prices has reached double digits in some Latin American countries, and there have been cases of hyper-inflation);
- (iv) overvaluation of the currency, to the extent that the local currency is inflated at a higher rate of exchange; and
- (v) deficits in commercial exchange to the extent that imports expand rapidly in comparison with exports.

Tweeten concludes that the process of economic degradation is rooted in a combination of causes that include cultural and institutional aspects, errors in the management of economic activity, human nature it-

self and other factors. The process, in Tweeten's view, depends more on the internal aspects of the country than on external forces or factors. What is important from a developing country's point of view is that the process has a severe effect on the allocation of resources for the provision of basic services, such as education, health, remedies for environmental problems, etc. All of those sectors are relegated to secondary priority in view of the magnitude of and the pressures generated by the deteriorating economy.

Some politicians hold that economic degradation is the price that one must pay in order to attain such objectives as distributive justice, women's rights, minority group rights, the protection of the environment and population control. Nevertheless, in the absence of a sufficiently strong economic base for dealing effectively with those objectives, what happens is that basic needs are not met; elementary education is not provided, the goals of food assistance to the poor are not achieved, and the environment does not receive proper protection. Furthermore, a decaying economy implies a reduction of economic opportunities for women and minorities, as well as increases in the rate of population growth etc. Environmental protection and food aid to the poor are regarded as luxuries which should be postponed in the face of the harsh reality of the economic situation. In reality, sustaining food production in the long term is by no means a luxury but a necessity, and the preservation of the environment as an important resource for future generations is a need that must be met because the environment cannot be viewed as a resource that may be exhausted in order to provide some measure of relief from the severity of economic degradation.

Impact of economic degradation on water services

Management of the water sector and its interactions with other sectors, the handling of the problems involved in the provision of water-based services, the prevention of water pollution etc are activities traditionally carried out by the state in Latin America. However, due to economic degradation there has been a growing weakness of the fiscal apparatus of the state, accompanied by a reduction in public credit, and leading to a reduction in financial assistance to water resources and other sectors.

For various reasons, among which the large amount of external debt plays an important role, states are experiencing growing pressure to balance their budgets. In doing so, they have resorted to the whole range of available instruments, because many of the basic tools of adjustment are inoperative in a context of crisis and instability. Inflation has been

widespread and in the face of growing rates of inflation we find the well-known Tanzig effect: in the short run there is a major reduction in state income. This is accompanied by a decrease in the real values of the taxes collected for the provision of public services, such as water, electricity and the like. A reduction in tax receipts brings about a reduction in the capacity of the state to provide those services. Consequently, at some point it may not even be possible to finance the costs of operation and maintenance.

Under normal conditions of relative stability, such problems are dealt with through budgetary allocations by the state, either in the form of subsidies or in the form of a temporary allocation of funds to overcome financial deficits arising from a temporary economic situation. Nevertheless, during periods of growing needs for adjustment, such as the present, centralized states react by limiting and reducing expenditures as much as possible. This means that the financial needs of public enterprises are no longer attended to, and in the face of a lack of needed resources the enterprises go into debt (adding their contribution to the overall credit problem), postpone or suspend investments and do not devote attention to maintenance activities. This, in turn, induces a process of growing failure to meet demand, reduction in the quality of services and a general deterioration of the enterprise's infrastructure.

Accompanying this, there is also a process of reduction in real wages in the state sector, which leads to the flight of trained personnel skilled in technical or entrepreneurial functions at the management level. As a result, the quality of human resources in the administration of services deteriorates.

This syndrome of decay in the quantity and quality of the various services leads to a crisis in the system. It is at this point that enterprises which traditionally provided state services of medium to good quality begin to show the inefficiencies that had previously passed relatively unnoticed. The public discredit of those services reaches such levels that there is a social consensus calling for profound and radical change. In this context, the image of private enterprise becomes tempting as a way to make a change which will be truly beneficial in improving services and increasing efficiency. This is one reason why many of the countries of Latin America are abruptly turning to the path of privatization of their major public enterprises.

The structural changes that one sees, together with the organizational lines that are being defined with regard to the reorganization of state enterprises, are elements which should be considered within the scenarios concerning the future of the administration of water resources in Latin America. It is undeniable

that those scenarios should include the predominance of private enterprise in the provision of services, and processes of decentralization and de-concentration in the provision of services. Another important factor that must be considered is the crisis-produced need for services to become self-financing so that rate structures cover the costs of operation and maintenance and, in addition, the investment costs of system expansion.

In the context of the current situation, it is illusory in many countries to talk about planning, about information systems and the like, because the magnitude of the economic crisis has reached such high levels that it has nullified all attempts at planning or organizing water systems. Those countries which so far have not achieved any significant development in their water infrastructure will find themselves relegating that sector to a secondary place in the face of the need to solve their macroeconomic problems. Those countries which, by good fortune or by sensible policies pursued earlier, have built satisfactory water infrastructures, as is the case in Brazil and Venezuela, are in a better position with regard to the supply of strategic resources to exploit future development.

The water sectors

Within the activities related to the use of water resources, we should differentiate between the production of water power, the provision of drinking water and irrigation. These are, in general, the most important activities associated with water use. Within this sectoral spectrum, activity relating to water power is the one which is systematically most fully developed and most modern in the countries of the region. Water-power enterprises have historically shown that they have better income, a greater facility for medium- and long-term planning, and greater economic and administrative efficiency in general. Second in importance, in so far as development is concerned, is the provision of drinking water and sanitation. However, this sector exhibits a very heterogeneous profile regionally as a result of the size and location of the centres served. Enterprises which cover large urban conglomerates may exhibit various types of technological or organizational backwardness, but they have good opportunities to attain advantageous financial positions by virtue of the vast markets they serve. In contrast, enterprises which serve conglomerates of smaller size or of poorer economic condition are encountering increasing difficulties and, in fact, they are the service systems which are unmistakably in a deficit position.

Last, within the family of water applications, there is irrigation. These are the activities that exhibit the

worst conditions in their technological, organizational, financial and other aspects. It is commonly found in Latin America that 'private irrigation' is much more developed and better established factually and institutionally than irrigation developed by the state.

It is clear that as economic degradation worsens, these three sectors will deteriorate in the reverse order to that presented above. Nevertheless, when economic deterioration lasts long enough, it affects even the water-power sector.

For example, in the case of Argentina the production of electrical energy decreased as a result of the overall drop in the country's internal demand. In addition, there was the natural problem of reduced rainfall which particularly affected the hydroelectric sector in the central Andean region. Finally, there was a lack of maintenance of the installations and equipment required for the generation and distribution of electricity, owing to the financial deficit of the power companies and the absence of financial support from the state. The deterioration that resulted from a decline in energy demand and in maintenance created a crisis in energy production and/or the energy distribution sectors, causing major deficits which may last for a considerable time.

As a consequence of the deterioration, there was a rationing of electrical energy, characterized by blackouts in high-consumption areas. Another serious disadvantage is that in order to increase energy production in the short term, recourse was made to thermal power plants which have the disadvantage of requiring greater capital costs per unit of energy, create a greater exhaustion of and dependence on fossil fuels and increase environmental pollution.

Up to now we have spoken of the water-using sectors and the manner in which they suffer from the ill effects of economic degradation. But what is least protected and suffers most intensely from the process of economic degradation is the water environment itself. Unfortunately, the water environment, with all its characteristics of a public benefit, depends directly on budget allocations from the state for its preservation. It is also under the jurisdiction of a multiplicity of administrative agencies which are not likely to regard the protection of the water environment as a matter of high priority. Consequently, the environment is degraded in a process which is often irreversible, at least at an acceptable level of costs.

Because the environment is not the property of anyone in particular, it is the cheapest resource that governments can utilize for financing an economic crisis. Because the environment belongs to everyone, its degradation becomes part of the process of impoverishment, of reduction of the quality of life and,

finally, of the loss of individual and community self-esteem.

Sustainable development, environmental and social costs and benefits

Sustainable development: a new concept

Among politicians and technicians concerned with the subject of development of water resources in particular, there is a consensus that there is a new and valid concept of development known as sustainable development [1]. This is a concept based on inter-generational equity, which means that the present generations should neither endanger a future generation's opportunity to obtain the necessary elements for their material needs, nor endanger their ability to enjoy a healthful environment.

Some economists define sustainable development as that which makes possible a maximum of economic development – measured by the gross national product – subject to the restrictions imposed by the environment. Whenever we speak of maximization subject to restrictions, we are, to a certain extent, assuming that there are two stages. The first stage consists of incorporating all the ecological variables and environmental interrelationships, in order to ascertain how far it is permissible to affect the environment without producing changes in it that would go beyond certain parameters or standards. The second stage consists of maximizing the benefit that man can derive from the system, subject to the restrictions defined in the first stage.

Whereas many economists support this scheme, there are many others to whom it is unacceptable. In general, the latter believe in the theory of 'maintenance of resources', envisaging a society for which maximization in two stages is not valid. Their basic argument is that the great objective of 'well-being' is not equivalent to the objective of 'well-having', as is implicit in any utilitarian focus on the use of the environment and of resources. For them, nature should be respected and not exploited. The criterion of maintenance – the maintaining of resources – is rather a concept of minimization because it implies minimizing the benefit derived from natural environments, with the restriction that the material needs of the community must be satisfied; this implies giving first priority to the protection of the environment.

Irrespective of which of these two extreme positions is closest to the one held by advocates of sustainable development, those advocates in general hold the following views.

- It is their perception that the biosphere imposes limits on economic growth.

- They express a lack of faith in science and technology as guides for the improvement of mankind.
- They are irreconcilably opposed to environmental risk.
- They support redistributive justice and uphold the equality ethic.
- They profess a concern with population growth and have faith in the wisdom of the human capital that is developing.
- They give priority to the survival of species, the protection of environments and minority cultures in preference to economic growth *per se*.

Not all advocates of sustainable development actually hold the above set of values, but in general they subscribe to most of them.

Just as there exists a set of values shared by those who favour sustainable development, there also exists a set of major objectives that they share. In general, the advocates of sustainable development agree that any policy associated with development should be analysed in the light of the following considerations.

- It should fundamentally support the natural environment.
- It should evaluate the demands made on resources on the basis that they are globally limited.
- It should give consideration to alternative resources which are local and renewable.
- It should endeavour to improve the standards of living of those groups which now live in conditions of degradation.
- It should strive for self-sufficiency.
- It should protect life against toxic and carcinogenic substances.
- It should respect the intrinsic dignity and value of every kind of life.

Thus, it is evident that sustainable development implies a conflict with many neoclassical concepts. We very often find policies or policy recommendations based on those conclusions which arise from the plain and simple utilization of neoclassical theory, such as improving skills, maximizing of the present values of productive activities and the like. The supporters of sustainable development question many of the neoclassical forms of traditional economic reasoning. They wish to reopen the discussion of such subjects as the limits of economic growth, the factors involved in cost-benefit analysis, the concepts of economic value, externalities, balance etc.

A clear definition of the major objectives by water authorities is fundamental for the formulation of

plans and projects. The idea of sustainable development is contrary to the over-exploitation of the environment that is now going on.

Traditional focus of project evaluation

Cost-benefit analysis can provide a rational framework for the evaluation of different courses of action. It is an excellent tool for evaluating alternative projects or programmes, and its final objective is the selection of the most suitable project or programme in light of the circumstances.

In the traditional utilitarian concept, the maximization of human well-being should be the main objective of economic policy in general and of water policy in particular.

The application of project-evaluation techniques, apart from questions relating to the values it involves, also poses certain difficulties: in the first place, it is necessary to formulate a series of projections or estimates whose validity can be verified only *ex post facto*. Apart from the risks of prediction, the problems of measurement must also be taken into account. Some benefits, although accepted, are normally impossible to measure in monetary terms. The same can be said of certain costs. The problem is that those components which constitute the externalities and result from the difficulty of quantification tend to be minimized naturally in the face of the apparent superiority of quantification.

In order to make sure that an evaluation is complete, we would have to examine each project in detail before comparing it with other alternative projects: studying economies of scale; establishing different priorities in the projects; and comparing complete programmes on the basis of different assumptions with regard to rates of growth of demand, trends in relative prices, rates of interest and even changes in the juridical and administrative norms of the executing agencies.

The technique of project evaluation can be used for the economic evaluation of a specific project, for determining which of several projects intended for the same purpose will obtain the desired effects at the least cost, or for determining which of several projects intended for different purposes will provide the greatest net benefit for the economy as a whole.

In evaluating the merits of alternative projects or actions, the decision-maker should ask a number of questions.

- Which projects are feasible from a political and institutional point of view?
- Which projects are feasible from a technical point of view including the environmental impact they produce?

- (iii) Which projects can also be defended with economic arguments? (In other words, will the benefits be greater than the costs?)
- (iv) Which one, among the various alternatives, constitutes the most economical project?

Another question that must be taken into account in the analysis relates to financial viability. In addition, consideration must be given to a matter that is generally ignored: the capacity of the agencies involved to carry forward the execution and operation of the project.

In making an economic evaluation we should clearly define the scope of the evaluation, both in space (region, state, country) and in context (private or social). In every case, we must supply a criterion of evaluation which may be the present net value, the cost-benefit ratio or the internal rate of return. For the first two, it is necessary to know the opportunity cost of capital for which there are three measures: (i) the rate of interest set by the market; (ii) the marginal productivity of capital in the private sector; or (iii) the corporate rate preferred at the time. Whatever the measure used, it should be understood that the application of a high discount rate produces discrimination against long-term projects, i.e. those in which there are long periods of gestation.

Project evaluation and sustainable development

The supporters of sustainable development believe that the traditional focus of project evaluation has its limitations. In their opinion, cost-benefit analysis involves a particular view of the world and reflects certain particular ethical premises [1]. From a philosophical point of view, technology represents utilitarianism or to put it into more precise terms: 'cost-benefit analysis can be analyzed as a very special sub-case of the utilitarian ethic in which the utility functions of individuals are linear, with identical marginal utilities among individuals, and in which future benefits are discounted identically with respect to the present time' [3]. Furthermore, in cost-benefit analysis, resources are evaluated according to their use by human beings. The criteria of efficiency require that resources should be taken from those sectors in which they are not being efficiently utilized and be transferred to those sectors which do not use them efficiently, irrespective of the circumstances and other considerations concerning the individuals involved. If we use conventional cost-benefit analysis as a criterion for decision-making, individual rights will necessarily be subordinated to the rights of the majority. Furthermore, to the extent that this type of analysis uses choices measured in monetary terms which must be carried out in the light of income limitations, in view

of the present state of preferences, the results will assign greater weight to the values that represent the *status quo*.

This type of result may be admitted in certain cases. Nevertheless, many decision-makers decide to reject the recommendations arising from these criteria of efficiency when serious questions of conservation and preservation of resources are involved. It is quite acceptable to consider rejecting recommendations based on efficiency when the project in question relates to a reallocation of income from poor sectors to rich sectors or from future generations to the present generation. There are also ethical questions when the criteria of efficiency involve such effects as the accumulation of carbon dioxide in the atmosphere, when they result in the exhaustion or excessive use of the resource base of developing countries, when they impose involuntary but serious losses on the world's poor and the like.

The utilization of project-evaluation techniques, as postulated by neoclassical theory, implies the use of a discount rate to weigh the flows of future income and costs. Such discounting is what has come to be called the tyranny of composition or the dictatorship of the present generation. This is true because by using the normally accepted discount rates, which to some extent reflect the opportunity cost of money, any income flow that goes beyond 30 years becomes practically insignificant in the present. This unquestionably implies an ethical valuation concerning future generations. It should be borne in mind that future generations have no opportunity to vote or express an opinion at the present time. This has led to major debates between the advocates of sustainable development and those of economic efficiency.

The ideology of sustainable development challenges the neoclassical concept of externality, and by extension defies the concept of market defects as such. Externalities are so called merely because they are external to the process of interchange through the market, but they are far from being external to the ecological process. From this point of view, externalities are the ultimate physical product generated in the economic process. Consequently, maximization of the economic product is viewed as maximization of externalities. Nevertheless, like some neoclassical economists, the supporters of sustainable development hold that externalities arise from institutional defects, from forms of property allocation which in many cases do not provide any incentive to protect the environment or certain types of resources.

The less importance we attach to externalities in the consideration of different plans of action, whether because they are considered peripheral, unnecessary or of low priority, the further we shall be

from the concept of sustainable development. This means that externalities should be considered the centre of attention of policies aimed at economic growth and should assume a conceptual and practical character of importance in the design of plans and policies. In this sense, institutional development plays a preponderant role, particularly in the light of the multiplicity of agencies with jurisdiction over the environment. For that reason, anything relating to institutional coordination in the actions of the government and control of the actions of private individuals should be considered to be of the highest importance.

Strategic analysis of the water sector

In the preceding section we have dealt with various aspects of transcendent importance for the knowledge and characterization of those aspects that directly or indirectly affect water resources. In this section we shall present a strategic analysis that takes as its unit of analysis a developing country, with all the symptoms of economic degradation, and moving in an international environment that conforms to its external context. The analysis takes into consideration the opportunities and threats of the external context and the strengths and weaknesses of the country's internal context, in determining the direction and intensity of the actions that tend to promote the development and conservation of water resources.

The strategic analysis

This analysis is not intended to be either profound or exhaustive; it constitutes merely an attempt to identify the major trends that interact and determine future courses of action. Starting with the external context in which a typical developing country must operate, we may mention the following opportunities and threats.

Opportunities

- The developed countries have become aware of the great environmental interdependence that exists among all countries and regions of the world. That awareness facilitates the channelling of funds through international agencies to developing countries to deal with environmental problems.
- The disappearance of the Iron Curtain constitutes a profound change that serves as a catalyst for the shaping of a new international order, within which the problems of the environment will have a privileged position.
- Environmental benefits have come to have an economic value in the international arena; that

fact is reflected in the proposals for 'debt for nature' swaps.

- International financing agencies have incorporated within their loan provisions requirements for an analysis and evaluation of environmental impacts, which makes it possible to internationalize those environmental aspects that were previously ignored.
- External debt of the developing countries (which also appears among threats) can be utilized as an element of pressure to motivate actions designed to develop and conserve water resources.
- The growing climatic imbalance and the consequent risks to mankind will encourage greater world-wide efforts to deal with environmental problems.

Threats

- The dynamics of power for the control of the economic processes of wealth accumulation at the global level indicate that there could be very little consideration of environmental problems.
- Situations of armed conflict – for the control of strategic resources, such as oil – distract attention from the allocation of resources to environmental purposes.
- The continued demands imposed on the developing countries for the payment of their external debt pose a twofold threat to them: (i) they accentuate the process of economic degradation, which leads to the utilization of the environment as a cost-free resource for financing attempts at economic stabilization; and (ii) they cause large financial transfers from the developing countries to the international banking system, which by reason of its organizational purpose, would invest in the environment only if it constituted a profitable activity.
- The discount rate required by international financing agencies (12%) clearly discriminates against projects of a long-term conservationist nature.

Turning now to an analysis of the internal context of a typical developing country, we may note the following strengths and weaknesses.

Strengths

- An 'average' developing country has a large supply of renewable natural resources. Their rain forests, in particular, play a role in cleaning the lungs of the Earth.
- Industrial development is slight or incipient, and therefore pollution from this source – the

most harmful of all – is of little importance so far.

- There has begun, particularly in Latin America, a process of state reform under which the state apparatus is being de-concentrated and decentralized. This leads to a situation in which the handling of environmental problems is being transferred to smaller units which are closer to the problem, thereby facilitating local participation and making a solution possible.

Weaknesses

- The main activity of a developing country is agriculture. With no other avenue available to it, population growth and unemployment exert pressure for the indiscriminate occupancy of virgin forests and grasslands, with the consequent and very often irreversible deterioration of soil and water.
- The institutional organization of a developing country is particularly unsuitable for handling environmental problems. Duplication of jurisdictions and areas with no jurisdiction are the rule, the result of legal and normative dispersion and of administrative atomization which leaves the authority applicable to a particular situation ambiguously defined.
- In the absence of clear cultural norms relating to the quality of the environment, the process of environmental degradation is leaving unpunished a number of attitudes and types of behaviour that tend to pollute the environment.
- There is a lack of internal financing for development and conservation of water resources. The crisis is so severe because the developing countries are experiencing serious financial problems.
- At no level does the current system of formal education contemplate any training in environmental topics, apart from a few exceptions.

This means that: (i) cultural forces that could oppose the process of environmental degradation are not created; and (ii) there is no critical mass of grey matter, either in quantity or quality, oriented towards the problem of dealing with the environment in its various dimensions.

Conclusions

From the analysis presented above, we cannot derive many opportunities for action, if indeed people do wish to assume an active role in defining the environment of the future.

From a strictly economic point of view, debt financing for the conservation of the environment in general and of water resources in particular will be inter-

nationally allocated to developing countries only when the level of international environmental awareness – meaning the power accumulated by conservationist organizations – becomes sufficiently large to withstand other antagonistic interests. The recent discussion of exchanging debt for nature preservation constitutes, in a small way, a victory for such conservationist groups.

From the point of view of the developing country faced with economic degradation, there are very few actions in terms of the allocation of financial resources that it can take before the problem of stabilization of the economy is solved. Nevertheless, it is possible to initiate a set of preparatory actions which will be consistent with the development and conservation of the environment and of water resources.

Everything tends to support the likelihood that in the developing countries environmental deterioration will continue. There will be increases in water pollution, there will be a greater unsatisfied demand for water services, there will be continued degradation of hydro-ecological systems and the like. At the global level, we may expect a continuation of environmental deterioration as well. There will probably be rising temperatures, caused by increases in carbon dioxide and climatic changes which impact on ecological systems etc.

Nevertheless, if we accept the thesis that a person's vocation is to be the shaper of his or her own future then we can advance the following recommendations.

- International agencies should channel financial resources to the developing countries as a *sine qua non* for reversing the processes of environmental deterioration.
- We cannot conceive of a situation in which those costs can be borne by the poor countries. In this context, the concept of national sovereignty becomes meaningless in the face of an inescapable world responsibility, and therefore we must regard as admissible the establishment of any control mechanism by the financing agencies once objectives and actions have been agreed upon.
- The developing countries can take the initiative in the execution of the following actions, in addition to the efforts made by them to stabilize their economies. (i) Introducing structural transformation which will make it easier to deal efficiently with the environment and with water resources, utilizing as instruments for that transformation decentralization and simplification of administrative management. This involves modification of currently prevailing standards, reallocation of roles and functions on

a sectoral and spatial basis, furthering of organizational development in the new context and reallocation of budgetary funds favouring those strategic agencies which actually produce changes and penalizing the non-strategic and static ones. (ii) The developing country should adopt the principle that the provision of water services should be a self-financing activity. To that end, efforts must be made to improve the commercial systems of hydroelectric enterprises, drinking water and sanitation, irrigation and the like. (iii) The scientific and technical agencies of developing countries should develop appropriate technologies for the sector, with machinery that will facilitate transfer processes. (iv) The developing countries should incorporate into their educational system positive values with regard to conservation of the environment. (v) The developing countries should incorporate strategic materials or courses of study at the university level to guarantee the future availability of a critical mass of trained professionals. The provision of fellowships by the developed countries and

horizontal cooperation are mechanisms that can be recommended. (vi) The developing countries should promote the creation of a management capacity, especially in the sphere of administration, within the universities and technical training institutes. This capacity will become a strategic resource. (vii) Finally, and most importantly, the developing countries should actively involve their own municipalities and non-governmental agencies in this complex of actions.

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