

CEPAL

Review

Executive Secretary of ECLAC

Gert Rosenthal

Deputy Executive Secretary

Carlos Massad

Director of the Review

Aníbal Pinto

Technical Secretary

Eugenio Lahera



UNITED NATIONS
ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN
SANTIAGO, CHILE, AUGUST 1992

CEPAL

Review

Santiago, Chile

August 1992

Number 47

CONTENTS

Education and changing production patterns with social equity. <i>Fernando Fajnzylber.</i>	7
The empty box syndrome. <i>Pitou van Dijk.</i>	21
Consolidating democracy and development in Chile. <i>Osvaldo Sunkel.</i>	37
Development pattern and environment in Brazil. <i>Roberto P. Guimarães.</i>	47
Integration today: bases and options. <i>Eugenio Lahera.</i>	63
Globalization and convergence: Latin America in a changing world. <i>José Miguel Benavente and Peter J. West.</i>	77
The world agricultural outlook in the 1990s. <i>Giovanni Di Girolamo.</i>	95
Evolution of the rural dimension in Latin America and the Caribbean. <i>Emiliano Ortega.</i>	115
The potential of Mexican agriculture and options for the future. <i>Julio López.</i>	137
The privatization of the Argentine telephone system. <i>Alejandra Herrera.</i>	149
Rationalizing social policy: evaluation and viability. <i>Ernesto Cohen and Rolando Franco.</i>	163
The political economy of the developmentalist State in Brazil. <i>José Luis Fiori.</i>	173
Guidelines for contributors to <i>CEPAL Review.</i>	187
Recent ECLAC publications.	189

Development pattern and environment in Brazil

Roberto P. Guimarães*

After describing the present situation of ecological transition, which is one of the factors in the economic, institutional and environmental crisis of present-day society, the author tries to identify the main features of the industrial and agricultural expansion of Brazil, highlighting the socio-environmental impact of the style of development pursued by that country since the war. On the basis of this diagnostic study, and especially of the technical background material prepared for the drafting of the National Report presented by Brazil at the United Nations Conference on Environment and Development (UNCED) (Rio de Janeiro, June 1992), the author describes the main requirements and components of a sustainable industrial and agricultural development strategy which will permit both proper management of the country's natural resource endowment and the maintenance of the environmental quality of the Brazilian ecosystem, while at the same time ensuring satisfaction of the basic needs of present and future generations.

*Social Affairs Officer in the ECLAC Social Development Division. During 1991, the author was seconded by ECLAC to the Brazilian Government as Technical Coordinator of the Brazilian National Report to the United Nations Conference on Environment and Development.

This article is based largely on the information and studies contained in the technical background material prepared by the Interministerial Commission for presentation at the United Nations Conference on Environment and Development and subsequently consolidated in the document *O desafio do desenvolvimento sustentável: relatório do Brasil para a CNUMAD* (United Nations, Brasília, September 1991). A preliminary expanded version was presented at the Fourth National Forum on How to Prevent the 1990s From Being Another "Lost Decade" (Rio de Janeiro, BNDES, 25-28 November 1991).

*The first thing you will see is
the smoke from our chimneys.
That smoke means food
and drink to us. It is the healthiest
thing in the world in every way,
especially for the lungs...*

Charles Dickens (*Hard Times*, 1854)

I

Styles of development, the ecological transition and the environmental crisis¹

If this final part of the century had to be summed up in a few words, it could be characterized as the exhaustion of a style of development which proved to be ecologically destructive, socially perverse and politically unjust. In this respect, the clear signs of vulnerability of our planet's whole ecosystem have acted as a great sounding board for the various individual processes of "depletion" which we are witnessing, linked together in an inflexible logic whose inescapable conclusion is the need for far-reaching changes. The debate on the new development model for Brazil is thus only a first step towards defining the significance, the direction and the limits of the transition to sustainable development.

The most obvious manifestation of the current crisis is undoubtedly the fact that we are living in an era of shortage of resources, difficulties in expanding the economic base of our national societies, saturation of the dumps for storing or eliminating the waste products of the industrial society, and above all an era with a feeble capacity of response by local, regional and world institutions to the challenges posed by this crisis. Although the crisis is of course of an environmental nature (progressive depletion of the natural resource base and reduction of the recovery capacity of the ecosystems) it is above all a political and institutional crisis, directly related with the power systems governing the possession, distribution and use of society's resources, which ultimately leads to a situation of either total shortage (complete exhaustion of our resource endowment) or relative depletion (unsustainable consumption patterns or inequitable access to those patterns).

¹ For more comments on this subject see Guimarães (1991b).

The incorporation of an ecological dimension into the public decision-making process—in order to take account in advance of the repercussions of public policies on the network of relationships which affect the ecosystems—is not only a reasonable aspiration but a veritable biological necessity for the proper maintenance of the natural systems which make life possible. This aspect of the present situation means that we must recognize that mankind is passing through a period of authentic ecological transition (Bennett, 1976). Among other dimensions, the present stage of the transition is characterized, in energy terms, by the tendency to use energy more and more extensively for the satisfaction of human needs, but also more and more inefficiently. Even more important, perhaps, is the fact that ecologically there is not only an increasing accumulation of goods for social uses not directly related with biological survival, but also the possibility of attaining this objective through the exploitation of environments increasingly far removed from local society.

It is not surprising, therefore, that the great majority of present-day institutions—established under the sway of the economic dogmas of abundance and material progress—are proving to be incapable of facing up adequately to the challenges of the transition. This situation naturally leads to the questioning of an internationalized style of development which is manifested mainly in the processes of modernization of agriculture, urbanization, appropriation of the natural resource base and use of non-renewable energy sources. The global and interdependent nature of society in these final years of the century does not manage to conceal the persistence of the North-South dimension, even in ecological matters. In the highly industrialized economies, environmental problems can generally be assimilated to pollution, so that their environmental policies are oriented towards avoiding even more serious degradation or even seeking to restore the patterns of water, air and land quality which existed before the crisis, while in the underdeveloped countries, the environmental crisis is clearly associated with the exhaustion of their resource base, and their policies should therefore give priority to rational natural resource management. However, this distinction has lost much of its validity, especially in the countries of the South, which are faced with situations of environmental degradation characteristic of the

impoverishment of their natural resource endowment, as a result of their underdevelopment, at the same time as situations normally associated with an “excess” of development. In this respect, not only has the economic gap between North and South grown still wider in recent decades, but there has also been an increase in the environmental and ecological disparity between the two worlds. It is blatantly obvious that the countries of the South are at the more vulnerable end of this dichotomy and are suffering the consequences of world degradation.

In short, the world is faced with the following alternatives: to continue with the present pattern, in which the more highly developed countries make intensive use of natural resources, allowing their population to enjoy a high level of consumption which contrasts with the shortages in the underdeveloped world, or to review these patterns in search of a model which puts less pressure on the natural resource base and permits more equitable levels of development. This model presupposes a new international division of labour involving far-reaching industrial retrofitting, changes in the consumption habits of the developed countries, and greater international solidarity in the sense of facilitating the access of the less developed countries to scientific and technological advances.

At the same time, the issues before the world pose unprecedented challenges for Latin America as a whole and Brazil in particular. The environmental crisis comes at a time when the region is in an equally unfavourable situation in many other areas. Resuming the road to development involves strengthening democracy, but at the same time stabilizing the economy—which presupposes the solution of the external debt problem—, incorporating it into world technology flows, establishing more austere and socially homogeneous consumption patterns, and improving income distribution. Finally, there are more than a few institutional difficulties standing in the way of the establishment of a new style of sustainable development in Brazil. Since the mid-1980s, Brazil has gone through eight stabilization plans, the national currency has changed its name four times, exchange policy has been changed on 18 occasions, nearly 60 different price policies have been tried, and the number of wage policies is already close to 20. For a country with a background of political and

institutional instability as marked as that of Brazil, the search for a new pattern of industrial and agricultural development which will permit a more harmonious relationship with the functioning of natural

systems is an exercise which calls for daring and creative imagination on the part of the economic elites, political leaders, the working classes and the population in general.

II

The Brazilian style of development since the war: broad elements of a diagnostic study²

Up to the mid-1960s, the mainstay of Brazilian economic growth was import substitution, while protectionism was the basic instrument of the country's industrial policies. The main financing mechanisms were direct contributions by foreign investors and money issue, which generated "involuntary saving" by the non-business sector. The exhaustion of this pattern of financing coincided with the speeding up of inflation and the accumulation of balance of payments deficits, which culminated in the recession and political crisis of the early 1960s.

After 1964, fiscal and financial reforms made it possible to overcome the fiscal crisis and reduce inflation, creating suitable conditions for a second growth phase, in the 1970s, in which import substitution was supplemented with the expansion of industrial exports. The 1973 oil crisis undermined the bases of this model, however. The reaction taken by economic policy was to support growth through greater external indebtedness, avoiding major variations in the basic economic indicators such as the exchange rate, interest rates and real wages. In terms of the economic results obtained, it can be said today that the investment programme begun in 1974 produced undoubted achievements. Industry leapt forward in the metallurgical and chemical sectors and also registered considerable advances in the production of machinery and equipment. Exports grew and were diversified. A boost was given to technological

training. Consequently, the structure of production underwent substantial changes which materialized as the big projects came on line.

At the same time, the adaptation of the territorial structure to the industrialization plans served to consolidate the territorial planning strategies aimed at removing the material, political and ideological obstacles standing in the way of the expansion of modern capitalism. In reality, the aim was to impose a technical and political control network on the national territory through government planning. In this way, a complex territorial dynamic was built up whose focal point was the group of great urban centres of the South-Central region, which absorbed massive proportions of investment by the State and by transnational corporations. The metropolitan expansion axis linked the cities of São Paulo and Rio de Janeiro in a great and almost uninterrupted industrial zone which also incorporated part of the State of Minas Gerais and sent out tentacles towards Brasília (essential administrative centre) and Espírito Santo (an important port, agroindustrial and steelmaking complex). In addition, another group of big cities was formed—made up of Belo Horizonte, Curitiba and Porto Alegre—which stood out by the rapid growth of their industry. A ranking of functions and power in terms of productive activities, distribution and resource management was thus created.

The maintenance of the extremely highly concentrated structure of land tenure resulted in the migration of large contingents of population to small towns, where they became a labour reserve for seasonal agricultural work, or to the big and medium-sized cities, where they swelled the ranks of the underemployed and unemployed. In some regions they became "prospectors" for deposits of valuable metals scattered over the national territory. It was thus that,

² With regard to this and the next section, see the technical background material prepared for the Brazilian National Report to UNCED by A. Barros de Castro; B. K. Becker and C.E. Egler; L. Guimarães Neto, S. Buarque and T.B. de Araújo; G. Martine; M.A. Ribeiro; Ch. C. Müller; A.C. de Souza Raes, and R.C. Aguiar. See also IBGE (1990); Guimarães (1991a).

in the economic and social and agrarian context, dramatic levels of rural and urban poverty continued to exist side by side with privileges with regard to land tenure, markets and participation in public resources. In the Northeast, the use of the admitted fragility of the regional economy due to the periodic droughts as an instrument for seeking differentiated treatment for the region led to a maze of subsidies and State protection impervious to the forces of competition associated with modern capitalism.

The social conditions in which the Brazilian population still lives after decades of rapid economic growth are only too well known. The rapid economic growth since the war, which turned a country whose level of development in the 1940s and 1950s was barely above that of the poorest countries of the region into the eleventh industrial power in the whole world, did not succeed in reducing the levels of economic and social inequality. On the contrary, in the period of fastest growth, between 1960 and 1980, the richest 10% of the labour force managed to increase its share of income from 40% to 50%, while the poorest 50% saw their share sink from a modest 17% to only 12% in 1980. Comparison of the available statistics for urban and rural areas clearly shows the spatial concentration of poverty in urban areas. In rural Brazil, poverty levels registered a downward trend throughout the 1970s and the early 1980s, though this trend levelled off in 1986. In urban areas, poverty went down from 35% to 30% between 1970 and 1980, but rose again to the level of 34% of the population in 1986.

The foregoing analysis makes it necessary to recognize that ecological problems reflect inequalities of a social and political nature (patterns of relations between human beings and the way society is organized) and also derive from structural distortions in the economy (the consumption patterns of society and the way it is organized to satisfy them). In Brazil, because of the size of the country's territory and population, the extent and diversity of its ecosystems, the complexity of the structure of production and the disparities in income distribution, the dilemma of sustainable development is expressed in the challenge of speeding up material development while at the same time improving social justice and securing good environmental quality. However, the homogenizing logic of economies of scale has bulldozed natural and cultural diversities which were seen as obstacles to progress. Considerable

parts of the national heritage, in the form of biodiversity and ways of life, have been sacrificed in the name of modernity, to the detriment of the quality of life of the population as a whole. It is hardly necessary to point out, in this respect, that in situations of extreme poverty, those who are marginalized from society and from the national economy have absolutely no commitment to avoiding environmental degradation, since society does nothing to prevent their own degradation as persons.

1. Evolution and impact of manufacturing industry

After the Second World War and up to the mid-1970s, the capitalist economies registered some of the highest rates of economic growth and the greatest changes in the structure of production in the whole of human history, spearheaded by the industrial sector. This expansion was headed by two great subsectors: metal products and machinery (the motor industry, capital goods and consumer durables) and the chemicals subsector (especially petrochemicals). At an early stage, the United States style of consumption spread to the European countries and Japan, and the energy matrix was changed through the replacement of coal by oil. This style of consumption was accompanied by a technological, organizational and entrepreneurial pattern focused on industrial production and backed up by big corporations, which closely linked together the world economy, especially in the capitalist countries. As is well known, in the case of Brazil the great boost for capitalist expansion was provided by the triad formed by the State, transnational corporations and private national capital. The rapid establishment of the international industrial matrix in Brazil made it possible to internalize the production vectors of the chemicals and petrochemicals sector, metal products and machinery, the transport equipment industry, the timber, paper and pulp industry, and non-metallic minerals, all of which have a strong impact on the environment.

In general, the massive late industrialization of the Brazilian economy brought in technological patterns which were advanced for the national base but were outmoded in terms of the environment, with few technological elements for treatment, recycling and reprocessing. Leaving aside the particular features of each ecosystem, the impact of the industrial sector on the environment depends on three major

factors: the nature of the industrial structure in its different relationships with the environment; the intensity and spatial concentration of the various types and branches of industry; and the technological pattern of the production process –technologies for the filtering and reprocessing of effluents and the economic reutilization of byproducts.

In order to estimate the effective impact of industry on the environment, it is necessary to analyse the way in which the spatial concentration of branches of industry accentuates or disperses their potential impact. The estimates of the value of industrial processing presented by the Brazilian Institute of Geography and Statistics (IBGE) for 1980 make it possible to identify the concentration profile of the various industrial branches on the basis of the proportion of this value accounted for by four industrial centres. According to the IBGE classification, the group considered to be of "extremely high concentration" comprises pharmaceuticals, toiletries, soaps and candles and printing and publishing, which have an average of 50% of the total value of industrial processing concentrated in a single centre, and 80% in three centres. After this come the electrical and communications equipment branch and plastics and rubber manufacturing, whose concentration amounts to 50% in one centre and 70% in three centres, so that they may be classified as "highly concentrated". At the other extreme there are the "dispersed" and "highly dispersed" groups. The first of these comprises non-metallic minerals, hides and skins, and the foodstuff and beverages sector, whose value of industrial processing concentrated in a single centre varies from 13% for beverages to 20% for non-metallic minerals, with the figures for the value of industrial processing concentrated in three centres rising to 27% for beverages and 37% for hides and skins. The second group comprises the branches engaged in the extraction of minerals and timber, which have 8% of the value of industrial processing concentrated in one centre and between 21% and 27% in three centres.

Taking industrial activity as a whole, it may be seen that from the very beginning concentration was intensified in the Southeast region, reaching a peak in the 1970s, when 79% of the total value of industrial processing was accounted for by that region. From that period onwards, partly thanks to the regional development policies adopted by the Government, partly because of the diseconomies of scale resulting from excessive concentration of economic activities in the region, and also because of the strengthening

of trade union movements, there was a slight tendency towards industrial deconcentration. Thus, since the early 1980s the Southeast region has only accounted for 72% of the total value of Brazilian industrial processing. Obviously, this process basically reflects the situation in two states: São Paulo and Rio de Janeiro. Even as far back as 1950, these States accounted for 20% and 10% of industrial establishments, 39% and 17% of the labour force employed in industry, and 48% and 20% of the total value of industrial processing in the country, respectively.

In 1970, the process of concentration reached its peak: São Paulo accounted for 31% of the country's industrial establishments, 48% of the employed labour, and 57% of the value of industrial processing. In 1980, however, the situation showed a trend towards deconcentration after that peak year of 1970. Thus, in 1980 São Paulo accounted for 29% of the industrial establishments, 45% of the employed labour, and 52% of the value of industrial processing, with Minas Gerais, Rio de Janeiro and Rio Grande do Sul competing for second place as regards concentration of industrial activity. It is also worth noting the intensification of the industrialization process in other states of the federation such as Paraná, Santa Catarina, Pernambuco and Bahia, whose values for the indicators in question ranged from 3% to 7%.

Using a methodology prepared by the State Foundation for Environmental Engineering (FEIMA) of Rio de Janeiro, the IBGE used the data of the 1980 industrial census to identify "potentially polluting" industrial establishments, according to the intensity of air and water pollution and the pollution parameters for the different branches of industrial activity. Thus, it was noted that in 1980 Brazil had a total of 214 156 industrial establishments, of which 106 506 (50%) were potentially polluting. The Southeast region contained the largest number of potentially polluting establishments, with 41% of the total, headed by São Paulo and Minas Gerais (with 23% and 12%, respectively). Next came the Northeast region, with 24% of the total, of which the state of Bahia accounted for 8%. The southern region contained 21% of the potentially polluting establishments, with the states of Paraná, Santa Catarina and Rio Grande do Sul accounting for relatively equal shares.

With regard to the specific problem of air pollution, the regional distribution of the polluting industries is approximately the same. First place is

occupied by the Southeast region, with 36% of the total establishments (São Paulo, 18%; Minas Gerais, 11%), followed by the Northeast states with 25% (Bahia, 8%) and the southern region, with 23%. The problem was more serious in the South (23%) than in the Northeast (17%), although an outstandingly unsatisfactory situation is occupied by the state of Maranhão which –largely because of Carajas– contained 4% of the establishments which are potential polluters of water resources. Moreover, the situation in some regions reached critical levels, as shown by the state of emergency declared in São Paulo in 1974 because of the concentration of pollutants in the atmosphere: a situation which was repeated on innumerable occasions up to the mid-1980s.

Finally, if we look at the situation of each industrial branch, we see that out of the total number of potentially polluting establishments, 40% corresponded to the non-metallic minerals branch. Of these, 15% were concentrated in Minas Gerais and another 15% in the state of São Paulo. With regard to air pollution, the potentially most highly polluting branches are food industries (20%) and the timber industry (17%). The food industries were mostly in the Southeast (30% of the total for the branch) and southern (27% of the total) regions, while the timber enterprises were in the states of the southern (40% of the total) and northern (18%) regions. With regard to water pollution, an outstanding place is occupied by the metropolitan regions of São Paulo and Rio de Janeiro, which have 15% and 5% of the total number of polluting establishments, respectively, concentrated in the metalworking, textiles, electrical and communications equipment, foodstuffs and timber industries.

Without denying the specific aspects connected with the impact of industrial activity on the Brazilian environment, there can be no doubt that the urban ecosystem is the one which has been most degraded by industrial expansion. This point of view, which has an eminently demographic basis, involves two different analytical dimensions from the environmental standpoint, both connected with the use of space. The first of them is the progressive concentration of the Brazilian population in cities, in a process of urban densification which takes place in all the regions of the country and raises environmental problems of a similar nature, with similar results and solutions, in all of them. The second aspect refers to the unequal spatial distribution both of natural

resources and of the economic activities undertaken by human beings. The combination of these two dimensions means that environmental problems have different degrees of intensity in different regions.

In terms of dynamics, the previously high population growth rate began to go down as from the late 1960s. This decline was only slight to begin with, but then speeded up and later became generalized. The abrupt drop in fertility took place in all regions, although this phenomenon was most marked in the urban areas and in sectors of society with higher levels of information and education. Thus, the total fertility rate fell from 5.8% in 1960-1970 to 3.2% in 1980-1990. As a result, the population growth rate likewise went down, from 2.9% per year in the 1960s to 2.1% in the 1980s. With the decline in fertility, it is calculated that at the end of the century Brazil will have a population of some 170 million people, with a growth rate of 1.5% per year in the 1990s. It is also calculated that the population will stop growing when it reaches the level of 265.5 million inhabitants, around the year 2075, when the average growth rate will be 0.58% per year. Analysis of Brazilian population growth patterns thus indicates that Brazil is already in an advanced stage of the demographic transition.

In the past, because of the spatial isolation of their various economic cycles, the occupation of the various regions of Brazil was always characterized by abrupt changes and solutions based on continuity. This is why there are so many dispersed or disconnected population centres in many points of the national territory. During the present century, however, the region polarized by its capital, São Paulo, has had an integrating influence, gradually unifying the national market in spite of explicit regional development policies which have made a systematic effort in recent decades to deconcentrate economic activity, including industrial activity, to more distant regions. The transfer of the national capital to Brasília attracted big migratory flows to the Centre-West region of the country, so that the population shifted to the interior. The process of geographical deconcentration in the 1970s may be explained by the expansion of the road network, the application of regional and urban policy instruments, and industrial promotion, which was reflected in the growing trend towards the installation of subsidiary plants and branches of companies from the metropolitan São Paulo region, especially those producing

intermediate goods. In this sense, the movement does not represent a true reduction of the process of concentration, but rather an expansion of the zone of influence of the dominant pole. In 1940, Brazil had only 51 cities with more than 20 000 inhabitants, whereas in 1990 it is calculated that the total came to 685. The total population living in localities of this size rose from 8.03 million in 1940 to 61.8 million in 1980. At present, 60% of the total urban population lives in nine metropolitan areas (São Paulo, Rio de Janeiro, Belo Horizonte, Porto Alegre, Curitiba, Salvador, Recife, Fortaleza and Belén). If current population growth trends continue, by the year 2000 nearly 80% of the population will be living in cities.

The urban environmental problems of Brazil are basically of two types. On the one hand, urban poverty (particularly in the big cities) affects a large proportion of the Brazilian population and merges with the consequences of environmental degradation. On the other hand, as already noted, there are the problems caused by the concentration of economic activity (especially in the industrial sector) in urban localities. The rapid urbanization resulting from the industrialization process has given rise to a deficit in the urban services infrastructure, the most serious environmental manifestation of which is the lack of basic sanitation. If it is borne in mind that nearly 33 million people now live on the periphery of the big cities, it is obvious that the problem of basic sanitation is and will continue to be one of the biggest urban problems in Brazil in coming decades. According to official data, 35% of urban dwellings (mostly located in the "favelas") are considered to be deficient from the sanitation point of view. The statistics on residential services hardly scratch the surface of the question of urban environmental sanitation.

Generally speaking, there have been big advances in water supply services. Thus, the indexes of service to the urban population rose from 45% in 1970 to 88% at present. With regard to the elimination of sewage, however, the results are much less satisfactory: over the same period, the growth in services was from 22% of the population to 35%, and the services continued to be of an extremely makeshift nature. This situation is aggravated by the fact that only 10% of total effluents receive proper final treatment, which would indicate that nearly 10 billion litres of sewage are discharged in the raw state every day into the earth or into bodies of water. Finally, it may be noted that the lack of sanitation

services mostly affects the low-income population. Of the 5.9 million urban dwellings which were not connected to the drinking water system and did not have flush toilet installations in 1980, 72% (over 21 million people) corresponded to families earning less than three minimum wages.

Another basic problem of urbanization is connected with refuse and urban cleaning. Refuse collection is as shaky a service as that for sewerage. Of the nearly 12 000 tips where municipalities put their solid waste, most are open tips or bodies of water, which involves problems of contamination of the air, water and soil, quite apart from favouring the proliferation of vermin harmful to human health. A sample of the biggest urban/industrial centres selected by the IBGE in 1980 revealed that in 63% of the 192 biggest urban centres in the country, solid refuse ended up in open tips. Few municipalities engage in the selective collection of refuse in order to recycle such materials as paper and cardboard, plastics and metals so as to reincorporate them in the economic cycle.

The situation with regard to workers' health (mostly in urban areas) is equally depressing. In ten years, over 10.5 million insured workers suffered accidents, and of this total over 41 000 died, while nearly 250 000 were permanently incapacitated. Studies indicate that the most frequent ailments are loss of hearing because of excessive noise; occupational dermatitis; metal poisoning, especially due to lead; effects of exposure to solvents, and various forms of pneumoconiosis. A special problem which has affected Amazonia since 1980 is due to the intensive use of mercury in gold mining. The main non-occupational form of exposure to mercury among human beings is the consumption of contaminated fish or fish products. Estimates based on the real production of gold indicate that approximately 900 tons of mercury were dumped in the Amazonian ecosystem during the 1980s.

Finally, ecological disasters are increasingly menacing risks for urban centres. It may be recalled by way of example that the presence of inhabited areas near pipelines transporting dangerous products can lead to serious accidents, as occurred in 1984 in Vila Socó (Cubatão, São Paulo), where the ignition and explosion of 700 000 litres of gasoline killed over 100 people. Both this accident and the radiation accident in Goiania (Goiás), in which six people died and a further 244 were contaminated with radiation from a cesium capsule, are eloquent in this respect.

2. *The expansion of agriculture and its socio-environmental impact*

The expansion of agriculture has reflected a pattern of industrial development and has been subordinated to it; it has been due mainly to the continual advance of the agricultural frontier and the introduction of more capital-intensive production techniques. The area occupied by agricultural enterprises almost doubled between 1950 and 1980, increasing by 1.67 million square kilometres. The process of modernization has been marked, however, by its uneven distribution –both regionally, by types of crop, and by classes of rural establishments– which reflects the piecemeal nature of this process and its links with the process of internationalization of the economy. Modernization has taken place at an intensive rate in the Southeast and southern regions, especially in São Paulo, Paraná and Rio Grande do Sul, as well as, in general, in areas engaged in the production of export crops such as certain areas in the Centre-West region and the Mata area in the Northeast. In brief, this process has represented the consolidation of the model based on agroindustrial complexes: a combination of science as applied to agriculture and profound changes in the organization of production, which has resulted in the elimination of the gap which previously separated agriculture from industry. The indicators on technification corroborate the great regional disparities in this sector.

Tractor use in agriculture illustrates the marked inequality of the modernization process. Although the number of tractors grew by 7 800% over the period 1950-1985, even in the latter year only 7.2% of farms had tractors. The southern region, where 16.3% of the farms had tractors, accounted for 43.2% of the total number of tractors in use in Brazilian agriculture. In 1980, three-quarters of the rural production units in Brazil only had manual production tools such as hoes, machetes, scythes and axes. Only 22% of these units used animal-drawn ploughs.

The 1980 data reflect the same inequalities in distribution with regard to chemical fertilizer use. Although the number of establishments using chemical fertilizers doubled over the period 1970-1985, in 1980 only 25% of Brazilian farms used them. The states of São Paulo, Paraná, Minas Gerais and Rio Grande do Sul accounted for 70.4% of the establishments using these inputs, although they only represented 18.4% of the total farms in Brazil. In

regional terms, and by types of crops, the available data clearly show that chemical fertilizers are used primarily for export crops. In the northern and Northeast regions taken together, sugar cane (which occupied 6.2% of the cultivated land) consumed 85% of the fertilizers used in those regions, followed by cacao, which, although occupying only 2.9% of the cultivated area, absorbed 10% of the fertilizers used. In the Southeast and Centre-West regions, coffee, sugar cane, soya beans and cotton consumed 75% of the fertilizers used, although they only occupied 27.2% of the cultivated area in those regions. In the south, the predominant crops were soya beans and wheat, which accounted for 90% of the chemical fertilizers used in the region.

The modernization strategy applied in Brazilian agriculture has also promoted a significant increase in the consumption of toxic agricultural inputs: herbicides, insecticides and fungicides. According to data from the IBGE, the consumption of toxic agricultural inputs grew by 300% between 1970 and 1980, from 27 000 to 80 000 tons per year. In corroboration of the subordinate position of agricultural modernization *vis-a-vis* industrial modernization, it may be noted that in 1974, 75% of the toxic agricultural inputs used were imported, but in 1980 national production already satisfied 50% of annual consumption. In 1984, 80% of the total consumption of toxic agricultural inputs was concentrated in the states of São Paulo, Paraná and Rio Grande do Sul, and was used above all for export crops: soya beans and citrus fruit alone accounted for 23% of total national consumption that year.

The social impacts of agricultural activities on the country were numerous and varied. First of all, the development of capital-intensive agriculture proved to be incapable of generating the number of jobs needed to absorb the rural labour supply, and this led to migratory flows to the cities or to areas on the agricultural frontier, especially Cerrado and Amazonia. Secondly, modernization was reflected in marked changes in labour relations, leading to the employment of former smallholders, settlers and sharecroppers on a partly wage-earning casual basis, so that they became seasonal migratory workers because of the expansion of single-crop agriculture and the consequent increase in seasonal work. The single-crop agriculture resulting from modernization led to the disappearance of the subsistence crops of rural workers, who became wage-earners looking for work in rural areas or in the cities.

Thirdly, when the average growth rates of the cultivation of staple foodstuffs and export products are compared with the population growth rates over the last 30 years, a clear picture is obtained of the general tendency over this period. Thus, it is observed that there has been either stagnation or a steady decline in the production of rice, beans, maize and cassava, while production of coffee, soya beans, oranges and sugar cane has remained at high levels. The increase in demand for staple foods which are no longer cultivated in the old subsistence farming units, together with low wages, has been reflected in a sharp drop in food consumption and greater malnutrition of the migrant population. Thus, in 1990 hunger or malnutrition prevailed among two-thirds of the Brazilian population. Fourthly, the modernization of agriculture has favoured to an even greater extent the concentration of rural property and the incorporation of small farms into large and medium-sized establishments. Another effect of the process has been the increase in the number of dwarf holdings, that is to say, the proliferation of very small holdings whose average area has steadily gone down. In 1960 there were 1.5 million rural properties, with an average area of nearly four hectares, whereas in 1980 the number had risen to 2.6 million, with an average area of 3.5 hectares, and in 1985 these tiny holdings amounted to 3.1 million, with an area of 3.1 hectares each. Data for 1980 show that 80% of the total area of agricultural holdings was accounted for by only 10% of the total number of properties.

The rapid growth of modern commercial agriculture, as well as aggravating the social crisis, has raised environmental problems which have not always been properly appreciated in all their seriousness. The growing use of chemical fertilizers and toxic agricultural inputs, the intense and concentrated process of mechanization, and the extension of single-crop agriculture aimed at the external market have led to the erosion and degradation of agricultural land, as well as serious impacts on forest resources, rivers, lakes and the ecological balance as regards pests and diseases. Finally, in some areas which have been the subject of public irrigation programmes, improper use of the technology has led to serious environmental problems, especially the leaching of chemical products and the salinization of agricultural land.

By the mid-1980s, Brazil had become the third biggest world market for toxic agricultural inputs, after the United States and France. As an indication of the problems caused by this growth with regard to the biological balance in agriculture, it may be noted that in 1948 the number of species harmful to cultivated plants amounted to 989, whereas in 1976 such species numbered 3 037. With regard to erosion, it is considered that normal agricultural activity causes an erosion rate of the order of 17 tons per hectare per year. The cultivation of soya beans and wheat in Paraná, however, causes an annual loss of 144 tons per hectare, which corresponds to over one centimetre of soil lost on each hectare each year. In the state of São Paulo, the total soil losses amount to 194 million tons. For Brazil as a whole, the losses averaged 25 tons per hectare per year, which represents an overall loss of one billion tons per year.

A process which is related with that of erosion is desertification, which represents the last stage in soil degradation. In 1977, at the Conference on Desertification organized in Nairobi by the United Nations Environment Programme (UNEP), it was asserted that Brazil is in the process of forming the third biggest desert in the world, only a little smaller than the Sahara and the Arabian Desert. This "Central Brazilian Desert" will extend from the coast of Rio Grande do Norte to the Centre-West region and also include large areas of the Northeast. The problem is not limited to these regions, however. In Paraná, for example, 20% of the territory is unproductive and open to the risk of desertification. In Rio Grande do Sul, at least three important focal points in the formation of deserts have been identified: San Francisco de Assis (2 000 hectares); Alegrete (1 500 hectares) and Itaqui (1 000 hectares), which together make up the "Desert of the Pampas".

The impacts of the horizontal expansion of agriculture which are most difficult to put right are those connected with the felling and elimination of native vegetation which has taken place in vast areas of the national territory. Before the coffee boom, forests covered nearly 82% of the area of the state of São Paulo, but by 1973 this proportion had gone down to only 8.3%. At the end of the 1940s, nearly 90% of the territory of northern Paraná was covered by native forests, but these now cover only a little over 17% of the region. There has been a similar impact in other regions.

III

Basic components of a sustainable industrial and agricultural development strategy

1. Preliminary considerations

Some words of caution are called for with regard to the interrelation between industrial and agricultural development and between the development of these two sectors and the maintenance –or in many cases, the restoration– of environmental quality patterns which represent an effective improvement in the quality of life of the population, and also with respect to the great diversity of regional situations existing in the country. In the first place, some of the requisites for sustainable development which will be presented below cannot be differentiated between the industrial and agricultural sectors. Secondly, most of these requisites demand, as prior conditions, the correction of the veritable gulfs dividing social groups and strata, separating the big cities from the rural areas, and differentiating the various regions of the country from each other.

In reality, a new development paradigm must permit a thorough review of the present practices with regard to the use of natural resources, through new forms of social organization and new patterns of production and consumption. For a start, it is impossible to conceive of an environmentally sustainable style of development which does not include the solution of the serious imbalances caused by the situations of extreme poverty and economic and social inequality which characterize Brazilian society in these last years of the century. It is not only wealth and natural resource ownership which are concentrated in the country, however. Access to the decision-making centres is still unequally shared among the cities. It is therefore felt to be equally essential to improve Brazilian democracy so as to tackle the problem of the divorce between society and the State and to overcome the situation of political poverty which aggregates and perpetuates economic and social inequality.

The recent pattern of development has left as its great legacy the unresolved problem of social duality. Nearly 40% of Brazilian families live in a situation of poverty, with a monthly income of less than a quarter of a minimum wage per head. Of this

total, 45%, representing 4.7 million families, live in conditions of total indigence. In 1989, the richest 5% of the population received 38.5% of the total income, whereas the poorest sectors received only 7.2%. The high indices of concentration are due to the differences in income between regions and sectors of production, as well as the structural characteristics concerning age groups and the educational base.

The Northeast, which contains 29% of the Brazilian population, has 53% of the country's poor. In 1980, each inhabitant of the Northeast earned on average the equivalent of a little over a quarter of what was earned by a person living in the Centre-South region. In short, a review of the social indicators at the beginning of this decade reveals an increase in the gap between urban areas and rural communities, as well as between regions. The majority of rural areas ended the 1980s in a more unfavourable situation than that registered by the cities 20 or 30 years before. The same is true of the Northeast, in comparison with the Southeast.

Part of the problem is due to a kind of superimposition of history. Whereas the countries which were industrialized a long time ago went through the industrialization process over a period of many decades, with consequent very gradual urbanization and social differentiation of their population, in Brazil these processes frequently occurred at much faster rates, within a single decade or even less. Trotsky's description of events in the Russian Revolution can easily be transferred to Brazil: "The savages are replacing their bows and arrows with rifles from one moment to the next, without first covering the path which separated these two arms in the past" (Deutscher, 1963, p. 230).

The results of this legacy, which acts as a kind of mortgage on Brazil's future development prospects, cause the social structure to exist against a background of dramatic tensions. The first aspect which must be highlighted is therefore that the mere restoration of economic growth is not enough to solve these serious problems. The transformation of the structure of production, which is essential in order to ensure the recovery of economic growth,

must be interlinked with a firm policy aimed at ensuring greater social equity, not only for the people of today, but also for future generations.

At the same time, criteria of economic efficiency guided solely by the market forces do not lead to a reduction of social and regional inequality or to rational natural resource use. The Brazilian experience has proved that the intensive mobilization of the factors of production favours the plundering of environmental resources and tends to spontaneously reproduce the initial social and spatial conditions which formed its basis. It must therefore also be recognized that the economic growth process does not take place in a social vacuum. Whatever the diagnoses underlying economic policy proposals in favour of the socio-environmental sustainability of development, it is necessary to examine with care the various global options proposed for overcoming the present problems and their implications with regard to the objectives of greater social equity and reduction of poverty.

In short, giving priority to macroeconomic policy options which permit the satisfaction of the basic needs of the poorest sectors; developing integrated social policies which have an impact that goes beyond the immediate combating of poverty; devoting a significant part of the product to the social sectors; modifying the distribution of public expenditure at the basic level, and reorienting social programmes for the most vulnerable groups do not seem to represent an economic obstacle. In fact, accumulation, distribution and citizenship are synchronous processes which are the form and substance of a single historical process. This being so, the economic, social and political evolution of the country is clearly pointing to the need to overcome the disparities between material progress, social justice and environmental sustainability. This is an eminently political challenge which must be faced by building alliances among the various social groups so as to obtain the consensual basis for the necessary reform of the public institutions. At the micro level, the institutional challenge of the crisis of the sustainability of Brazilian development amounts in essence to the democratization of society, while at the macro level it amounts to the democratization of the State. The first of these objectives assumes the strengthening of social and community organizations, the redistribution of resources and information to the underprivileged sectors, and an increase in the capacity of analysis of their organizations and their decision-making capacity. The second objective is achieved through the

opening up of the State apparatus to citizen control, the updating of political parties and electoral processes, and the incorporation of the concept of political responsibility into public life.

2. The components of a new pattern of industrial and agricultural development

The transition towards a new style of development presupposes well-defined strategies for transforming sectors of production which are essential for the economy and for the well-being of society. The present economic and environmental crisis may be attributed to the imbalances resulting from a style of development based on production processes making extensive use of natural resources and fossil fuels, which were considered to be extremely abundant. It may be attributed, above all, to the belief that the "free goods" of nature, such as air, water and even the forests, are unlimited and capable of receiving any amount of wastes, refuse, polluting gases, etc. generated by a consumer society which squanders natural and human resources.

Certain general components of the new development strategy are essential prior conditions for giving consistency to industrial and agricultural development policies. Thus, the establishment of a new and sustainable style of development in the country calls for the strengthening of the existing instruments and the creation of new ones. The first action to be taken must undoubtedly be the establishment of a system of resource accounts which makes it possible to incorporate the economic value of the natural resource endowment of the country in macroeconomic planning. To put it briefly, just as government planning only became possible once there was already a solid system of national accounts, without which it would be quite impracticable to indicate to the productive sector the optimum resource distribution which should be applied, likewise, any development strategy which seeks to internalize the environmental costs of economic activity needs instruments for establishing natural resource endowment accounts.

Parallel with the establishment of resource accounts, a thorough review of the economic paradigms is called for, so as to give a strictly operational character to the criterion of the environmental sustainability of development. The contributions made by Herman Daly in this respect have been very valuable (Daly, 1990, pp. 1-6). There are two basic ideas in this new form of economic thinking. Firstly, for the

case of the management of renewable natural resources, there are two fundamental principles that must be taken into account: on the one hand, the rates of utilization must be commensurate with the rates of replacement, and on the other hand, the rates of emission of effluents must not be greater than the capacity of assimilation of the ecosystems into which they are released. This means that the "rates of recovery" and the "rates of regeneration" must be treated as "natural capital". Inability to maintain these rates must therefore be considered as the consumption of capital: that is to say, it is not sustainable. Secondly, for non-renewable resources, which by their very nature cannot be used indefinitely on a sustainable basis, it will be necessary to limit their rate of utilization to the rate of development or discovery of new substitutes. This means, among other aspects, that investments made for the exploitation of non-renewable natural resources must be accompanied by equivalent investments devoted to the search for substitutes.

With regard to the financing of development, the Brazilian economy must recover its saving capacity. For this purpose, it will be necessary to overcome the fiscal crisis which characterized the 1980s and the early 1990s and emerge from the present impasse in which the balance of payments surplus is immediately absorbed by the external debt repayment commitments. In this respect, lengthening the term of the debt merely reduces the frequency of the renegotiation exercises, since the commitments are perpetuated and the international banking system becomes a kind of rentier installed in the country's economy without any risk whatever to itself.

Specifically in respect of environmental matters, it is necessary to redefine the schemes for the application of penalties for damage to the environment in order that the income collected in this way may be used by the environmental bodies themselves. In order to increase this income, it would be important to apply market mechanisms, such as rates and tariffs which incorporate the costs of environmental preservation into private costs, through mechanisms which could be in line with the principle that "the polluter must pay". Among other market mechanisms which deserve to be strengthened, mention may be made of the "waste exchanges" –on which the industries of a given region trade the effluents arising from their activities, which can often become inputs for other industries– and "pollution rights".

It is worth placing special emphasis here on these pollution rights, which, through their transfer within industries, make it possible for the public authorities to give up using tax regulations based on the establishment of emission limits for each industrial unit and apply instead regional effluent emission limits, according to the recovery capacity of each ecosystem. In this way, a substantial part of the maintenance of environmental quality would become the responsibility of the market, since the trading of pollution rights would stimulate the modernization of technology and cease to penalize industries which, in the present state of development of technology, are not in a position to reduce their levels of emission of effluents. The present system of fines, in addition to hindering the internalization of the costs of environmental degradation through the regulations it applies, penalizes industries which, although they use the best technology available, nevertheless exceed the pollution limits, while it favours those which, although admittedly within the established limits, do nothing to improve their production processes.

Quite apart from the potential income offered by many of these arrangements, it is of fundamental importance to secure external resources also. Conversion of the external debt for application in environmental projects and, more broadly, in sustainable development projects, is an important alternative way of obtaining resources for both governmental and non-governmental bodies. Bilateral loans and loans from multilateral credit agencies will continue to be essential for the execution of environmental projects as well as development projects. What may appear to be perfectly valid for certain projects or sectors, however, may tend to lose its validity in an overall setting. Thus, if the level of indebtedness is contained, this means that there will be no new money: the dollars obtained will go to service the debt, and such projects as are "financed" will actually be carried out in national currency with domestic saving. To sum up, as preservation of the environment is an investment whose profitability is difficult to quantify, and frequently it involves world-level responsibilities, then the external resources used for it should not be governed by market conditions. Preference should be given to donations or loans on very soft terms, especially for regional-scope projects.

With regard to industrial development, the scientific and technological progress attained in recent decades makes possible a fuller knowledge of the

ecological processes in the biosphere and offers suitable techniques for monitoring world changes in these processes. There is also the possibility of using new production processes which are less dependent on energy and raw materials, of using new energy sources based on new materials, and above all, of taking advantage of the possibilities of making much better use of biological resources. The common denominator of all these changes could be described as the shift of emphasis from matter and energy to information; from quantity to quality. In other words, the type of economic production now taking shape at the international level makes intensive use of scientific and technological knowledge rather than natural resources as such. This explains how countries with a poor endowment of natural resources, such as Japan, have attained a high level of economic and social development.

Scientific and technological progress is incorporated into the productive sector, with benefits for the environment, in three main ways: high-technology industrial development; use of knowledge in the existing productive structure, and projects designed to promote the recovery of the environment. The proper use of technology makes it possible to establish clean industries, which are the basis for a form of economic growth that is more balanced and integrated with the environment. In respect of the second line of action, it may be noted that even slight under-utilization of technological knowledge causes shortcomings in production management; the present times call for innovations in the management of technology itself. Every effort should therefore be made to promote a management philosophy based on quality and productivity, integrated within an environmental approach. In the third major line of assimilation of new and environmentally acceptable technologies by the productive sector, it may be noted that there is a big market for activities and projects directly linked with the environment. A typical example is the recycling of refuse and the re-use of wastes and effluents.

The use of appropriate technologies offers opportunities for achieving optimum regional solutions, since when these technologies have been developed over many years or decades this means that they have absorbed the cultural tradition of the environment in which they are used, thereby offering an empirical basis for understanding problems and favouring the emergence of appropriate projects. In this respect, biotechnology is a natural option for

Brazilian development. The use of biological systems for converting forms of energy or changing one chemical substance into another (bioconversion) has various advantages: high selectivity, flexibility, low energy input requirements, high catalytic activity, environmental compatibility, ease of application regardless of the place where they are used, and renewability. The impact of biotechnology in such sectors as textiles, fine chemicals, new materials and microelectronics is undoubtedly impressive, as may be seen already in the developed countries.

With regard to renewable sources of energy, leading possible alternatives or supplements to petroleum are natural gas, shales, peat and nuclear energy. All of these, with the possible exception of peat, are centralized forms of energy. In the case of decentralized renewable forms of energy, there is a wide range of possibilities, including wood and charcoal, liquid fuels such as alcohol and vegetable oils, gaseous fuels derived from biomass, and small hydroelectric power stations, as well as forms of technology of more restricted use, such as biogas and direct, thermal or voltaic solar energy. A new industrial development strategy also calls for a thorough change in the transport system of the country, with greater use of the railways and seagoing and river vessels for transporting cargo, as well as support for programmes to expand public transport systems and replace diesel oil with natural gas, biogas or electricity in urban centres. It may be noted that the Brazilian Constitution lays down that cities with 20 000 inhabitants or more must have an urban development plan which provides for the establishment of an integrated transport system. In establishing the infrastructure, a prior requisite is guaranteed control over land use, since road administrations only have power to act in the actual space occupied by the roads.

With regard to sustainable agricultural development, we have seen how the process of institutionalization of agriculture, subsidized by the State and propelled by the logic of industrial expansion, has led to an increase by leaps and bounds in the impoverishment of the population and the squandering of much of the available natural resources. Reversing this situation involves changing the priorities of agricultural policy and applying a new model which includes better distribution of the rural population over the territory, gives priority to food production and proper soil management, as well as the proper distribution of water resources, and presupposes the use of appropriate technologies for each region.

It is vital to adopt a broad programme of reform of the system of land ownership. Side by side with the agrarian reform initiatives, it is also essential to gradually replace single-crop agriculture with diversified cropping. It is also necessary to develop integrated agricultural-forestry-stock breeding production systems, in keeping with the ecological vocation of each region. It goes without saying that a policy of this nature also requires the development of agroecology, with the replacement of toxic agricultural inputs with biological controls for species which are harmful to crops. The use of herbicides, insecticides and fungicides would initially be restricted and subsequently scheduled for virtual elimination. With regard to food security, finally, it is necessary to expand the genetic base contained in the plants traditionally used for food production. It is vitally important for the country to seek alternatives in this respect through agricultural research carried out in systems of *in situ* and *ex situ* conservation based on germ plasm banks, botanical gardens and genetic reserves.

The aim of conserving genetic resources and preserving biodiversity is to concentrate on the species which can have an impact on the modernization of strategic sectors such as human and animal health, food production, agriculture and the environment, and to ensure that this genetic material, as well as information on it, is available for present and future generations. However, the internationalization of the legislation on intellectual property applied to biological products, as proposed by some developed countries, will permit the legalized appropriation of those resources by the most advanced countries, which have an indisputable advantage over the developing countries in terms of techniques for making use of genetic resources. It is well known today that real control over genetic resources lies in access to information on genetic material and the possibility of using it, through the mastery of manipulation techniques. Consequently, any law on intellectual property applied in this area will tend to benefit those countries which are already most advanced in techniques for making use of genetic resources.

IV

Final comments

In advanced capitalist countries, the reconciliation of economic and environmental objectives depends on technology capable of turning industry and transport into systems which use fuels and raw materials in an extremely efficient manner and are based on inputs of low environmental cost which generate few residues. To this end, it is necessary to establish closed technological systems, that is to say, systems depending only to a minimal extent on natural resources. For the developing countries, whose trade balance depends mainly on their exports of primary commodities, the prospects presented by a situation where such closed technological systems prevail is gloomy. In most of the countries of the South, little progress has been made in the area of new technologies. These technologies are obtainable—generally from the private sector of the developed countries—only through payment of royalties and acceptance of other financial, trade, and often political commitments.

Consequently, the technological solution proposed for environmental problems by the industrialized countries brings into question the role which the developing countries play in the international economic system. Their traditional role as suppliers of primary commodities, the proceeds from which are already insufficient to take care of their basic development needs, will tend to go down still further in the near future. The evolution of new technologies very clearly shows the need to make a concentrated domestic effort to develop spearhead technologies which are not aggressive for the environment, as well as to arrive at international agreements designed to facilitate access to the technologies developed by the industrialized countries.

In short, while Brazil is beginning to make adjustments in the profile of its industry, the world economy is entering on a new technological cycle and paradigm. In contrast with what happened in post-war industrialization, which was characterized

by intensive consumption of natural resources—raw materials, basic commodities and energy products—the new growth pattern is characterized by high demand for information and knowledge, with a relative reduction in the consumption of environmental resources and the production of polluting effluents.

In spite of the foregoing, it must be acknowledged that there have been substantial changes in the treatment given in Brazil to environmental questions, from the political, legal and institutional point of view. From the economic, financial, scientific and technological point of view, however, there are structural problems which prevent any hope of major progress in the short term. Restrictions on public expenditure, measures to contain inflation and the debt burden are some of the factors which considerably limit the possibilities for large-scale action by the government.

The problems inherent in the fact of being a developing country are further magnified by the special features of Brazil. The great extent of the biggest reserve of tropical forests in the whole world, the heterogeneity of its ecosystems, its biodiversity, the location of extraordinarily large mineral deposits in various points of the subsoil under the forests, and the existence of rivers capable of producing energy and food are all elements that make up a rich endowment of resources but at the same time a challenge that cannot be ignored by politicians, planners and scientists. There are few developing countries which still have territories theoretically available for settlement or economic conditions for promoting such settlement on a large scale, and none of them have such a huge area, with such a biological diversity that must be investigated, studied and ultimately preserved or used, as Brazil. These features impart a world dimension to the country's environmental problems and make it obligatory for Brazil to take part in multilateral efforts to seek solutions for world imbalances. Just as the challenge of reconciling environmental quality and economic growth, in its international expression, calls for the participation of Brazil in the search for solutions for world environmental problems, so, in the domestic dimension, it is essential that society as a whole should participate in building a new style of development for the country. The relationship between the private sector and environmental protection, for its part, must be understood as part of the political, institutional and

historical process of the country, especially with regard to the role that the State has played in mediating between the social forces and guaranteeing democratic rights. Such features, together with the income distribution profile, explain why generally speaking the bias of decisions in society is inclined too far towards income concentration and penalizes the exercise of the basic rights of the citizen, among which is the right to a decent quality of life. Thus, economic power has traditionally meant the power to pollute in spite of the laws. It is not without justification that it is asserted that the country has adequate environmental legislation, but it is not fully complied with.

Recently, however, some reaction has been observed in entrepreneurial circles themselves against the evils of a type of economic development which pays no heed to environmental considerations, even when these represent a risk for the continued existence of certain activities and their acceptance by society. Thus, in recent years environmental management has become a part of industrial planning and operations, just like community relations. The legal requirement to carry out studies on the environmental impact of the entry into operation of industrial units and other forms of resource use, and the holding of public hearings to discuss projects, will lead the productive sector to pay increasing attention to environmental factors. In this transitional process, the adoption of clean technologies which minimize negative environmental impacts has taken place on an uneven scale in the different sectors, although it is recognized that the costs of controlling pollution are less and the efficiency achieved is greater when environmental protection and management measures and measures to control risks are taken into account from the initial stages of an industrial project. In some sectors, such as the aluminium, chemicals, petrochemicals, and paper and pulp industries, the process of incorporating environmental safeguards is at a more advanced stage, since these industries are adopting, *inter alia*, technologies and measures for the control and recycling of wastes. The public sector, generally speaking, already has experience in environmental control of large-scale projects such as those in the electricity and mining sectors. Positive results have been obtained in research on technological solutions for the environmental problems generated in the agricultural sector.

These small seeds of a new growth pattern, more in keeping with the ecological conditions of the

country and aimed at improving the living conditions of the population, seem to have fallen on fertile ground. Nevertheless, the magnitude of the challenges calling for decisive action demands an even more determined attitude by Brazilian society as a whole. When what is involved is something more than the mere maintenance of a certain lifestyle and involves the total reformulation of its material, productive and even ethical bases, more is demanded from human beings that their mere capacity to adapt or their capacity for "fine tuning". What is needed is a firm determination to bring about a veritable revolution in the paradigms and practices which govern life in society. Albert Einstein said, with regard to the beginning of the nuclear age, that "everything has changed" and that "we need a different way of thinking if humanity is to survive". The global crisis in the environment also marks the beginning of a new age and a new style of development. There can be no doubt about this. Charles Birch was completely right

when he said "maybe we could not predict this new era, but we can certainly invent it".³

Consequently, ecological arguments also necessarily constitute political arguments. Before examining the technical arguments for the taking of rational decisions, it will be necessary to create alliances between the different social groups capable of furthering the necessary changes. It is to be hoped, in this respect, that Brazil will take advantage of the momentum provided by the Rio Conference to begin a search for compromises—both internally and internationally—which will make possible the emergence of a new pattern of industrial and agricultural development which fulfills the requirements of environmental and social sustainability.

³ Both quotations are from Guimarães (1990), pp. 59-95.

Bibliography

- Banco Nacional de Desenvolvimento Econômico e Social (BNDES) (1991): *IV fórum nacional: como evitar que os anos 90 sejam mais uma "década perdida"*, Rio de Janeiro, 25-28 November.
- Bennett, John (1976): *The Ecological Transition: Cultural Anthropology and Human Adaptation*, New York, Pergamon Press.
- Daly, Herman (1990): Toward some operational principles of sustainable development, *Ecological Economics*, vol. 2, No. 1, Amsterdam, Elsevier Science Publishers B. V., April.
- Deutscher, Isaac (1963): *The Prophet Outcast: Trotsky 1929-1940*, New York, Oxford University Press.
- Guimarães, Roberto P. (1990): La ecopolítica del "desarrollo sustentable": una visión latinoamericana de la agenda global sobre el medio ambiente, Roberto Russell (ed.), *El sistema internacional y América Latina: la agenda internacional en los años '90*, Buenos Aires, Grupo Editor Latinoamericano.
- (1991a): *The Ecopolitics of Development in the Third World: Politics and Environment in Brazil*, London, Rienner Publishers.
- (1991b): O desafio de desenvolvimento sustentável: preservação ambiental, crescimento econômico e justiça social (Subsidio Técnico para o Relatório Nacional do Brasil para a CNUMAD), Brasília.
- IBGE (Instituto Brasileiro de Geografia e Estatística) (1990): *Diagnóstico do Brasil: a ocupação do território e o meio ambiente*, Rio de Janeiro.
- United Nations (1991): *O desafio do desenvolvimento sustentável: relatório do Brasil para a CNUMAD*, Brasília, United Nations Conference on Environment and Development, September.