

CEPAL

Review

Executive Secretary of ECLAC
Gert Rosenthal

Deputy Executive Secretary
Carlos Massad

Director of the Review
Anibal Pinto

Technical Secretary
Eugenio Lahera



UNITED NATIONS
ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN
SANTIAGO, CHILE, AUGUST 1991

CEPAL

Review

Santiago, Chile

August 1991

Number 44

CONTENTS

Industrial restructuring, trade liberalization and the role of the State in Central America, <i>Larry Willmore</i> and <i>Jorge Máttar</i>	7
The prospect for equity, <i>Marshall Wolfe</i>	21
The social actors and structural adjustment, <i>Eugenio Tironi</i> and <i>Ricardo A. Lagos</i>	35
Selectivity as the crux of social policies, <i>Percy Rodríguez Noboa</i>	51
Latin America's return to the private international capital market, <i>Peter J. West</i>	59
Debt/equity conversion, <i>Michael Mortimore</i>	79
Options for Latin American reactivation in the 1990s, <i>Colin I. Bradford, Jr.</i>	97
Productivity: agriculture compared with the economy at large, <i>Gerardo Fujii</i>	105
Scenarios for the new era, <i>Ernesto Ottone</i>	115
Industrial and urban pollution: policy options, <i>Hernán Durán de la Fuente</i>	125
International insertion and institutional renewal, <i>Fernando Fajnzylber</i>	137
Recent ECLAC publications	167
Guidelines for contributors to CEPAL Review	171
ECLAC publications	173

Industrial and urban pollution: policy options

*Hernán Durán de la Fuente**

This article reviews the conditions that must be fulfilled by the countries of the region in order to tackle and solve their growing problems of pollution from industrial and urban wastes, and the role that should be played in this by industry, science and technology is analysed. The industrial pattern of the region is compared with that of the developed countries and its specific structural shortcomings are indicated. These lie fundamentally in the insufficient development of the most sophisticated industrial branches —metal products, machinery and transport equipment— and of the scientific and technological facilities normally linked with them. In the developed countries, technological solutions and the production of the equipment needed to solve the problems of contamination are specifically focused on these industrial branches and their technical and scientific base. Consequently, as a path to be followed by the countries of the region, it is proposed that emphasis should be placed on the industrial development of these branches and also of the endogenous scientific and technological base connected with them. Economic, scientific and technological co-operation and integration between the countries of the region is also suggested. Through this approach, the larger and more advanced countries, which already have a certain capacity for developing anti-pollution technologies and equipment, should find a broader market in the region for sustaining this development. Progress in these structural conditions will facilitate the application of effective policies against industrial and urban pollution, instead of the inadequate policies so far applied, while it will also permit the region to take advantage of this challenge to develop its industrial, scientific and technological capacity, which is a factor intimately linked with development.

*Expert in the ECLAC Environment and Human Settlements Division.

Introduction

When levels of industrial production were low and there was no excessive urban concentration, the management of urban and industrial wastes did not represent a problem, or, to put this in more subjective terms, such a problem did not *appear* to exist because the population did not understand that the growing amount of contaminants could endanger their health or that the deterioration in their environment would prejudice their quality of life.

As the perception of the population has changed and they are beginning to press for improvements in the quality of the environment, it has become clear that there are efficient technological solutions for reducing the current levels of contamination and that the problem is connected with development options and, above all, decisions of a political nature.

The technological solutions are not neutral, however: some of them can alter the lifestyles of the population, others may affect economic development itself by absorbing greater resources, and in some cases they may prove to be unsuitable because they were conceived for other conditions. For this reason, the selection of the technology to be used plays a decisive role in sectoral policies.

In developing these views, a central thesis was confirmed: both the solution of the health problems caused to the population and the maintenance and improvement of the ecosystems of the region are the responsibility of those who cause the disturbances (the principle that the originator of the problem is automatically responsible). The effective reduction of levels of contamination involves changes in the production patterns of the industrial sector, which must modernize its activities by improving its levels of productivity, raising the international competitiveness of its products, and investing in creativity, intelligence, engineering, organization, planning, science and technology. This approach to seeking a solution is actually of benefit to industrialists, as it improves the profitability of their activities and opens up possibilities for new business. In order for this process to take place, however, it is necessary that the relevant public bodies should combine demands (taxes, monitoring, control measures, legislation, etc.) with incentives (credits, tax differentials, etc.).

The region has before it the challenge of taking advantage of the experience of the developed

countries in order to create its own technological options (in the light of the specific characteristics of the pollutants involved) and generating an industrial base capable of implementing these options. These tasks involve the whole of the region, which is why the final proposal made here is to promote concrete regional co-operation activities.

In section I of this paper, Latin America's industrialization pattern is compared with that of the developed countries in order to draw conclusions on the contamination generated by the sector and the region's possibilities of progressing towards a solution of this problem. Section II examines possible solutions, and it is seen that these can form the basis for new industries, investments,

jobs and other components of development. Section III analyses the formulation of anti-pollution and environmental protection policies, the difficulties and factors involved, the various strategies used and other elements, illustrated with examples from countries which have made more progress in this field.

Finally, this paper takes into account the experience built up by ECLAC in this field within the conceptual framework of a recently initiated project on policies for the environmentally appropriate management of urban and industrial wastes. This project is being carried out with the support of the German Co-operation Agency, Gesellschaft für Technische Zusammenarbeit (GTZ).

I

Environmental features of industrial development

1. Background

It may justifiably be said that up to the early 1970s, the industrial and technological development which was taking place in the world, while offering a growing volume of increasingly sophisticated goods, was also capable of causing serious health problems to workers and to the population in general, as well as causing deterioration in the environment. Albeit commensurately with the different degrees of industrialization, the ill-effects were equally serious both in the most highly industrialized countries and in the Third World, including Latin America. Since then, the experience of the industrialized countries has shown that, with a coherent national development policy, industry can also generate suitable technology and equipment for reversing the negative effects of this trend. The developing countries are also seeking solutions, albeit slowly and timidly. However, they do not always themselves generate the anti-pollution technology and equipment they need. Why is this? What features of industry in these two groups of countries are responsible for these differences? What kind of industrial development is needed in order to avoid the ill-effects referred to?

The answers to these questions are to be found in a comparative analysis of the development of

the two groups of countries, designed to identify the factors which make possible this advantage and thus suggest the direction in which the structural changes in the countries of the region should be oriented.

2. Latin America's industrial development pattern compared with the rest of the world

Latin American industry accounts for a little over 5% of world production. A rapid review of each of the industrial branches shows which of them are over this percentage and which of them are under it.¹ Those branches which are over the 5% level may be said to represent the dominant development style of the sector, while those that are under it represent a non-dominant style.²

¹ Branches classified according to the International Standard Industrial Classification (ISIC), Rev. 2, at the three-digit level.

² The analysis was based on statistical information provided by ECLAC.

This latter group (that with a smaller share) is made up of the following industries: printing and publishing, industrial chemicals, metal products, non-electrical machinery, electrical machinery and transport equipment. The first of these industries is linked with the degree of diffusion of knowledge, which constitutes a further index of the development and improvement of the cultural resources of the region. The chemical industry and all the others classified under the metal products and machinery branch have dynamic effects on the economy as a whole and assist in providing the capacity needed for proper management of industrial and urban wastes.

It is worth noting that, in relative terms, the region has a higher proportion of polluting industries than would normally correspond to it in line with its share in world industry. Of these industries, oil refineries and chemical plants (ISIC 352) are the most important, followed by beverages, tobacco (which has direct and indirect harmful effects) and basic industries.

If we look at the evolution of the industrial sector in the region in the second half of the twentieth century, the first thing that is noted in general terms is the decline in growth rates after the 1970s, which became even more marked as from 1980, and the second point is that growth shows big differences between countries. According to ECLAAC data, between 1950 and the mid-1980s Uruguay increased its industrial production by a factor of 1.9, while Argentina and Brazil did so by factors of 2.8 and 12.6, respectively.

The region's structures of production have undergone substantial changes over the last 30 years, and this undoubtedly raises new challenges with regard to the management of industrial pollutants and their environmental impact. In the large countries of Latin America, with bigger domestic markets (Argentina, Brazil and Mexico), the situation is more reminiscent of recently industrialized countries than of the countries of the Organization for Economic Co-operation and Development (OECD), while in the medium-sized (Chile, Colombia, Peru and Venezuela) and small countries (the remainder) the proportion of industry accounted for by non-durable consumer goods amply exceeds any of the cases in question.

The relative importance of the *intermediate goods industry* in the region is not very different from its importance in the OECD countries and the

recently industrialized nations. This sector is of greater relative weight in the domestic markets of the three large countries than in the smaller countries. Furthermore, in the large countries this share is tending to increase, while in the small nations it tends to stagnate. This situation is explained by the fact that in the latter countries the basic oil refining and cement manufacturing industries were established in mid-century, and there have not been suitable conditions for going on to higher levels of demand which would justify the expansion of the sector. It may be noted that these industries are serious sources of pollution if not run efficiently.

If we look at the changes in the share of each of the sectors in the industrial product (the gross domestic product of manufacturing) it may be seen that the changes which have taken place in the second half of the twentieth century have given the intermediate goods sector a greater relative share than that of non-durable consumer goods. While the latter have remained important, they have shown less dynamism than the former, and still less than the metal products and machinery sector.

The intermediate goods sector of the region covers various industrial branches whose relative weight in respective world production exceeds that of manufacturing as a whole: this is particularly so in the cases of wood, paper, other chemical products, rubber, ceramics, glass, cement and lime, and iron and steel. At the same time, this is the sector with the greatest and most varied harmful effects on the environment, so that proper management of pollution should be given particular importance in it.

Finally, mention must be made of the sectors of the metal products and machinery industry producing consumer durables and transport equipment. There has been much talk of the technical and economic importance of these production activities, both for development in general and for the possibility of creating an endogenous technical and industrial nucleus capable of ensuring non-polluting industrialization.

In the Latin American countries, the situation of this sector varies considerably. In Brazil, for example, it is of great importance. The share of the consumer durables industry in the industrial product, though less than in the most highly developed countries, is very similar to that of a recently industrialized country such as India, and

higher than that of the Republic of Korea. In Argentina, its share is smaller and there has been some slackening in the tendency displayed by that country in the 1960s, which was characterized by strong development of the metal products and machinery industry in general, with activities which were competitive even at world level. In most of the small countries, the sector displays a weakness which gives rise to concern about the possibility of ensuring future development of the anti-pollution industry.

It may be concluded from this comparison between the industrial patterns of the countries of the region and those of the most highly developed countries that the industrial sector is of significant relative weight in the region, where the most highly polluting industries, and those producing toxic and dangerous wastes in general, have reached a level of development which confirms what is known about their tendency to cause environmental deterioration and increasing health problems for the population. It may also be assumed, at this level of aggregation of the analysis, that the nucleus which could be expected to serve as a basis for the creation of technology, the production of anti-pollution options and better management of pollutants has a level of development directly proportional to the size of the countries and their degree of development, displaying a disquieting weakness in the region. For this reason, from the environmental standpoint horizontal co-operation and economic integration are essential for the countries with smaller domestic markets.

Unless suitable policy measures are adopted, two types of effects may be expected: i) there will be no technological response to the environmental problems caused by the industrial sector, so that the present levels of environmental deterioration will be maintained or increased, or ii) the response will be on the basis of technologies from abroad, without any endogenous scientific and technological development. In other words, if the present inertia persists, either the region will continue to move towards environmental collapse, or yet another opportunity for trying to break the vicious circle of dependence will be wasted. Policy measures alone, of course, would not be sufficient to ensure industrial development or the creation of an endogenous technological development nucleus.

Thus, it may be concluded from this rapid comparison of industrial development patterns that industry in the region has reached levels of development which endanger the preservation of the environment, while it lacks the more dynamic branches that could ensure the correction of this structural weakness.

3. General background on the population and urban development of the countries of the region

In order to supplement the foregoing analysis, some background information on the population of these countries is called for. There are two reasons for this. Firstly, at this level of knowledge of industrial development it is obvious that its main support base is the domestic market: there are no known successful examples of industrialization which have based their growth on the external market without first of all having strong support from the domestic market. Some examples from Europe show that market integration can make up for some objective weaknesses of countries with only small populations. At the same time, empirical experience confirms that the size of the domestic market depends not only on the number of inhabitants in a country and the degree of openness of its markets, but also on income distribution (Fajnzylber, 1990). Secondly, urban development means urban wastes, and in order to avoid their harmful effects on the environment it is necessary to take joint action with the industrial sector along the lines already indicated.

As is clear from various studies, the degree of industrialization –understood as the share of the industrial gross domestic product in the global gross domestic product– is closely related to the size of the population. Thus, in general terms and for similar levels of per capita income, the greater the population, the greater will be the share of industry in the product. It is also clear that a similar relationship tends to exist between per capita income and the degree of urbanization. Both these trends follow the development pattern of the industrialized countries. In Latin America's case, however, there is an unusual fact: the degree of industrialization is not always directly related to the degree of urbanization. This is so, for example, in Brazil, where severe social inequalities persist in spite of the high degree of industrialization

reached. In the long term, however, the disparities with the degree of urbanization should tend to diminish.

The region displays a large number of special features. Quite apart from the heavily recessionary situation of recent years, it may be noted that in spite of the levels of industrialization reached by Brazil in recent decades, the development of the Brazilian domestic market is still only slight compared with that country's population. In other

words, the differences between the size of the populations of Argentina and Brazil, for example, are not always reflected in the levels of consumption of many industrial goods, because of the more unequal income distribution in the latter country. The same conclusion can be drawn from the analysis of other cases, thus showing how important equity is for these purposes. The generation and treatment of domestic wastes will inevitably be strongly influenced by this factor.

II

Towards an industrial solution of the problem of pollutants

1. *Economic aspects*

Contrary to what was believed until recently, there is no proof that an environmental protection policy has any adverse effects on business and industrial development. Indeed, leading authorities on the matter believe that environmental pollution control is an important source of new business, particularly in hydrocarbon processing, which in 1985 accounted for only 12% of the US\$3 billion of new plant construction. In the Federal Republic of Germany, US\$50 billion was spent on environmental control during the 1971-1980 decade. The Government's current programme to remove sulphur dioxide and nitrogen from power station wastes has created a new market worth about 20 billion German marks during 1986-1990 (Whitaker, 1987, pp. 1-2). These elements suggest that the anti-pollution industry could become an important source of industrial and technological development for the region, and this fact should be duly taken into account.³

Likewise, "According to OECD's figures, the impact of environmental measures on the growth of GNP has been very limited, with control measures bringing about a slight increase in economic growth in the short term. In the longer term, the economic impact of such measures might be slightly positive or slightly negative, according to the specific circumstances in the country con-

cerned In the United States, the benefits of air and water pollution control had been estimated at 1.6% of GNP in 1978".⁴

From the above information, it is obvious that the problem of contamination and wastes can no longer be considered solely as an economic burden. It is clear that the action taken to solve these problems generates activities which, because of their complexity and interest, act as a stimulus for development and may give rise to a new virtuous circle of growth in which technological development, the production of capital goods, increased employment, and the reduction of pollution are all linked together.

In previous studies it has been indicated that, if the example of United States industry is applied to the region, it may be estimated that the new investment needed in order to avoid the harmful effects of industry alone averages some 10% of the capital invested in that sector.⁵ Naturally, if the measures were applied in advance and not after the fact, these percentages would tend to go down.

Before going further with these reflections, it is worth seeing in greater detail what happens in the case of some specific solutions.

⁴ Statement by Erik Lykke, Director of Environment of the Organization for Economic Co-operation and Development (OECD), at the World Industry Conference on Environmental Management (Versailles, 1984), quoted in *Industry and Environment*, Special Issue No. 5, 1984, Nairobi, United Nations Environment Programme (UNEP), pp. 3-4.

⁵ See, in this respect, Durán, 1981.

³ This topic is dealt with in greater detail in Durán, 1988.

2. Development of new technological and production activities as a result of the problems caused by industrial pollutants

It is difficult to estimate the magnitude of the problem of toxic pollutants in the region and the solutions applied to deal with them. There are some interesting experiences, however, which would not demand special processes if applied in the region.

Thus, for example, in the cement industry toxic wastes can be dealt with as part of the normal production process, since the clinkering temperatures of around 1 500°C at which the rotary kilns operate are considered more than sufficient to eliminate some pollutants. In a Norwegian cement factory, it was estimated that the investment needed to incinerate 20 000 tons of dangerous wastes per year would be approximately US\$2.5 million. The annual operating costs would be US\$365 000, while the increased production costs would be US\$400 000. These figures take account of the increased shutdown time for maintenance of the kilns and dumping of electrostatic precipitator dust, owing to the higher concentration of inorganic chlorides. They do not include increased liability insurance costs, however, since it seems likely that the burning of waste in a cement kiln will not require increased cover. The annual income from the charges made for the incineration services was calculated at US\$980 000, while the annual fuel savings were estimated at 16 000 tons of coal or 10 000 tons of petroleum (Viken and Waage, 1983, p. 78). It may be noted, in this connection, that cement industries exist in all the countries of Latin America.

In spite of the experience acquired, it is obvious that the problem of eliminating this type of pollutants has not yet been solved. In addition to technological policies based on successive advances towards the achievement of endogenous development, suitable control policies, instruments and regulations are needed. For this reason, it is worth referring once again to the Norwegian experience, in which it was stated that: "A scheme of direct State grants covering 66% of investment costs and 34% of loans has been extended. Selective economic assistance to increase collection of specific types of waste will not be introduced before experience with various regulatory actions and collection sites is gained" (Viken and Waage, 1983,

p. 78). Furthermore, it would appear that the general policy being followed in many countries of the region is to progress on an industry-by-industry basis, analysing each case separately.

Thus, solutions are not only connected with the search for specific techniques, but also with activity regarding the endogenous technological development nucleus and specifically the promotion of the various design engineering specialities. Some comments made by Whitaker in 1987 illustrate what we have just been saying and make it possible to gain a clearer idea of the mechanisms involved:

a) "The business strategies presently being followed focus on financial engineering techniques, although cost minimization programmes and the application of new technologies also play a key role in them".

b) "The present annual worldwide investment volume in new industrial plants is estimated to be in the range of US\$150-200 billion In 1984, plant engineering firms based in the United States accounted for nearly 40% of the world market, followed by Japan (over 20%), the Federal Republic of Germany (13.5%) and the United Kingdom (11.4%)".

c) "In terms of increased business volume, Japanese engineering contractors have expanded most rapidly during the past decade. Their share of the world market rose from 2% in 1977 to 12% in 1980 and over 20% in 1984, largely at the expense of United States contractors, whose share of the world market declined accordingly. In the view of Dr. Lothar Jaeschke, the success of Japanese firms can be ascribed to their readiness to accept large risks while offering low prices". (Whitaker, 1987, pp. 1-2).

The problem of wastes is clearly just as much industrial as urban. This has been clearly understood in the developed countries as a result of observation of what is happening in the Third World. Among the most noteworthy observations is that contained in an article on the pollution of the Love Canal, in the south of Taiwan, and also of the entire region, which has been characterized by rapid industrial development. The estimated cost of merely cleaning up the Love Canal at Haohsiung comes to hundreds of millions of dollars. The task has attracted the interest of United States businessmen, who have offered all kinds of equipment, from enormous electrostatic precipitators and

sophisticated waste incinerators to delicate and sensitive monitoring instruments (Sease, 1987).

Robert McIlvaine, a consultant to Northbrook III, estimates that the figures involved in tackling the problem of atmospheric pollution in the world market will be of the order of US\$13.6 billion in 1997, of which over half will be invested outside the United States and Europe. David Haines, an international sales executive of the Westinghouse Corporation, has stated that Taiwan plans to build 23 waste incineration plants at a cost of over US\$100 million each. The Republic of Korea is engaged in talks on the construction of some 15 plants. India's ambitious energy plan for the coming years will cost some US\$15 billion, a considerable part of which will be devoted to the reduction of atmospheric pollution.

Once again, the United States Government has acted in support of the external trade activity of that country's enterprises through the State Department's Trade Development Program. This department considers that the export of equipment for reducing contamination is a promising line of business, and it has budgeted over US\$2 million for seminars and feasibility studies in various Asian countries (US\$900 000 for Taiwan and US\$500 000 for Malaysia and Thailand). The link between technological and production development is nothing new in the Government's support policy, which finances consultants and engineers who can make an important contribution to the penetration of new markets: it is considered that if they can win contracts to identify the contamination problems and propose solutions, those solutions will be built predominantly around equipment manufactured in the United States, rather than in Europe or Japan (Sease, 1987).

3. Industrial management of urban wastes

Since there are no detailed reports on the ways in which wastes are eliminated in the region, it is necessary to have recourse to other information. A preliminary idea in this respect can be gained on the basis of what is happening in the United Kingdom. In that country, the method most frequently used in the early part of this decade was the treatment of wastes in sanitary landfills. More sophisticated processes were less prevalent then, and still are (Durán, 1988). No information is available on what this means in terms of environmental dete-

rioration, but there can be no doubt that that country's experience, especially after the unfortunate events due to atmospheric pollution in London in the 1950s, has generally been better than that of our own region.

The sanitary landfill method of treating domestic wastes does not rule out the recycling of some of the products contained in them. In the less developed countries, however, the rubbish is not only less abundant in per capita terms than in developed countries but also has a physical and chemical composition which makes it of low calorific value.

In Santiago, Chile, for example, the calorific value is less than one thousand kilocalories per kilogram of refuse, which means that it cannot be autocombustible in an incineration process except by spending large amounts on external energy. Moreover, the products capable of being recycled—many of them of higher thermal value—never arrive at the refuse dumps, since veritable armies of scavengers from the poorest sectors search for them and take them away from the households in the sectors which generate most refuse. This does not happen in most of the cities of the developed countries, where the refuse is more abundant and more autocombustible. In order for the organization of a landfill to be effective, action is required which involves a typical challenge of an industrial nature. It may be noted in this connection that in Santiago, Chile, the production of methane gas from landfills has made it possible to replace up to 18% of the commercial piped gas, and it is hoped that this figure can be further improved with some technical advances.

In Rio de Janeiro, successes similar to those described above have been registered. In short, landfills with domestic refuse could become an interesting energy source for quite a few industrial processes.

In the United Kingdom, licensed landfill capacities range between 10 000 and 200 000 tons per year: considerably more than the maximum capacity of a typical incineration plant, which can only handle about 20 000 tons per year (Pearce, 1983).

It is estimated that the United States produces 54 million tons of dangerous wastes every year, and approximately 80% of these are eliminated in landfills. The Eckhardt survey, carried out in 1979, concluded that between 1950 and 1978 a total of 54 of the biggest chemical companies in the

country had eliminated 93% of their wastes on-site in their own facilities. Landfilling, land treatment and surface impoundment accounted for 84% of the wastes; deep well injection, 10%, and incineration, 4%.

The total volume of dangerous wastes of industrial origin produced in the member countries of the European Community (EEC) is between 15 and 20 million tons per year, of which approximately 7 million tons are eliminated through treatment, incineration or landfilling. The annual growth rate of waste generation, in both the United States and the EEC, is between 2% and 4% (Pearce, 1983, p. 58).

Returning to the subject of the technological options available, experience has shown that incineration—the only means of direct destruction—has the drawbacks of not being suitable for certain types of wastes and of generating toxic gases and unburnt particles. There are also the problems of eliminating heavy metals from the chimneys and preventing damage to the structure of the incinerators. Innovative techniques such as pyrolysis, which considerably reduce the problems of air pollution, have worked well at the experimental level and could become important methods of waste treatment in the future. At present, however, there is a serious shortage of thermal installations, and the capacity of the existing plants is low compared with the volume of waste that can be received by sanitary landfills. Moreover, the costs of incineration are approximately two and half times greater than the latter (Pearce, 1983, p. 58). It is important there should be an exchange of information on this matter in the region in order to find out which options have been the best from the economic and sanitary points of view. Likewise, it would be necessary to find out whether experiences like

those of the Norwegian cement industry could be repeated in the region, or if it is possible to use the pottery industry or other industries which are more abundant in Latin America in order to eliminate specific wastes.

Still looking at the matter from an economic standpoint, it may be asserted that—returning to the problem of the lack of treatment of waste water—the most suitable methods of treatment of liquid wastes for the developing countries are, firstly, settling ponds, which have a cost of US\$10 per inhabitant, and secondly, deep oxidation pits, which have a cost of US\$14 per inhabitant (Boré, Pizarro and Cabrera, 1986, p. 5). According to these figures, an investment of between US\$650 million and US\$1 billion would be needed to treat the waste waters of the entire urban population of Argentina, Brazil, Chile and Uruguay.

This option is open to a good deal of doubt: it assumes the existence of land with an opportunity cost equal to zero, which is not very likely, especially in the big cities of those countries. On the other hand, the equipment needed for more mechanized treatment plants is not excessively complex (motors and water pumps, flotation tanks, etc.) and it would be easy to construct it in the region itself. It has not been possible to obtain more information with respect to the latter possibility, however.

In short, it may be seen from the foregoing that there are various techniques for eliminating urban and industrial wastes and that the best solutions are not necessarily the most expensive ones. Finally, there is clear technical interest in seeking joint solutions, although this has not yet been expressed at the political, legislative and institutional level.

III

Environmental control measures, instruments and policies

1. *General political and institutional considerations*

As the world has experienced a succession of serious social and environmental crises, the issue of the environment has been occupying an increasingly important place among social and political concerns. At this level, what is involved is the problem of the survival of all forms of life on earth, which are threatened by a style of development that has not been capable of creating suitable conditions for environmentally sustainable growth.⁶

It is possible that the energy crises, first of all in 1973 and again in 1979, were among the factors which did most bring about an awareness of the links between environmental problems and those of economic development. There has been no radical change in the situation, however: the global economic crisis, among other things, prevented the correction of all of the underlying problems, but at least there were qualitative advances which may eventually take a quantitative form. The majority of the other problems referred to have had rather local or sectoral importance.

In the course of this study it has been noted that, in addition to the population, which now sees for different reasons that its very survival is threatened by environmental problems, other new power groups have emerged which are interested in reducing the effects of pollution. These groups are to be found in the consultancy firms which provide technical services (engineering services) and in the capital goods industry. The figures involved are such as to bear comparison with any other branch of economic activity. Looking back, it can be seen that this interest is an important new development which gives more hope of generating moves in favour of change among the political groups which exercise power but which so far have been reluctant to act in a decided manner.

Latin America must generate an endogenous development nucleus which gives priority to the development of local capacity, instead of simply being a source of profits for foreign consultancy firms, as is usually the case. As the scales of production of the polluting industries increase, the temptation not to take corrective action is increasingly strong, representing a clear conflict of interests. The attitude of the authorities will be decisive in deciding which way the balance tips: in favour of the environment or in favour of those who are polluting. If there is no awareness of the problem at the governmental level, it will be very difficult to find environmentally acceptable solutions.

The political dispute goes beyond the strictly national context, however. A new ally of the defenders of the environment –unexpected and highly inconsistent with some of their ideals– is beginning to emerge as the processes of internationalization of production and trade openness increase: namely, producers in developed countries who have to compete with the commodities or manufactures of the developing countries. These producers are beginning to demand tariffs applicable to the domestic market which compensate for the higher operating and capital costs that they have to incur because of being obliged to treat their wastes and practice environmental management. At the same time, they are pressuring their own governments and international public and private project financing agencies to demand that producers in developing countries should take anti-pollution measures so as to avoid unfair competition on third markets.

Curiously enough, the sectors most reluctant to apply such measures are the governments themselves, and this is reflected in legislative and institutional weaknesses. In countries such as Chile, the legislation is incomplete and therefore inoperative, while in others (Argentina, Mexico, Venezuela, etc.) the legislation is applied in an inefficient manner in spite of the existence of departments or ministries responsible for these matters. In all cases, the environmental management and control functions are poorly allocated and do not enjoy the necessary independence. The arguments put for-

⁶ For a better understanding of the concept of "environmental sustainability", see Gligo, 1987.

ward by those who are reluctant to take action range from the need to carry out cost/benefit studies –involving factors that are open to question on each side of the matter– to the need to assign resources in line with criteria where social considerations prevail over those of an environmental nature, as though the two things were in opposition.

It is not the aim of this article to refute such arguments; for the moment, it is only desired to identify the actors and define their positions in order to find possible bases for promoting environmental protection and improvement policies and selecting suitable arguments to make possible the co-ordinated functioning of the new emerging branch of activities dealing with industrial waste management.

2. The approach taken by some developed countries and the role of their industrialists

The need to formulate policies and the manner of doing so is a task imposed by specific urban/industrial development objectives at given moments.

In Japan, for example, according to Norishige Hasegawa, Chairman of the Sumitomo Chemical Corporation and Vice-President of the Japanese Federation of Economic Organizations (KEIDANREN), the dramatic reduction in environmental pollution was the result of industry having to operate under severe regulatory standards. What is remarkable, however, is the way that Japanese industry has managed to remain competitive. Indeed, one of the lessons constantly reiterated was that industries which set out to curb their pollution, through recycling and the application of low- and non-waste technologies, were often able to achieve greater profitability than competitors who had stuck with older, more polluting technology. During the 1960s, there were outbreaks of ailments such as Minamata disease (mercury poisoning), Yokkaichi asthma, and cadmium poisoning, due to the consumption of contaminated rice. Not surprisingly, the public demanded action from the government to restrict pollution from industry, and industry had to comply. Japanese motor vehicle manufacturers, for example, had to come up with vehicles able to comply with exhaust emission standards more stringent than anywhere else in the world. Today, total exhaust emissions of carbon monoxide

are only 5%, those of hydrocarbons 4% and those of nitrogen oxides 8% of the levels prevailing before the application of the rules. The aluminium smelting industry has devised means of collecting almost all the emitted hydrogen fluoride, while in the city of Yokkaichi, once world-renowned because of its environmental pollution, sulphur dioxide levels have fallen from 0.083 parts per million in 1965 to less than one eighth of that level today. At the same time, the chemical oxygen demand of the liquid wastes discharged into the Seto inland sea has dropped by 65% in three years, when the target set for industry was for a reduction over that period of 50% (UNEP, 1984, pp. 2-3).

It may be concluded from the foregoing that the formulation of policies for these activities is made more difficult by the need to reconcile the interests of different sectors of the population. On the one hand are the goods producers –who currently represent the group which is polluting– while on the other hand there are the government officials who must reconcile the various interests involved, as well as specialists in public health who represent the population. The latter see the problem in the following terms: “the task of environmental policies and legislation is now, as it was formerly with legislation on industrial hygiene, to get industry to comply with the provisions. There is always some dissension from vested interests, but the underlying difficulties are cultural and educational. To overcome these difficulties, the first essential is the establishment of a specific agency responsible for environmental protection, which must have exclusive competence, independent of all other Ministries, especially that of the Economy. Such a body must have consulting, supervisory and controlling functions, including supervision and implementation of adherence to regulations, with the power to suspend economic activities and public or private construction work. Further, it must have the right of intervention in any project which could have a deleterious effect on the environment. Such a body should be answerable to the Head of State” (Magariños de Mello, 1983, pp. 52-53).

The government authorities, for their part, consider that prevention is much better than cure. In the view of Erik Lykke, “clean technologies turned out to be beneficial both to the public and to industry. Not only had some 200 000 people found employment in “eco-industries”, but a

French survey on the use of 200 "clean" technologies indicated that their application led to savings in energy and in raw materials in approximately half the cases. In Denmark, the use of clean technologies had led to financial benefits in 44% of the cases, that benefit averaging some 13% of the investment cost. Nevertheless, clean technologies still remain little used in industry. They are used in about one-third of polluting plants in Denmark, and they represent about 20% of pollution control investment in the United States, and probably much less in most other countries. It must be stressed that sustainable economic growth cannot be achieved in a badly managed environment and with a seriously degraded resource base".⁷

With regard to the effects of such policies on production processes proper in the capital goods industries and technological development, it would seem that industrialists are tending to take a new attitude. Dr. Otto Koch, Director of Bayer AG, has stated that: "The best solution clearly lies in new, environmentally safe technologies with which products can be manufactured without any significant waste generation, or such that it is easily manageable. This solution of the future will nevertheless require one or two decades for the research, development and industrial start-up. Environmentalists, journalists and politicians without any scientific or technical back-up often do not appreciate this fact".⁸

Furthermore, the manner of combating pollution differs according to the size of the enterprises involved. Thus, small and medium-sized industries cannot tackle their pollution problems on their own: "governments and local authorities must determine what kind of regulation is required, how long should be given for it to come into effect, and whether control would be best achieved through a system of penalties and fines or through incentives in terms of tax concessions, capital grants and advice, or through a combination of several methods" (UNEP, 1987, p. 2).

⁷ Statement by Erik Lykke, Director of Environment of the Organization for Economic Co-operation and Development (OECD), reproduced in *Industry and Environment*, Special Issue No. 5, 1984, Nairobi, United Nations Environment Programme (UNEP), p. 4.

⁸ Quoted in *Industry and Environment*, Special Issue No. 5, 1984, p. 21.

It may be asked what practical response there has been to this challenge. According to the information collected at the Stockholm Conference in 1972, only 26 countries then had national bodies connected with the environment. A review carried out 10 years later revealed that by that time 144 countries had such bodies. This growth had been accompanied by the establishment of over 5 000 non-governmental bodies connected with this issue, many of them located in developing countries. A recent survey carried out among persons involved in environmental protection matters in 72 developing countries revealed that a high proportion (88%) considered that the current protection efforts were inadequate (in the developed countries, the percentage was 55%) (Sammy, 1982).

3. The institutional response

In some countries, joint ministries have been set up for the environment and housing or natural resources, while in others interministerial commissions have been established. A number of countries have environmental plans, and most of them include environmental considerations in their national plans. In a substantial number of countries, quality standards and procedures have been established for evaluating environmental impact (Gladwin, 1987, chapter 1; Bustamante and Torres, 1990, pp. 109-122).

As a background consideration for the analysis, however, it would appear that the establishment of environmental policy bodies and environmental protection agencies outside the polluting sectors has not given satisfactory results.

It would therefore be desirable that in policy definition, the industrial development bodies themselves—whether they are ministries or corporations—should play a fundamental role, together with health and environmental protection bodies. The execution of a project should not be authorized without the approval of the control body. These rules should, of course, be extraordinarily strict, should be brought to the notice of the population, and should form part of a comprehensive programme which makes it possible to correct the heavy burden of past errors.

Finally, what has been stated regarding the degrees of industrialization achieved shows that there is still a certain amount of structural fragility

in the region with regard to the assumption of all the tasks called for by an industrial environmental protection policy. Because of this structural fragility, the countries of the region are not –alone

and unaided– in a position to find the technological and production responses to the problems encountered. It is therefore clearly urgent to achieve closer horizontal co-operation links.

Bibliography

- Boré, D., F. Pizarro and N. Cabrera (1986): *Diagnóstico de la contaminación marítima en Chile*, Santiago, Chile, Production Development Corporation (CORFO)/Instituto de Fomento Pesquero (IFOP).
- Bustamante, M.-I. and S. Torres (1990): Components of an effective environmental policy, *CEPAL Review*, No. 41 (LC/G.1631-P), Santiago, Chile, August.
- Durán, H. (1981): Estilos de desarrollo de la industria manufacturera y medio ambiente en la América Latina, *Estilos de desarrollo y medio ambiente en América Latina*, O. Sunkel and N. Gligo (eds.), Lecturas No. 36, vol. 2, Mexico City, Fondo de Cultura Económica (FCE).
- (1988): Los desechos urbano-industriales: ¿nueva rama de desarrollo industrial y tecnológico?, *Ambiente y desarrollo*, vol. 4, Nos. 1 and 2, Santiago, Chile, Centro de Investigación y Planificación del Medio Ambiente (CIPMA).
- Fajnzylber, Fernando (1990): *Industrialization in Latin America: from the "black box" to the "empty box"*, "Cuadernos de la CEPAL" series, No. 60. Santiago, Chile. United Nations publication, Sales No. E.89.II.G.5.
- Glifo, N. (1987): Política, sustentabilidad ambiental y evaluación patrimonial, *Pensamiento iberoamericano*, No. 12, Madrid, Ibero-American Co-operation Institute (ICI)/Economic Commission for Latin America and the Caribbean (ECLAC), July-December.
- Gladwin, Thomas N. (1987): Environment, development and multinational enterprise, *Multinational Corporations, Environment and the Third World*, C. Pearson (ed.), Durham, North Carolina, A World Resource Institute Book.
- Magariños de Mello, M. (1983): General guidelines for an environmental policy and a preliminary case study in a developing country, *Industry and Environment*, Special Issue No. 4: Industrial Hazardous Waste Management, Nairobi, United Nations Environment Programme (UNEP).
- Pearce, P. (1983): Landfilling: a long-term option for hazardous waste disposal?, *Industry and Environment*, Special Issue No. 4: Industrial Hazardous Waste Management, Nairobi, United Nations Environment Programme (UNEP).
- Sammy, G. (1982): *Environmental assessment in developing countries*, Doctoral Thesis, University of Oklahoma, *World Environmental Handbook*, World Environmental Center.
- Sease, D. (1987): Asia's industrial waste could spell profit for U.S. firms. Makers of cleanup gear capitalizing on an environmental awakening, *The Wall Street Journal*, 9 June.
- UNEP (United Nations Environment Programme) (1984): *Industry and Environment*, Special Issue No.5: World Industry Conference on Environmental Management (WICEM): Outcome and Reactions, Nairobi, UNEP.
- (1987): *Industry and Environment*, vol. 10, No. 2: Environmental Management of Small and Medium Size Industries, Nairobi, UNEP.
- Viken, W. and P. Waage (1983): Treatment of hazardous waste in cement kilns within a decentralized scheme: the Norwegian experience, *Industry and Environment*, Special Issue No. 4: Industrial Hazardous Waste Management, Nairobi, United Nations Environment Programme (UNEP).
- Whitaker, D. (1987): Bright future tinged with uncertainty, *Development Business*, No. 217, New York, United Nations, 28 February.