THE DEVELOPMENT PROCESS IN THE COMMONWEALTH CARIBBEAN AND ITS ENVIRONMENTAL IMPACT

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SUMMARY

This paper illustrates how environmental degradation is related to the development process. It traces historically, the pattern of development of the Commonwealth Caribbean through its two main phases.

Firstly, the colonial era, in which the colonies only produced basic raw materials for the colonial powers, resulting in widespread environmental damage; and secondly the post-independence era marked by the policies of industrialisation by invitation and import substitution, which were not local resource-base oriented but merely demand responsive.

Finally, the paper draws attention to the environmental dangers of the new policy being discussed, that is the broadening of the industrial base of the region and the creation of vertical and horizontal industrial linkages in the absence of an appropriate environmental policy. It is contended here that such a policy must be consistent with the development objectives of need satisfaction of the broad mass of the people.

1. INTRODUCTION

Historically, the countries of the Commonwealth Caribbean, during the Colonia era, were seen only as producers and suppliers of basic raw materials for the industries of the colonial powers, who in turn supplied the finished consumer and limited capital goods requirements of the former. Indeed, by the beginning of the twentieth century, the British colonies were seen to be such potentially large markets for the finished products of British industries that some politicians openly advocated the encouragement of mass migration of these countries to ensure the situation in perpetuity.

It was against this background, that when after the Second World War, the local populations began to gain increasing political control of their countries, and finding their economies so underdeveloped, the "Lewis doctrine", for development, emerged. The cornerstone of that philosophy was that these countries could only develop rapidly by industrialising, and that since they lacked the necessary capital and technology, the only way to accelerate the process was to entice foreign compani to establish subsidiaries. By doing this, it was anticipated that advanced technolo would be assimilated rapidly in the country, leading to its diffusion throughout the economy, and that as a result of the generation and distribution of substantial inco the local population would, automatically, be able to continue the process themselve This was the so-called "industrialisation by invitation" process which was universall adopted throughout the Region.* To facilitate the process, the Governments of the Region devised generous fiscal incentives, including duty-free imports of machinery and raw materials, which were to be granted to the foreign investors.

The strategy of industrialisation by invitation, subsequently, had one of import-substitution superimposed on it, and the policy instruments, used to hasten this phase of development, remained essentially the same.

Throughout this entire period, very little attention was given to the protecti of the physical environment. Indeed it was generally felt, throughout the Developin World, that to insist on pollution control and protection of the environment would b counter-productive with regard to the attraction of capital.

Thus, in the context of the historical development of the Caribbean, as very briefly summarised above, it should be expected that the environmental problems of the Region would be quite different to those of the metropolitan countries.

This article attempts to show by suitable examples how the various stages of the development of the Commonwealth Caribbean have affected the environment and to point out the future dangers if a sound environmental policy is not adopted.

2. THE EFFECT OF THE COLONIAL ERA

As mentioned in the previous section, the colonies were seen only in terms of their value as suppliers of raw materials. Thus in the earliest days after their

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*The word "Region" with a capital "R" is used to mean the CARICOM countries.

"discovery" by Europe, the most prized territories were those which were rich in gold, diamonds and other precious and semi-precious gems. Subsequently, when sugar became a prized and valuable commodity, those territories which had fertile soil suitable for sugar cane growing became the most fought over. Latterly, with the advent of beet sugar and the decline of cane sugar, minerals such as bauxite and more importantly oil and natural gas have determined the countries' value. The smaller territories of the Region are also prized for their beaches and amiable climate. Nevertheless, regardless of the period of history chosen, the wealth of the countries has always been measured in terms of and determined by their value to the metropolitan powers.

As a consequence of the above, production of commodities by individual territories were (and still are) out of all proportion to their populations, leading to environmental degradation more rapidly and far greater than would be the case if production had been primarily to meet local needs.

2.1 The Sugar Industry

Thus to take the production of sugar as an example, over 55% of the total surface area of Barbados is permanently under sugar cane, while the figures for Trinidad and Tobago and Jamaica are approximately 10% (representing about 30% of the land presently under cultivation) and 7½% respectively. In terms of the production of sugar, the per capita figures for the three countries are 0.53, 0.24 and 0.22 tons per year respectively, while the consumption for each territory is about 0.04 tons per capita per year. One would expect a single operation on such a scale to have a significant direct effect on the environment of those countries. The magnitude of the impact is related to the following main aspects of the industry.

(i) monocultural agracultural practice

(ii) large-scale crop-spraying

(iii) large-scale use of inorganic fertilizers

(iv) the generation of solid wastes viz. filter press mud cakes and bagasse.

(v) the generation of large volumes of liquid effluents with a very high bio-chemical oxygen demand (BOD). This problem is compounded by the fact that the effluent is generated during the dry season when river flows are at their lowest.

(vi) the generation of air-borne pollutants resulting from the burning of the cane before reaping and from the use of bagasse as a fuel for the factory boilers.

Since production is presently between five (Jamaica) and thirteen (Barbados) times the local requirement for this commodity, the impact on the environment must be at least that much greater than would be the case if the industry were geared primarily towards local needs.

2.2 The Bauxite Industry

Similarly, bauxite production in Guyana and Jamaica is an export-oriented operation. Thus Guyana, with a small population of 400,000 in 1948, produced 2.6×10^6 metric tonnes (i.e. 32% of total world production). By 1973 (population 760,000) production had increased to 3.5×10^6 metric tonnes (5% of world production). However, Guyana has a large land area (2.15×10^5 km^2) and it may be argued that the effect of the operations on the total environment is not too serious. Even if one were to agree with this argument, it certainly cannot be applied to Jamaica, which has a population of 1.8×10^6 and a land area of only 11424 km^2. That country first produced bauxite in 1952 (4.2×10^5 tonnes) and by 1973, output from the mines had increased to 13.49×10^6 tonnes (i.e. 20% of world production). A growth rate of 7 percent per annum from 1960 and 6 percent per annu from 1969 to 1973 was recorded.

Although the environmental impact of the bauxite industry in Jamaica had been serious, particularly that associated with alumina production, it is interesting to note that the leases signed by the Jamaican Government with the foreign companies, required the latter to rehabilitate the mined out areas. No such provision was made in the case of Guyana, where operations began at the beginning of this century at a time when it was never thought that the colonies would ever be granted independence.

2.3 The Pre-Independence Situation

The effect of colonialist policies therefore was the degradation of the natur environment occasioned by the development of export oriented "one-crop" economies. the same time, the result was that very few types of pollutants were introduced int the natural ecosystem. Thus, prior to the middle of this century, the only signifi cant industrial pollutants in the Region were: those resulting from the sugar indus and (for some countries) the banana industry; those caused by the bauxite industry Guyana, and other quarrying operations carried on to obtain materials primarily for local construction; and those introduced by the petroleum industry in Trinidad.

However, the most serious form of pollution which affected the population at large resulted from the lack of adequate sanitation facilities. Even today, gastro-enteritis and other water-borne diseases, occasioned by inadequate sewage disposal systems, remain the greatest cause of infant mortality throughout the Caribbean[1].

Another legacy of the colonial era is the effect of uncontrolled deforestatior of the mountains which took place in many of the islands. Some of the forests were cut down for timber and some by peasant farmers, who, being unable to obtain land or the plains or in the valleys, had very little choice. The effect has been the parti destruction of the water sheds, erosion of the thin topsoil and the silting up of th rivers. This in turn has led to very uneven river flows during the rainy and dry seasons, together with increasing incidences of flash flooding.

3. THE MODERN ERA (1950 to Present)

During the 1950's the policies for broadening the industrial bases of the countries of the region were being formulated. These have already been briefly out-

lined in Section 1

During this period of time, many industries were established in virtually every field of activity such as: food processing, lead smelting, battery manufacture, metal plating and finishing, cement, fertilizers, cosmetics, pharmaceuticals, and weaving and dyeing. This has led to the introduction into the environment of increasing quantities of BOD, phosphates, inorganic and organic chemicals, and the highly toxic heavy metals such as lead, chromium, zinc and copper. The majority of the new establishments commenced operation during the last fifteen years, and one might expect that in the absence of environmental legislation and controls, the situation in the countries which have industrialised the most, should be close to catastrophic. However, taking Trinidad and Tobago as an example, the situation is nowhere nearly as bad as may be expected.

The dearth of quantified data, makes it impossible to paint the total picture; however, a qualitative analysis may be made of the situation by considering the nature of each enterprise together with its location. Additionally, the daily water consumption of the enterprise can be used as a guideline for the type of operation carried on.

Table 1 shows a breakdown by number of enterprises of ten main manufacturing categories established in Trinidad and Tobago between 1961 and 1975 (Two categories viz: garments and furniture, have been omitted from the analysis as they were assumed to be basically non-polluting). This table shows that of the three hundred and eighty-seven (387) establishments tabulated, just four categories accounted for two hundred and sixty-five (265) (i.e. 68.8 percent of the total).

TABLE 1 - NUMBER OF MANUFACTURING ESTABLISHMENTS IN EACH OF TEN CATEGORIES, ESTABLISHED IN TRINIDAD & TOBAGO BETWEEN 1961 AND 1975

CATEGORY	NUMBER	% OF TOTAL
Food and Drink Processing	58	15.0
Textiles	10	2.6
Building Materials	67	17.3
Plastics Processing	19	4.0
Printing and Packaging	28	7.2
Paper Products	31	8.0
Cosmetics	14	3.6
Chemical Processing	19	4.9
Assembly Type and Related Industries	57	14.8
Miscellaneous Manufacturing	84	21.7
T O T A L	387	100.0

These are the categories of miscellaneous manufacturing (21.7%), building materials (17.3%), food and drink processing (15%) and assembly-type and related industries (14.8). Of these it was found that only two (food and drink processing and building materials) were responsible for the bulk of the water pollution in the country.

Table 2 shows a breakdown of the number and percentages in each category which can be considered to be polluting. Of the three broad categories: water pollution, air pollution and land pollution, the study showed that water pollution was the most serious and widespread. 25.8 percent of the establishments discharged pollutants of one sort or another. However, the range of pollutants was found to be quite small, the majority being BOD from the food processing industry (28% of the total) and suspended solids from the building materials industry (26%).

The other pollutants of significance which could be identified were: titanium, lead and zinc from the paint industry; chromium, zinc and acids from electroplating; acids, alkalis and phosphates from the cosmetics and detergents industry; acids and lead from the metal treatment and battery industries; and polychlorinated biphenyls

TABLE 2

NUMBER OF ESTABLISHMENTS IN EACH CATEGORY WHICH CAN BE CONSIDERED TO BE POLLUTING (% AGES IN PARENTHESIS)

Type of Pollution	Food and Drink Processing	Textile industry	Building materials	Plastic processing	Printing and Packaging	Paper products	Cosmetics	Chemical Processing	Assembly type and related industries	Miscellaneous manufacturing	TOTAL
WATER	28(48.3)	1(10.0)	26(38.8)	8(42.1)	3(10.7)	2(6.5)	3(2.1)	10(52.6)	2(21.1)	7(8.3)	100(25.8)
AIR	8(13.8)	0(0.0)	35(52.2)	11(51.9)	2(7.1)	0(0.0)	0(0.0)	7(36.8)	8(14.0)	1(1.2)	72(18.6)
LAND	0(0.0)	0(0.0)	25[c](37.3)	0(0.0)	20[c](71.4)	31[c](100)	0(0.0)	0(0.0)	1[c](1.8)	4[c](4.8)	81(20.9)
TOTAL[ab]	33(56.9)	1(10.0)	36(53.7)	11(57.9)	3(10.7)	2(6.5)	3(2.1)	11(57.9)	13(22.8)	8(9.5)	121(31.3)

a These totals do not include those industries which only generate scrap

b An industry which is both water polluting and air polluting is counted only once in the total

c Refers to scrap as a form of land pollution

(PCB's) from the plastics and adhesives industries. The quantities of these tend to be fairly small individually. However, some of them particularly lead, chromium, titanium, zinc, and PCB's are toxic in very small quantities and can be concentrated by the biological food web. In the absence of quantitative analyses it is not possible to determine the nature of the problem. Nevertheless, it should be noted that since most of the establishments are concentrated along the East-West Corridor, the substantial majority of these effluents are discharged either directly to the Caroni River or indirectly via the small tributaries such as the St. Joseph or San Juan Rivers. Ultimately of course, it ends up in the Caroni swamp and the Gulf of Paria.

Air pollution is not a general industrial problem, but does create severe localized problems. This is not surprising since air pollution is more a phenomenon of primary industries, domestic heating, motor vehicular traffic and electrical power generation from fossil fuels other than natural gas.

There are a few large primary industries in the country which give rise to localized problems which can have serious effects on the population. The main gaseous air-pollutants in this country are oxides of sulphur and hydrocarbons from the petroleum refineries, and oxides of sulphur from the sulphuric acid plants. Particulate air-pollution results from the cement company's operation at Claxton Bay. These pollutants only make themselves obvious during the infrequent wind reversals. However, that is not to say the local population is not at risk nor have suffered respiratory damage. What is required in order either to condemn or to exonerate the industries is a detailed analysis of the nation's health statistics to determine whether or not the incidence of respiratory illnesses is higher in certain areas than in others and thereby to see if there is any correlation with the location of particular industries.

The other serious localized problem is the Beetham Highway Municipal Waste Disposal Site. Without a detailed analysis of the smoke, one can only wonder at the possible myriad of chemicals which may emanate from that area and blow over the highly densely populated East Port-of-Spain area.

A more general widespread source of pollution is that emanating from vehicular traffic which generates carbon monoxide, particulates, oxides of sulphur hydrocarbons oxides of nitrogen and compounds of lead. However, this aspect cannot be dealth with in this paper.

In fact a complete and more detailed investigation of the present situation in Trinidad and Tobago and indeed of the entire CARICOM Region showed that the most serious environmental effects are associated with domestic sewage, large export oriented extractive industries, agriculture, food and drink processing, emissions from motor vehicles and the building materials industry, in that order.

This pattern is completely different from that which obtains in a highly industrialised country such as the United States of America. Table 3 lists the major polluting industries in the U.S.A. and it should be noted that only three of the eight listed (Petroleum, chemical plants and food drink and meat processing), contribute significant quantities of pollutants to the environment in any of the CARICOM countries.

TABLE 3. MAJOR POLLUTING INDUSTRIES IN THE U.S.A.

Industry	Air Pollutants	Water Pollutants
Pulp and Paper[d]	H_2S, mercaptans	Organics, suspended solids, crude soaps, sulphides, colour
Iron and steel mills[d]	Particulates, HF, SO_x, cyanides	Suspended solids, phenols, oils, acids, cyanides, thermal
Petroleum refineries[e]	H_2S, SO_2, particulates	Oil, organics, thermal
Smelters[d]	Particulates, HF, SO_2, As	Solid wastes, thermal
Chemical plants[d,e]	SO_x, NO_x, H_2S, NH_3, HF, HCs, particulates	Suspended solids, thermal, wide range of chemicals
Food, drink and meat processing[e]	Odour	High BOD, suspended solids
Power generation[e]	SO_x, NO_x, O_3, particulates	Thermal
Metal treatment[e]	Acid fumes, solvent vapours	Cyanide, Cr, Zn, Cd, Sn, Fe, Cu, Pb

d Planned industry for CARICOM

e Already in existence in CARICOM

Nevertheless, given the absence of environmental legislation and minimal controls, and given the list of products manufactured in Trinidad, the following toxic chemicals should appear in the environment in significant quantities: arsenic, cadmium, chromium, copper, fluoride, lead, mercury, titanium, thallium, zinc, and PCB's; and their concentrations should be such that their presence would result in sickness and disease among the population. However, this is not the case. Indeed even highly polluting industries such as paper products and plastics processing which exist in Trinidad and which have fairly large outputs, discharge only relatively small amounts of pollutants to the environment.

The main reason for the absence of significant quantities of these toxic pollutants is that the majority of the industries are "screw-driver", finishing-touch or packaging establishments. The closer an industry is to primary production, in general, the greater and more toxic the effluent becomes. Thus if backwark linkages had been

created in the economy, the country would have been faced with very serious proble in the absence of environmental controls. Even in the food and drink processing industry, the lack of backward linkages with local agriculture has lessened the effect of the BOD loading.

Hence ironically, the absence of substantial quantities of toxic pollutants is an indictment of the type of industrial development which has taken place so fa

Nevertheless, it is quite clear that if the Governments of the region are to broaden their industrial base, as they clearly must, then they will have to think very carefully about the possible environmental effects. This will entail the adoption of a sound environmental policy.

4. THE NEED FOR AN ENVIRONMENTAL POLICY

There is a growing awareness on the part of the Governments of the Region th past policies have led to a rather haphazard, import intensive manufacturing secto linked neither to their countries' natural resource base nor to other industries i the country. Consequent upon this, they are drawing up plans to enter a new phas of development which will entail the establishment of primary industries (such as iron and steel, aluminium smelters, pulp and paper, petrochemicals etc.) some bas on indigenous raw materials, with the hope that this will lead to the creation of vertical and horizontal linkages in the economy - the so-called deepening of the manufacturing sector. The possible environmental consequences of this, in the absence of appropriate regulations and control mechanisms, could be catastrophic, especially since the majority of the countries are very small.

At the same time, these highly capital intensive industries will require sub stantial financing by overseas investors. In order to lower production costs, increase profit margins and to attract foreign investors, it must be very temptin to reduce pollution abatement to the barest minimum. In highly competitive and polluting industries such as iron and steel and aluminium smelting, there must be significant pressure from would-be investors to cut back on pollution control. Indeed, the report produced for the Second General Conference of the United Natio Development Organisations in Lima, Peru, in March 1975 [2], draws attention to the danger that the developed countries, faced with severe pollution problems, may tr to locate their more polluting industries in the developing nations, leading essentially to the exportation of the former's pollution.

However, even if the Governments are fully cognisant of the dangers associa with their major industrialisation thrust and install the most advanced control equipment available, the countries will still be faced with very serious environmental problems unless pollution control legislation is enacted in the ver near future. The reason for this is that the other aspect of the plans, the spin industries will probably be established in the private sector, and it is unlikely that they will be persuaded to be voluntarily environmentally conscientious and t they will institute satisfactory pollution control without legislation.

It may very well seem at this stage that there are only two alternatives; t is, should a country develop industrially and suffer the environmental consequenc

or should it just continue to import finished and semi-finished goods (leaving the bulk of the pollution in other countries). However, the problem is much more complex. It is because the planners and politicians often see the problem only in this light that they damn those who are genuinely concerned, accused them of being unrealistic and of wanting to hold up progress. The politicians and planners argue that the cost of pollution control is too high for a developing country, but they do not take into their accounting the environmental cost in the absence of controls, such as medical costs, increased maintenance costs of buildings, vehicles etc., the cost of permanent loss of land or fisheries etc.

However, even the issue of the total cost of pollution control is a very complex one and relates inter-alia to the level of development attained by a country and the production volumes of the individual establishments.

Whereas for countries such as the U.S.A. and those in Europe, the average cost (in terms of price increases) of the strictest pollution control will be between 1% and 2%, the likely effect of similar legislation would most probably be far greater in Trinidad and Tobago. The reason for this is that the former countries have well-integrated economies and it is generally true that the cost of pollution control as a proportion of total capital and manufacturing cost, decreases, the further a process is removed from the extractive and primary processing industries. Thus to take the aluminium industry as an example, the capital cost of satisfactory air-pollution control equipment is about 10% of the total cost of the plant and the operating costs for this equipment is about 5% of the sales price of the aluminium. The profit margin per unit of production is also generally small. Further downstream, on the other hand, the pollution control cost for manufacturing products from aluminium sheet is effectively zero, and the profit margin is high. Hence provided that the whole industry is vertically integrated, the cost of controls to the consumer is fairly small.

If on the other hand, a Government was to decide that it did not want the pollution associated with the heavy industries, nor was it prepared to pay for controls (which means that they would not establish them), then cost-wise the consumer would still be no better off. This is because, if a country established only the reasonably non-polluting downstream operations based on primary processed raw materials from the developed countries which have to use the most stringent pollution control processes, then they would have to pay the disproportionately high cost of their pollution control measures. This therefore, brings the issue right back to

(1) the need for proper integration of the economies

and (2) the need for an environmental policy.

A pre-requisite of a comprehensive environmental policy is the recognition that one of the principal goals of the State must be the care and protection of the human being. For a society to advance economically, its activity must alter the state of the natural environment, in many cases with serious repercussions. This inevitably leads to conflicting situations which reflect the contradictions between the implementation of development plans and the need for environmental protection, and this is true regardless of the political system. Consequently, a sound environmental

policy for a developing country must be drawn up in conjunction with its developme strategy, and such a strategy must give priority to meeting the real needs of the people.

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