## TOPIC 6

# ENVIRONMENTALLY ORIENTED INDUSTRIAL PLANNING

#### Scope

Most developing countries have, at one time or another, considered industrialization as the panacea for problems of economic development. They believed that industrialization would reduce their dependence on the highly industrialized countries of the world and that their claim to political independence would be fully realized only when they had established a selfsufficient economy. It was also thought that a self-sufficient economy would become a reality when manufacturing industries complemented the merely extractive and domestic industries. Thus industrialization was seen as the basis of development and the hope of developing countries. This attitude accounts for the considerable attention which developing countries have given to industrialization in recent decades. Although developing countries are at varying levels of industrial development, it is true that all of them are still very eager to modernize the industrial sector of their economies and to reinforce the base of a self-sustaining economy.

Most developing countries are also still actively engaged in the task of changing the pattern which their industrialization assumed during the colonial era. The character of industrialization during the early colonial period was basically that of extracting raw materials (many of them non-renewable) for the markets of developed countries where the manufacturing processes took place. Although industrialization has made some progress in the developing countries, extractive industries are still of paramount importance. In a few of these countries, geography and history have conspired with politics to keep extractive industries dominant. A case in point can be found in the industrial experience of the Latin American countries. Despite some noticeable advances in industrialization, a considerable proportion of the industrial activities of these countries consists of the exploitation and export of non-renewable raw minerals (silver, tin, copper, iron, zinc, lead, tungsten, molybdenum, antimony, iodine, and crude oil) and in land and sea primary products. It is worth noting that most of the mining and petroleum exploitation in these countries has been carried out by foreign countries which are often unconcerned about the effects of such extraction on the economic life of the countries involved and on the quality of the environment. It is no exaggeration to claim that other developing countries shared this experience in broad detail.

In recent years, especially during the United Nations' Development Decade, industrialization in the developing countries has been rapidly transformed. Apart from domestic industries or handicrafts and the extractive industries, numerous small-scale and medium-scale industries have been established. A few large-scale industries, especially iron, steel, and petrochemical, have been established, although they are still few and far apart. More important, they are unevenly distributed, and some developing countries are without any of these heavy industries, in spite of the fact that they are recognized as the real hallmarks of full industrial development.

The low level of heavy industrial development explains why few, if any, of the developing countries have become exporters of industrial goods. This situation illustrates clearly the economic gap yet to be filled by the developing countries if they are to become highly industrialized. It also points to the fact that the gathering momentum of industrialization in the developing countries will have an increasing and decisive impact on the environment.

The necessity for environmental orientation in industrial planning is therefore obvious. Until recently, the impact of industrialization on the environment was minimal, and the self-control mechanism of nature could have handled whatever damage might have occurred. The story is now different. The technologically operated industrialization of recent decades has had increased adverse effects on the environment, and the break-down of the self-adjusting mechanism of the environment is imminent. In order to avert some of the numerous problems of unguided and uncontrolled industrial development, more attention must be given to making industrial planning environmentally oriented.

#### Options

It is a foregone conclusion that developing countries must industrialize. The question that provokes debate is how they can industrialize to aid their economies and at the same time support the welfare of the environment. Obviously, certain options or alternatives are available, some more profitable than others. In general, the available options will depend mainly on the types of industries to be established and their locations.

As to the types of industries, it is desirable for every country or region to establish, as far as practicable, a whole range of light to heavy industries and in such sequence as the economy permits. This is easier said than done, but nothing less ambitious will meet with the economic aspirations of the inhabitants of the different countries. Each country will, of course, determine its own priorites.

The Republic of Korea may be cited as an illustration of the ordering of priorities. During the First Five-Year Plan Period (1962-1966), the Republic of Korea concentrated on developing its agriculture mainly for food crop production; its energy industries (coal mining, power generation, oil refineries); and its basic industries such as fertilizers and cement. During the Second Five-Year Plan Period (1967-1971), the emphasis was on developing the iron and steel industry, machinery, electronics, petrochemicals, etc., while much importance was attached to social overhead capital (e.g., highways, ports, and industrial estates). During the Third Five-Year Plan Period

(1972-1976), efforts will be exerted to develop heavy industry, including ship building and precision machinery, and to further development of the petrochemical industry. Many other countries have similar plans, but not many have attached proper importance to the spatial and regional planning of these industries. Neither have they weighed carefully the effects of the projected industrial expansion on the environment and on the quality of life of the people. How best to approach this inevitable expansion of industrialization is suggested under the section on guidelines.

Just as there are options regarding the types of industries to be established, there are also options concerning their location. Most of the industries established in developing countries in recent decades are normally located in or near cities, or later gravitate to them. As a matter of fact, industrialization and urbanization normally occur in the same place and have a mutual attraction. This trend, if uncontrolled, may cause or aggravate environmental problems (air pollution, water contamination, excessive noise) and result in the inadequacy of public facilities such as water, housing, sewage, schools, hospitals, markets, and transport.

Although industrialization and urbanization have a common location in economically developed countries, it is still possible to keep them at some distance in the developing countries, especially by encouraging rural industries *per se* (handicrafts, agro-based industries, and other small-scale industries) and by locating medium-scale industries in the rural areas. This point is developed further under guidelines.

Since most of the industries in the developing countries have not yet been established, industrial planners have the choice of concentrating or dispersing them. In most developing countries, the lack of firm regulations for industrial planning has resulted in an anarchic pattern of industrial growth and areal spread. In some cases, the few regulations which have been suggested deal only with the inner arrangement of the industry, its sanitary aspects, and, to a lesser extent, with controlling the harmful effects of haphazard growth. By opting for a reasonable degree of concentration and dispersion, little or no damage would be done to the environment. It is mainly by environmentally oriented industrial planning that a balance could be achieved between concentration and dispersion, which may result in dispersed concentration or concentrated dispersion. Until recently, basic factors considered in the process of determining the location of industries did not include those which recognized the interests of the environment. Such traditional factors are:

- (1) Space requirements, including building costs and other physical facilities.
- (2) Availability of raw materials and other inputs and parts.
- (3) Availability of machinery and equipment.
- (4) Availability and cost of energy (e.g., electricity, coal, fuel, and gas).
- (5) Availability of labor.
- (6) General infrastructure, especially of transport and communications.
- (7) General relationship with other aspects of the economy (especially in terms of financial sources, providers, customers, and general service).

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(8) Overall national security and national strategy.

These factors are not at all exhaustive; in fact, their flexibility depends to a great extent on the range of options that a country is willing to consider.

In recent years, because of an increasing awareness of the environmental dimension of industrialization, the following factors have increased in importance: the effects of industry on environment and vice versa; the possibilities for the elimination of wastes, unusable residuals, and effluents; and the possibilities of recycling. These factors weigh heavily in determining some of the guidelines and research priorities which are suggested below. The developing countries have the option of according them the importance which they deserve.

### Guidelines

Aiming for total welfare. In developing countries, environmentally oriented industrial planning must be geared to the total welfare of the inhabitants. The planning must cater to the welfare of individuals and of the community at large. In many developing countries, the colonial heritage has led to the stratification of society into elites; skilled workers; and laborers, most of whom are illiterate. Industrial development, in terms of its diversity, must cater to the interests of the different classes and aim to bridge the gaps among them.

Efforts should be made to ensure the growth of the total economy so that polarization into urban and rural economies, in terms of industrialized and non-industrialized economies, respectively, would be prevented. The current trend for urban areas to become exclusively industrialized and for rural areas to depend mainly on primary or extractive industries should be vigorously counteracted. Whatever the economic advantages of the concentration of industries in cities where infrastructural facilities are currently available, determined efforts should be made to disperse them as much as possible. Industries should be seen as a means of attracting to rural areas the facilities usually associated with urban areas. Planning which is sufficiently forwardlooking should ensure that some of the infrastructural facilities are provided in rural areas before full-scale industrialization begins. In general, industrial planning in developing countries must attach more importance to regional than to local development.

In order to provide for the total welfare of the people, the concept of industrialization should be broadened to include not only the manufacturing facilities, but also facilities for the educational, recreational, social, and health needs of the workers. The conditions suitable for maximum production should be considered along with those which would ensure the maximum efficiency, comfort, and satisfaction of the workers.

In certain situations, increasing economic productivity leads towards decreasing social welfare. Attempts should be made to reverse such situations by according social welfare a premium over economic productivity. To do otherwise is to overlook the fact that increasing economic productivity does not necessarily contribute to total welfare. In a special way, industrial planning in developing countries must demonstrate a sharp awareness of the traditional life of the people, and must ensure that whatever is compatible in their backgrounds with modern attitudes to industrial development is jealously guarded and preserved. The tempo of industrial development must be controlled as much as possible to avoid abrupt and disruptive changes in the life-systems of the people. What is being suggested here is that rather than bending the people to industry, every effort should be made to find ways and means of adjusting industry to the lives of the people.

*Educating the people for industrial life.* It should not be assumed that some of the inhabitants of the developing countries are, by the nature of their present occupations (such as shifting cultivation and nomadism), averse to becoming industrialized. Aversion and resistance to change become manifest when people are not prepared for change. A systematic process of education for industrial life is needed in many developing countries. Such an education should include technical training for those who can become skilled workers or managers and should aim at improving the quality of manpower for industry.

*Exploiting non-renewable resources.* Any form of exploitation and utilization of non-renewable resources which does not consider future prospects could result in sub-optimal output and a low standard of environmental quality. Resources must be exploited and managed by necessary compromises. In addition, adequate provisions must be made for their conservation, and any irrational exploitation based on the attitude of conquering the environment must be avoided.

In previous years, especially before independence, most exploitation of resources in developing countries overlooked local or domestic interests, both economic and environmental. The reaction to this has been the nationalization of some industries in some countries. The so-called "principle of comparative advantage" used to justify the exploitation of these resources for the use of manufacturing industries in "mother countries" is no longer tenable. Current exploitation should be undertaken first for domestic industries and then, where there is an adequate surplus, for export.

In addition, exploitation should be carried on in relation to known or proven reserves, and long-term implications should be kept in mind. It is important to realize that unbridled exploitation can lead to serious ecological imbalances, even in the short run.

*Guaranteeing the stability of the environment.* Environmentally oriented industrial planning must guarantee the stability of the environment in the near and far future. The effects of industry on the environment, and vice versa, must be carefully assessed at all stages, and a course of action leading to a stable state at particular times must be followed. The environment must also be preserved from contamination and other harmful effects, especially those that are irreversible.

Governments must enact laws for the preservation, conservation, and restoration of the environment. Many Latin American countries, especially Argentina, Brazil, Chile, Mexico, and Peru, have commissions and other bodies which act on behalf of their governments to cater to the interests of the environment in many ways.

Fostering an integrated approach to industrial development. The spatial allocation of resources would help to balance the inter-regional inequalities which normally develop at the early stages of industrialization, especially where economic considerations are paramount in the decision-making process. There is a tendency for countries with wide inter-regional disparities to fall apart. The spatial element of development would, if noted, help to reduce such disparities and should not be underestimated in development strategy.

In recent years the need for the integrated utilization of natural resources has become evident. Yet, more often than not, the practice has been to seek the integrated development of only one resource at a time, e.g., that of water development schemes within the physiographic basin of each developed river. Since various resources are indivisibly integrated in their occurrence, their exploitation and utilization should be based on the concept of total integration or unity which is characteristic of the total environment itself.

In many of the developing countries, national boundaries do not accord with physiographic units so that it becomes necessary for many nations to work together if they are to achieve maximum utilization of the integrated resources provided by nature. Some countries are so small in size and population that they must cooperate with others in industrial planning and development if they are to make any progress at all. No country can develop its industrial activities in isolation: each country is linked with others in a matrix of world relationships and is kept in a perpetual state of dynamism by the complex interactions of geographical, economic, social, and political systems. It must be added, however, that any attempts made jointly by many countries to plan their industrial development in reference to a commonly shared environmental resource does not absolve each of the countries from responsibility in the execution of its own particular objectives of industrialization.

The integrated approach to environmentally oriented industrial planning makes it possible to adopt the concept of growth centers which can exist at a variety of levels, namely, local, regional, national, and international. It is now generally agreed that particularly in developing countries the development of growth centers for industrialization also permits the development of a spatial strategy for an urban-rural continuum. This strategy may in the long run reduce the migration pressure which has caused the creation of slum quarters in and around cities and the revolting sanitary, economic, and social conditions which accompany unplanned city development.

Recycling of resources and their products. Recycling should be the watchword in most developing countries. For too long a time, many agricultural, forest, and mineral resources were exported more or less in raw form to industrially developed countries so that their by-products were never available to the countries of extraction for purposes of industrial production. Today, even though the industrially advanced countries are understandably concerned with recycling their wastes, developing countries have yet to use in full the different by-products of their resources. Initial efforts should be concentrated on ensuring that every by-product of any industrial project is extracted and used locally instead of being exported. Although the exportation of timber and petroleum, virtually in their raw forms, illustrates convincingly this point of under-industrialization, almost every industry can go at least one step further in maximizing the use of raw materials.

The intensive processing of resources at the local level will not only generate more industry, but will also guarantee a higher price for the various industrial products and by-products. The traditional policy of keeping market prices under the control of the highly industrialized countries has long been due for a change. Developing countries must be able to enter world markets subject to the laws of supply and demand, and not to price controls exercised by the developed countries.

#### **Research** program

*Natural resource survey.* Institutional arrangements for natural resource surveys have not always been accorded the importance which they deserve. The inventory of mineral resources in particular must be accelerated in most countries and completed in others. Comprehensive surveys leading to thoroughly documented inventories of resources, especially in terms of their potential reserves, should form a major area of research activity in the countries of the developing world. In regard to certain raw materials, such as trees, research should be geared to finding effective methods of regeneration and replanting in order to ensure a steady and continuous supply.

Some countries have produced national atlases which are compendia of information on natural resources both physical and human, but by and large, there are many gaps in these atlases. Relevant departments of the universities and of the government should collaborate on forming the institutions which will undertake the natural resource surveys. There is a great need to collect well-documented and frequently up-dated information on natural resources.

Relevant and appropriate industries. A general classification of industries includes the following types: handicrafts or domestic industries, large-scale industries, and international industrial complexes. Not all types are relevant or appropriate at all levels of development; some cannot be effectively sustained at particular levels. In order to promote productive and environmentally oriented industries, it is necessary to establish relevant and appropriate types of industries at each level of economic development. Researchers should therefore attempt to assess the types of industries that would fit into the particular level of socio-economic development in developing countries. Such research activities should include a continuous survey of the space requirements for industries, the types of appropriate machinery and other physical equipment, the quality and quantity of the available labor force, the cost of various inputs, and an estimate of the size of the market. The necessity of research in this field is underscored by the bitter fact that the developing countries have experienced the failure of many industrial projects caused by a lack of awareness of environmental, human, and cultural variables which interact with economic and technological variables. It is an obvious fact that the adoption or rejection of a new form of technology or industry — where there is a choice — is as much a function of the social and economic variables as it is of the physical environmental variables.

Adaptation of industries to the life-styles of the people. Research should be undertaken to find out ways of adapting industries to the life-styles of the inhabitants of developing countries. All too often industrial projects are imported from industrially developed countries into the developing countries without any change in the structure of the industries and in the lifestyles which the industries demand. Such a situation could disrupt the sociocultural life-styles of the inhabitants with the consequence that industrial development would generate socio-cultural degeneration. As far as is practicable, ways and means should be found to preserve the socio-cultural values which the people continue to cherish. Therefore, systematized research into the social and cultural characteristics of the inhabitants of developing countries is necessary in order to know how to adapt the industries in the area to the people. Such an adaptation would in the long run make possible a healthy and viable relationship between the people, their industries, and the environment.

*Effects of misuse and abuse.* Research should be geared to monitoring the misuse and abuse of the environment for industrial purposes. It goes without saying that most forms of exploitation for industry create problems of pollution, contamination, degradation, exhaustion, and so on. Particularly in mining, certain damaging effects result from concentrating plants for the washing, melting, and refining of ore. The rate of accumulation of these wastes and other forms of pollution should be studied so that effective means of waste disposal can be devised. Furthermore, inventories and studies of environmental and ecological problems produced by each industry should be made with a view to providing effective solutions, preferably those which can solve the problems speedily.

*Personnel.* One of the tasks of research should be to train the type of personnel who can translate guidelines into practice. Appropriate training programs should be provided for producing trained personnel in the field of environmentally oriented industrial planning. Such trainees are expected to form a new breed of planners, and to be aware of the role of the environment in the determination of planning objectives in developing nations (economic growth, economic independence, and integrated socio-economic welfare). Such personnel could operate within a National Environment Resource Institute in each country.