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GOVERNMENT INITIATIVES IN ACHIEVING ENVIRONMENTALLY
SUSTAINABLE INDUSTRIAL DEVELOPMENT

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I. INDUSTRIAL AND ECONOMIC BACKGROUND

1. Global industrial growth in the last two decades has seen a higher average annual growth in manufacturing value added (MVA) for developing countries as a whole compared to that of developed countries. Even so, the benefits of this growth in industrial output have been eroded by the comparatively higher rates of growth in population resulting in a significant decline in standards of living, as measured by per capita income. 1/

2. Moreover, the industrial-growth sectors in developing countries have mainly been resource-based light industries and capital-intensive industries producing basic materials. These highly resource-intensive industries, using large quantities of water, energy and raw materials, are at the same time pollution intensive, generating a large variety of pollutants and industrial wastes including toxic substances. 1/ This has grave implications for the physical environment in developing countries, and underlines the fact that the issue of environmental deterioration is one of the major concerns facing humankind. Society has become increasingly aware of the problems of environmental degradation due to a number of factors such as the following:

(a) Acute income and population concentration caused by the process of urbanization. In many countries this has led to agglomerations of substandard dwellings without minimum sanitation or environmental infrastructure. The social perversity of this situation has increasingly been recognized by organized groups within society;

(b) Low levels of public health services, particularly in regard to basic sanitation, in the developing countries, creating the conditions for certain diseases to remain endemic, while others associated with environmental deterioration become more widespread;

(c) Growing numbers of combustion-engine vehicles resulting in increased air pollution;

(d) Environmental disasters due to the indiscriminate use of certain products and raw materials;

(e) Development of the chemical, steel, fertilizer and petrochemical industries, which have a high degree of potential for polluting the environment.

3. The degradation of the environment, in its totality, cannot be attributed to specific projects. Rather it is a consequence of a very large number of small, sometimes separately insignificant, activities by individuals or enterprises of all sizes. In this process the role of agriculture, transportation, heating and energy production is predominant. But a share of the deterioration of the physical environment must also be attributed to the manufacturing industry.

4. Despite its potential environmental costs, the primacy of industrialization for the developing countries is beyond dispute. Much more important, industrialization could help to provide a cure for environmental problems, if an environmentally sound industrial development strategy were pursued. Such strategies call for the integration of environmental concerns into industrial development plans and policies at the initial stages of formulation.

5. Until recently the environment has not been treated as a scarce resource. There have been no markets for and no price on environmental resources such as air, water and soil. This has resulted in an over-exploitation of such resources and has underlined the need for an ecologically sustainable industrial development (ESID) strategy that would aim at rectifying the misallocation of such resources by government intervention and appropriate environmental policies. Such policies, however, must be in line with a broader economic perspective, especially the need to foster environmentally favourable investment conditions in developing countries. Environmental policies, regulatory instruments and economic mechanisms are necessary but not sufficient conditions to achieve ESID. They must be accompanied by increased investment, a reshaping of the international community and a global partnership to ensure an improved quality of life for present and future generations.

6. Among the many issues presently facing the international community, the following are relevant to promoting ESID:

(a) New technologies give the industrialized countries superiority in industry and agriculture;

(b) The difficulties preventing the developing countries from controlling inflation, the lack of investment there, and the deadlock over external debt have distracted the attention of Governments from effectively tackling environmental problems associated with industry;

(c) The environmental challenge is one of the few areas of global interdependence that could act as an incentive to increased cooperation between members of society and between countries at different stages of development.

7. The way forward for a country lies in mobilizing its own resources and potential to modernize its economy, stimulate its young people to participate in and to build a democratic, ecologically responsible and socially equitable country. This process can be facilitated by the adoption of sectoral and regional strategies based on proven competitive advantages. For their success, such strategies depend, however, on joint inter-organizational efforts resulting in actions aligned to national priorities (education, regional integration, job creation, reduction of inequality) as well as international goals (globalization of markets, environmental awareness, technological and industrial modernization).

8. Most of the policies and policy instruments described in the present paper are not specific to industry, but are intended to influence the economy as a whole. Nevertheless, when applied they would have an impact on the industrial structure (sectoral distribution, location, size of enterprises etc.) and on the choice of technology.

II. THE NEED FOR GOVERNMENT INTERVENTION

A. Environmental deterioration in the economic context

9. Environmental resources (air, water, soil) are often treated as free goods or as common properties to which no individual rights exist. This could lead to a conflict between private and social interests in the use of such

resources. Since the price of goods and services do not include any cost for the use of environmental resources, the price structure is distorted. The resulting negative externalities necessitate government intervention to rectify this market failure and internalize the cost of using up environmental resources.

10. Thus, there are sound economic reasons for government intervention in the process of environmental management in order to attain the objectives of maintaining environmental quality.

11. The principal roles to be played by the Government in intervening in the process of environmental management are the following:

(a) Internalization of costs of damages to the environment;

(b) Determination of the correct price for environmental resources that are being depleted.

This may be done either by the formulation of new policies or by the elimination of inappropriate policies (both industry specific as well as general) that fail to take environmental considerations, employment, health, sanitation etc. adequately into account in the promotion of industrial development.

12. One way of dealing with the internalization of environmental costs is for Governments to adopt the principle that the polluter pays, which is discussed below.

B. The polluter-pays principle

13. The preceding section highlighted the need for Governments to participate in solutions to environmental problems, whether these problems are seen as being due to failures of the price system or due to shortcomings in the establishment of property rights over environmental resources.

14. Major environmental problems are negative externalities imposed on third parties. In other words, the cost of actions taken by one party are borne by other parties who are not directly involved in the process of production or consumption that gave rise to these externalities.

15. If the party responsible for causing environmental damage is not made liable for doing so, it will have insufficient interest in solving the problem. So if solutions to environmental problems are to be found, it is important to make those who cause them accountable in monetary terms for the damage done. This means adopting the principle that the polluter pays.

16. The polluter-pays principle was defined by the Organisation of Economic Co-operation and Development (OECD) in the 1970s and is applied in most OECD countries. 3/ It implies that the polluter must assume the cost of pollution-reducing measures rather than the State or the general public.

17. The principle may become a reality by the use of economic instruments, such as taxes, fees and charges levied on pollution. Such instruments have been adopted in several countries and will be analysed in the following chapter.

18. The principle is highly important in the development of environmental policy, owing to a number of factors, among which are the following:

- (a) The gap between private and social costs can be narrowed;
- (b) Making this principle known to the general public can improve public awareness of and attitudes on ESID;
- (c) Methods of pollution prevention, including non-polluting technologies, and control are likely to be introduced more quickly.

III. REVIEW OF POTENTIAL GOVERNMENTAL INITIATIVES TO ACHIEVE ENVIRONMENTALLY SUSTAINABLE INDUSTRIAL DEVELOPMENT

A. Instruments of intervention

19. The instruments that are available to Governments for implementing ESID can be categorized in different ways. One possibility would be to characterize them according to the time perspective in which the impact is expected. Some measures aim at solving a critical problem as soon as possible; an injunction may be used. Other measures, such as awareness programmes and green labels, will aim at changing the behaviour of the consumers or the producers in the longer run. The classification used herein is based mainly on the one used by OECD, 4/ which distinguishes between regulatory and economic mechanisms. A third category has, however, been added, that is, mechanisms for strengthening the institutional framework.

20. The end of this section contains a detailed discussion comparing regulatory and economic measures. However, a few points are highlighted here.

21. Legal and regulatory measures are intended to control directly behaviours that may result in environmental harm. Regulated actors must comply or else face sanctions. Economic measures provide incentives or disincentives that are intended to influence economic decisions that have environmental consequences. They normally allow some flexibility to the environmental actor in deciding how to proceed.

22. The distinctions between these two approaches tend to become blurred in practice. Many measures to directly control environmental impact by law or regulation have an economic component. Many economic instruments are based on, or set forth in, laws and regulations.

23. It is also of fundamental importance to note that because an instrument is "available" does not mean that it can be used by any Government under all circumstances. The instruments must also be "permissible" and "relevant". For an instrument to be permissible it must be in line with policy objectives and constraints adopted by the Government in question. To be relevant the instrument must address a problem relevant in the country in question and in such a way that the effect is assured. For example, taxes as instruments, however efficient, would hardly be effective if there were no efficient system for tax collection. Equally, instruments that would be harmful for export production could be problematic in countries where the export objective has priority over all others. In general terms this problem is discussed in chapter IV, which deals with the combination or mix of different instruments in the design of ecologically sustainable industrial policies.

24. The foregoing is particularly relevant for developing countries where priorities, needs and constraints are often fundamentally different from those of industrialized countries in which pollution-control policies were first developed and government instruments designed. In practice, it has to be taken into account that the number of available instruments that would be permissible and relevant in developing countries is considerably smaller than in industrialized countries. Since the pollution problems often are of a transboundary, regional or global nature the resulting dilemma, or goal conflict, has to be resolved through international cooperation between Governments (see working paper V).

25. What follows is a discussion of these mechanisms and an indication of their usefulness as a means for promoting ESID.

B. Regulatory mechanisms

26. The preferred way for Governments to encourage ESID related objectives has been through statutes or legislative statements of environmental quality objectives to be achieved through regulatory regimes. Statutes enacted by government bodies can be specific, but all require clarification or refinement to make the regulatory regime operational. Regulations establish the particular policies and procedures that an environmental management agency uses to carry out its statutory goals.

27. The creation of environmental property rights in the United States of America, in the form of emission credits that can be traded in the market, granted to corporations that control pollution, is one example of a government intervention. Other illustrations of the need for government intervention in the United States are manifest in the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). RCRA was enacted to deal with problems of hazardous waste disposal that had been brought to public attention as a result of a series of accidents. CERCLA envisaged the setting up of a trust fund financed mainly by taxes on chemical manufacturers for compensation in cases of environmental degradation and accidents.

28. In developing countries, the role of the Government has traditionally concentrated on the setting of standards and legislation. In India, for example, there are three specific acts of legislation: the Water Prevention and Control of Pollution Act 1974, the Air Prevention and Control of Pollution Act 1981, and the comprehensive legislation of the Environmental Protection Act 1986. In addition, government institutes such as the National Environmental Engineering Institute and the Central Pulp and Paper Research Institute are conducting research in environmental protection. Similar government-supported institutes are found in China, Indonesia, Myanmar and other countries. 2/

29. A regulatory regime consists of four activities: standards, permits, monitoring compliance and enforcement. The major purpose of these four activities is to encourage, guide or prohibit future conduct that would be detrimental to the environment.

1. Developing standards

30. The first essential element in most regulatory programmes is to issue standards that clarify an agency's approach to mitigating environmental

problems. These standards, which set pollutant-discharge limitations, are usually determined in one of three ways. Technology-based standards specify the discharge limitation based on the availability and affordability of technology, without consideration of the quality of ambient environment. The effluent guidelines for water-pollutant discharge issued by the United States Environmental Protection Agency are an example of this type of standard, which is frequently copied by developing countries. Ambient-based standards specify a safe or clean environment based on the protection of human health and welfare, without consideration of cost or technological feasibility. The ambient standards for air and water quality issued by the World Health Organization (WHO) are used by many developing countries for setting their ambient environmental standards. Between these two extremes, benefits-based standards focus on the trade-off between the risks to society from pollution and the costs society must pay to reduce pollution. This balancing approach could be of considerable use to developing countries because of the limited capital available for environmental management.

2. Issuing permits

31. The second essential element in most regulatory programmes is to ensure that pollutant-discharging facilities obtain operating permits. Permits tailor national standards to individual facilities and their environmental circumstances. An essential element of a permitting programme is an inventory of pollutant sources. Usually, at this point in the regulatory process, there is room for negotiation between the Government and the regulatory community.

3. Monitoring compliance

32. The third element in most regulatory programmes is to monitor the compliance of facilities with the conditions of their permits. There are four sources of compliance information: (a) self-monitoring and reporting by the source of pollutants; (b) inspections by government officials or independent third parties; (c) citizen complaints; and (d) ambient monitoring. The mix of information sources used varies from one country to another, but self-monitoring and inspections are by far the most important means of compliance monitoring.

4. Enforcing permit conditions

33. The fourth element in most regulatory programmes is to provide a wide range of enforcement responses to violations of environmental operating permits. Traditional enforcement sanctions fall into four general categories (informal, administrative, civil and criminal). A variety of informal responses, such as warning letters and telephone calls, fall at one end of the enforcement spectrum. Beyond these informal responses, environmental agencies use administrative, civil and criminal remedies and sanctions.

34. This regulatory regime, often described as command and control, does have its strengths. It provides the public sector with some assurance that technically and economically feasible actions are being taken to abate pollution. It gives the industrial polluters a reasonably predictable target that they must achieve, and generally protects competitive positions by imposing uniform requirements. Lastly, in industrialized countries, this regulatory mechanism has scored notable environmental successes, albeit at a higher financial cost than necessary. Water quality has improved following reductions in organic pollutants and air quality in urban areas has improved in the wake of reductions in particulate matter and sulphur oxides.

35. This regulatory regime also has its weaknesses. It has not been particularly effective with regard to managing pollution from small- and medium-sized facilities, or from nonpoint sources, such as runoff of pesticides and fertilizers from agricultural activities. In some cases, it has achieved its success at a very high cost because of its uniform requirements and emphasis on technology-based standards, which can restrict industrial flexibility and discourage innovation. Also, the past tendency to regulate by environmental media (e.g. air, water, soil) has tended to shift environmental problems from one medium to another (e.g. switching from burning garbage to dumping it in the ocean).

36. Most developing countries over the past 20 years have adopted some environmental statutes or legislation, but have failed to create a regulatory regime to achieve environmental objectives in industry and other sectors. A worldwide survey by WHO in 1985 highlighted the lack of the basic elements of a regulatory programme. 2/, 5/ Of the 59 developing countries that are industrializing more or less rapidly, only 10 had most of the key programmed components, 29 had some and 20 had few or none. Not one of the other 76 developing countries had any significant institutional capacity in environmental management. A survey by UNIDO in 1990 of industrial wastewater management in seven African countries showed that all seven had some form of legislation or statute, but that only one had the essential elements of a regulatory programme. 1/

37. There are a number of constraints in many developing countries that can make it particularly difficult to successfully implement regulatory regimes. Government institutions usually lack sufficient resources to carry out programmes that involve establishing, monitoring and enforcing sophisticated technical requirements. Broad use of enforcement mechanisms may not be readily accommodated in non-litigious cultures, particularly in Asia, or may be undercut in situations where poor economic conditions lead to corruption and bribery. It may sometimes be better to have no regulatory programme or a very modest one than a programme that cannot be effectively administered and so undermines the Government's credibility.

38. Three case-studies have been chosen to illustrate different aspects of pollution control. The first, on watershed management from Indonesia, illustrates the use of regulatory mechanisms.

Case-study one*

39. The Kali Surabaya Pollution Control Program (KSPCP), located in the Brantas River Basin of East Java, was the first comprehensive effort to reduce water pollution in Indonesia. Programme components include: developing industrial waste treatment facilities; improving sanitation; building institutions; and training personnel to monitor discharges of liquid wastes. The programme is administered by the Ministry of Public Works Directorate General.

40. An initial review in 1985 identified four factories (a sugar mill, two paper plants and an MSG factory) that were responsible for 77 per cent of the pollution in the Surabaya River and 94 per cent of the industrial pollution in

*Based on Economic Policies for Sustainable Development (Asian Development Bank, 1990).

the programme area. During the years 1986-1988, KSPCP concentrated on pollution abatement for these four facilities and on improvement of domestic sanitation facilities for communities along the Surabaya River. The factories received notice to comply with discharge regulations and they agreed to implement pollution-abatement measures by the end of 1987. These measures included recycling some waste materials and using recirculated water.

41. All four factories implemented the agreed-upon measures by the deadline. Overall pollution reductions were approximately 80 per cent. During the same period, pollution from domestic sources declined by 25 per cent, and pollution from smaller industrial sources by 10 per cent.

C. Economic incentives and disincentives

42. The treatment of environmental resources in traditional economic theory as free goods and/or public assets has resulted in a misallocation of these resources, which in turn has had negative social and economic implications. For example, air and water are considered free goods that produce benefits for which users need not be charged. As a result, industry is not motivated to invest in the conservation or improvement of environmental resources that in the first instance are of social relevance.

43. Moreover, if natural resources, such as air, water and land, are seen as public assets and utilized without limitation, the benefits of such utilization are privately enjoyed, while the costs are socialized. Finally, if prices, being the foundation of a market economy, do not reflect the environmental cost of production processes, they fail to perform their role as a rationalizing force in the market.

44. The potential role of government policy should therefore be to establish the link between resource scarcity and prices in order to improve resource management and promote sustainable development.

45. The adoption of economic incentives and disincentives in environmental management systems is of increasing importance for an effective approach to the problem. The approach must address the following aspects of policy reform:

(a) Internalization of environmental and social effects of industry policy;

(b) Correction of market failures;

(c) Elimination of market-distorting policies (e.g. elimination of pesticide subsidies). 6/

46. The economic mechanisms that are suitable for inclusion in environmental management systems are discussed below. They are fiscal measures (taxation, accelerated depreciation, elimination of subsidies, tax exemption, government procurement); direct financial support (concessional financing, subsidies); and tradeable permits and insurance.

1. Fiscal measures

47. Different countries at different times have adopted fiscal incentives to encourage the implementation of pollution-control systems. Similarly, it is possible to adopt fiscal incentive schemes to promote ESID. Among such measures, the following should be emphasized:

(a) Pollution taxes, making it expensive to cause pollution and encouraging the implementation of pollution-prevention systems;

(b) Application of the mechanism of accelerated depreciation to foster investments in pollution-prevention and waste-minimization systems as well as pollution-control equipment - companies can use this method to depreciate their equipment quickly, thereby artificially increasing costs and reducing the amount of corporate income tax due;

(c) Elimination of subsidies in order to reveal the actual prices of goods;

(d) Tax exemption for pollution-control equipment as well as for the adoption of clean technology, thus reducing the cost of such equipment and technology;

(e) Government expenditure, that is, the use of its purchasing power.

(a) Taxation

48. This is one of the most widely used mechanisms for pollution control. Taxation is one means of implementing the polluter-pays principle, based on the monetary liability of the polluter for damage caused. Funds raised by taxation can be used to set up funds for financing activities for pollution prevention. Production processes that pollute are taxed in such a way that the cost of the environmental damage caused has to be incorporated into the cost of the product. This should induce the polluter to implement environmental-control systems more quickly.

49. The degree to which effluent emitted by an industrial company is treated becomes a decision the company itself must take, since it will have to pay society for cleaning up the pollution it causes, and thus to provide the resources required to treat the remaining portion of its effluent or waste. This inducement is highly relevant to ESID, since it can effectively lead to a change in behaviour resulting in the adoption of technologies that consume environmental resources less intensively and are cleaner.

50. Taxation schemes can be found in practice in a number of countries. France uses taxation to control water and air pollution. In the case of water pollution, the French system comprises six basin agencies that are responsible for taxing polluters, whether they are industrial firms, individuals, farms or municipal governments. As an illustration, the agency for Seine-Normandie, corresponding to the Paris region, levied the equivalent of \$US 250 million in 1990 alone. These funds in their entirety will be invested in water-pollution control in the same region. 7/

51. In the case of air pollution, Decree n. 85.582 of 7 June 1985, set a charge of F 130 per tonne of sulphur dioxide emitted for companies that emit more than 2,500 tonnes per annum. In France the principle of self-financing is important. Funds from the public budget are difficult to obtain. In the case of water-pollution control the main source of financial resource is the funds from taxation, and that is well accepted.

52. Germany has a water-pollution taxation system. Water quality in that country has improved considerably since the charge system has been in operation. The Netherlands has a water-taxation system. The water-pollution

charge is felt to be effective and has introduced strong pollution control incentive impacts on certain industries. 4/

53. Australia, Belgium, the Netherlands and the United States apply charges on solid wastes. The United States levies taxes on raw materials whose processing creates hazardous wastes. In principle the aim of taxation as a pollution-control mechanism is to change the behaviour of users of the environment, leading them to consider the introduction of clean technologies, or at least of technologies that consume less resources in the production process, as has already happened in several countries. However in practice the charges are low and unlikely to affect behaviour in a significant way. This mechanism alone is insufficient, others must be found to complement it.

(b) Accelerated depreciation

54. Depreciation is the reduction in value of an asset through wear and tear. An allowance for depreciation on a company's real estate, machinery, equipment and vehicles is permitted in its accounts before calculating profit on the grounds that consumption of capital assets is one of the costs of earning the revenues of the business. The pertinent legislation establishes the asset life to be taken as a basis for these calculations. If a firm increases depreciation, either by increasing the number of assets to be depreciated or by reducing the useful life considered for depreciation purpose, it increases its costs and reduces the corporate income tax payable.

55. Depreciation acceleration is used as an incentive in several countries with the aim of stimulating companies to introduce pollution-prevention systems, thereby reducing the impact of the cost of environmental control on final costs. Among these countries are France, Japan and the United States.

56. In France, the law allows accelerated depreciation in the first year of 50 per cent of the value of all construction required for the installation of facilities for water-pollution control. Application of the depreciation mechanism to equipment for air-pollution control is also permitted under specific legislation.

57. In Japan, the mechanism of accelerated depreciation, used in the 1970s, was the most important benefit granted to companies implementing pollution-control projects. This permitted depreciation in the first year of 50 per cent of investment in such systems.

58. In the United States, the 1976 Tax Reform Act provided for accelerated depreciation both of environmental-control projects and for equipment that is not specifically designed for pollution control but contributes to a reduction of emissions.

(c) Elimination of subsidies

59. Several countries follow policies of economic growth based on the granting of subsidies to a number of productive activities. These subsidies may take many forms, such as concession of long-term loans at low interest for the implementation of certain activities; tax breaks for certain activities; price controls; and protection of domestic markets for producers operating locally.

60. An economic growth strategy that does not adequately account for environmental concerns and based on governmental stimulation through subsidies may

lead to the over-utilization of natural resources. In Brazil, for example, in recent years there have been cases where subsidies have led to more intensive use of environmental resources. Two of these cases are worth discussing in detail.

61. The first noteworthy case is industrial development in Brazil in the period 1975-1980. This period saw the start of a new stage in the industrialization process, geared to substituting imports of steel products, pulp and chemical feedstocks, and to boosting the shipbuilding industry. Subsidized long-term credit lines were granted to all these industries. The strictly economic aim of import substitution was attained, and indeed Brazil is now an exporter of all the products mentioned. However, the industries are environmentally aggressive, and this is especially problematic since they were set up and stimulated by State financing.

62. The second case is the programme of incentives for fuel-oil substitution by industry. Here the State offered financing facilities to assist the replacement of fuel oil both by electricity and fuelwood. An adverse consequence was an increase in deforestation. In addition to the environmental damage caused, many of the heat-generation systems implemented at that time have fallen into disuse owing to the rise in the cost of fuelwood, and thus there have also been economic losses from inefficient resource allocation.

63. A final feature of Brazilian policy worth noting is that the national development bank, BNDES, which administers the granting of credit lines for many such cases as those mentioned above, gives the same treatment in terms of interest rates and maturities for loans for the acquisition of clean technologies as for those that consume natural resources.

64. The elimination of subsidies for activities that consume natural resources is economically rational and reduces the payment made by society for pollution and environmental destruction.

(d) Tax exemption

65. The objective of the exemption from taxes on pollution-control equipment is the reduction of the final price of such equipment, making their acquisition less costly. Such a policy must be carefully implemented in order to avoid giving excessive incentives to the acquisition of pollution-control equipment instead of production improvements leading to the prevention of pollutant emission.

66. According to a report by the ECE, "In most market economies of the region, fiscal policy is a major instrument of environmental policy-making. A similar approach is also followed by some Eastern European countries. In Hungary, for instance, profit tax allowances granted on the interest payment of environmental investment credit were introduced in 1989. Refunding value added tax on investments for the improvement of water quality, and reducing tax rates for environmental services are now under consideration. In Yugoslavia, expenses of enterprises and organizations devoted to environmental protection may, under certain circumstances, become tax deductible." 7/

(e) Government procurement

67. In contemporary economies public spending represents a sizeable proportion of a country's gross domestic product (GDP), from 7 per cent in

low-income countries to 27 per cent in high-income countries. Part of this is capital spending (investment) and purchase of other goods and services. These two components of public spending account for 4 per cent of GDP in low-income countries, 8 per cent in middle-income countries and 14 per cent in high-income countries.

68. In relation to a world GDP of \$US 13 trillion (1990), the two above-mentioned components of public spending amounted to more than \$US 2 trillion. This purchasing power can be used by Governments in many countries as a powerful instrument in ESID strategy. Its full potential has not been exploited hitherto.

69. In operational terms, Governments can exercise this power in a similar manner to some non-governmental organizations in the United States. There they publish a list of companies and products that cause environmental problems to serve as a guide for consumers' purchasing decisions. Thus, Governments could set up a system whereby companies with unsolved environmental problems would not be allowed to supply goods or services to the public sector.

2. Direct financial support

70. Several countries offer support to companies that cause pollution, in return for the implementation of pollution-prevention or control systems. Among the most common types of benefit are subsidized financing of pollution-control facilities, and transfers of public funds to pay for part of the control facilities implemented by firms.

(a) Concessional financing

71. The main characteristics of this forward mechanism - low interest and long maturities - reduce the short-term impact of the cost of pollution control on production costs. In order to ensure that there are no distortions in terms of competitiveness, there must be uniformity in the control action established by environmental agencies. In what follows some examples are given of the use of this mechanism in countries where it is relatively common.

72. In Brazil, the Sao Paulo State Pollution Control Program (PROCOP) is a rotating fund that provides a permanent line of credit specifically for companies to develop pollution-control projects. Loans are repaid in up to 10 years with interest at 6 per cent or 9.5 per cent a year (principal is indexed to official inflation). There is also a national programme, POC Ambiental, administered by BNDES.

73. In the United States, where there are a number of types of financing for environmental-control projects, the outstanding examples are the credit lines offered by the Small Business Administration and the Economic Development Administration, mainly in the 1970s. The funds in both cases come from placement of federal bonds with the incentive of a rebate on income tax, so that the cost of money to the final borrower is reduced. The payback period can be as long as 30 years. In some cases, these credit lines are not available and companies must raise the funds required for pollution control on the financial market. Even so, the United States Government can provide guarantees when called upon to do so.

74. In Finland, a pollution-control programme for water was developed with the support of long-term financing for private enterprise. Interest rates

varied from 6.5 per cent to 7.5 per cent a year, well below the market rate of about 9.75 per cent.

75. In Japan, interest rates on pollution-control financing ranged from 6.8 per cent to 8 per cent a year in 1975, compared with a market rate of 9.1 per cent. According to estimates, this subsidy represented 2.6 per cent of the investment made by Japanese companies in pollution control.

(b) Subsidies

76. This mechanism involves government grants to offset part of the costs borne by companies in implementing pollution-control systems. It has been used in the United States, and in France and other OECD countries.

77. In France, any company liable for payment of water-pollution tax is entitled to receive a grant covering part of the funds required for implementation of a water-pollution-control system. 4/

3. Tradeable permits

78. A market mechanism for pollution control, which takes the form of the system of emission rights, has been used in the United States since 1975. It is designed to meet the needs of private enterprise and act as an incentive to the introduction of environmental control systems. The emission rights in question can be traded on the market. 4/

79. Trading in emission rights takes account of a common element, known as emission reduction credits. These credits can be obtained by a company from the environmental agency when it controls its emissions to a greater extent than the law requires. When emission credits are issued they take the form of bonds and can be traded in accordance with the control policy in force in the region in question.

80. Among the strong points of this mechanism are the following:

(a) Motivation to apply the polluter-pays principle, since emission credit trading is a private transaction;

(b) Motivation of emission control by companies at higher levels than the law requires so that they thereby obtain emission credits and keep them for later use;

(c) Possibility of expanding an industrial facility by using emission credits obtained as a result of controls implemented in the original plant;

(d) Possibility of reconciling economic growth with environmental protection by the use of emission credits by companies already operating;

(e) Motivation to introduce clean technology.

81. Although the emission-rights mechanism presents advantages that indicate its suitability for inclusion in an ESID strategy, it is not universally applicable because the rights in question must necessarily refer to the same type of pollution and pollutant. Also it can be complicated to monitor and enforce compliance with the traded permit system.

4. Insurance

82. Ideally any ESID strategy would include a correct evaluation of activities that are of potential risk, and a provision making it mandatory to acquire insurance cover against any damage that such activities may cause.

83. If companies presenting environmental hazards are compelled to insure themselves for this risk, they may rethink their entire operation. Technological choice will be more careful. The available options of implementing pollution control, and operating and maintaining existing pollution-control systems will be chosen more carefully, since this will reduce the cost of insurance.

84. Under pressure from insurance companies, firms will make every effort to avoid damaging third parties, who are also likely to have environmental insurance coverage. The possibility of litigation between insurance companies, or between firms with insurance cover and third parties suing for damages, will force all business organizations to devote far more attention to environmental issues.

85. Another advantage of this type of insurance is that reinsurance institutes will also pay more attention to environmental problems and will force their members to adopt a conservative approach to the negotiation of cover for clients, in order to avoid having to pay for damages in environmental litigation.

86. As a practical matter, however, the advisability and feasibility of requiring such insurance will vary widely in different countries and for different industrial activities.

87. The second of the three case-studies, given below, is chosen to illustrate the combination of a broad array of incentives and disincentives.

Case-study two*

88. Jiangsu Province has the most experience with industrial environmental management in China. This province is the largest industrial producer in China, responsible for nearly 11 per cent of the country's industrial production. The value of industrial output in 1988 was \$US 58 billion. Major industrial sectors include machinery and textiles, chemicals, food processing, electronics and construction materials. The province is also one of China's main agricultural areas. Major products include rice, wheat, cotton, rapeseed and silk. Industry generates 68.5 per cent of total social product and agriculture generates 16.4 per cent.

89. Jiangsu is located halfway down China's eastern shore along the Yellow Sea. Its topography resembles large parts of the Netherlands, with an extensive system of rivers, lakes, reservoirs and canals.

90. About 120,000 industrial facilities operate in Jiangsu. Of these, about 70,000 are collective enterprises, many of which are township and village enterprises. Jiangsu is one of only two provinces where the output of such enterprises exceeds that of State-owned enterprises. Some 98 per cent of

*F. Halter, Case Studies of Government Intervention in Industrial Environmental Management, prepared for UNIDO (22 July 1991).

Jiangsu's industrial facilities are small-scale and account for about 75 per cent of industrial output. However, the few large- and medium-scale enterprises account for most industrial pollution. For example, of the 3,000 enterprises in Nanjing, about 35 that are routinely monitored are the major source of water and air pollution.

91. Legal and institutional arrangements for environmental protection in China are more integrated into the framework of government at all levels than in most developing countries. For example, there are fairly well-established legal and administrative procedures assessing the environmental impact of new facilities. A system for accrediting environmental consultants (mostly academic and research organizations) has existed since 1986.

92. National legal requirements establish: economic quality standards for surface water; integrated wastewater discharge standards; and effluent discharge standards for specific industries. In addition, Jiangsu has local standards although compliance with them has been weak because it is technically and economically difficult for industries to meet them. Also, sources tend to dilute their effluent with pumped surface water in order to evade the standards, which set concentration levels (as opposed to mass discharge limits). The 11 municipalities in the province are developing environmental standards that will be adopted for the region.

93. Government efforts to manage industrial pollution reflect a broad mix of approaches, described below. Municipalities usually have more resources and more effective implementation than villages and townships within the province.

(a) Environmental impact assessment is required for new facilities, as noted above;

(b) Pollution levies are assessed against industries, based on the highest polluting constituent. The levies do not take into account any pollution management efforts. The amounts assessed are not high enough to influence facilities' environmental behaviour. Collection rates are much higher in municipal areas. The levies are higher for water pollution than for air pollution. By law, 20 per cent of the levies is allocated to defray the administrative costs of the local institutions that collect them, and 80 per cent to funding pollution control. The demand for pollution control funds is much greater than the money available from levies;

(c) Other sources of funding for pollution control investments include: allowing industries to retain 6 per cent of depreciation allowances for this purpose; using sewer charges to fund the construction of sewage treatment plants; and applying part of the infrastructure charge for new construction projects;

(d) A five year tax break is given on investments in comprehensive waste utilization;

(e) Administrative fines are assessed based on discharge levels above the regulatory standards. Fines are rarely assessed, but even the threat of a fine can be a powerful incentive;

(f) The system for grading enterprise management and designating model managers includes several elements that can affect environmental management, such as: economic efficiency; materials and energy consumption; safety; and environmental protection. An enterprise that incurs a pollution fine or penalty cannot receive a high grading;

(g) State ministries in the industrial sector are supposed to meet targets for improving the recycling and reuse of water, reducing consumption of energy and raw materials, and increasing pollution control investments. This results in some pressure on enterprise managers to pursue these goals;

(h) There is some enforcement of zoning restrictions to help protect water catchment areas and sites that are vulnerable to air pollution. In some municipalities, the Government provides financial assistance to industries that relocate outside of residential areas;

(i) Criminal sanctions. The law provides for criminal sanctions, but no information on their use is available.

94. The Chinese Government is now discussing with the World Bank a programme to evaluate the operation of pollution management measures in Jiangsu, and to examine how to implement some improvements in the system. Improvements would probably be tried first as a pilot phase in selected locations in Jiangsu Province. Possible steps to strengthen industrial environmental management include:

(a) Raising the amount of pollution levies to generate more incentive to reduce pollution;

(b) Placing more emphasis on pollution prevention;

(c) Stressing joint treatment facilities and other shared activities between small- and medium-scale enterprises to achieve better economies of scale;

(d) Extending charges to broader categories, such as industrial use of municipal sewer systems.

95. Another important factor is the low cost of industrial inputs, such as water, energy and raw materials.

D. Mechanisms for strengthening the institutional framework

1. Cultural and social incentives

96. Among several kinds of cultural and social incentives, environmental education seems to be highly relevant. Here dissemination through formal as well as informal channels must be considered.

97. Formal environmental education takes place through the various tiers of the school system, in the teaching of such disciplines as ecology and other matters related to the environment. Some specialists have argued that excessive focus on specific disciplines such as ecology overlooks the principle that the environment is present in all spheres of life, so that the best approach would be a multidisciplinary one.

98. Formal environmental education plays a crucial role in the process of changing the behaviour of society as a whole with regard to environmental issues, and as such it must be given greater attention when priorities are being determined.

99. Informal environmental education consists of the teaching, discussion and dissemination of environmental information outside the formal limits of the

school, i.e. through the mass media, ecological and environmental movements, intensive short courses for specific target groups, political parties, business organizations, trade unions, clubs and so on.

100. Informal environmental education can be an important tool in the process of obtaining ESID, insofar as it enables the society to become more aware of industrialization from the standpoint of their impact on the environment.

101. In Brazil, a formal and informal environmental education programme is being developed by the Sao Paulo state government, under the aegis of its Environmental Department. The formal education segment consists mainly of the publication of classroom texts on the environment and the informal segment consists mainly of support for initiatives designed to disseminate information on action connected to the environment.

102. Another important initiative in the field of informal environmental education is the holding of public hearings as part of the process of assessing environmental impacts by activities such as issuing permits or reviewing national environmental profiles and action plans. At these hearings the community is free to voice its opinions and to assist in the decision-making process regarding introduction of an activity that has an impact on the environment.

103. Use of the educational process in relation to environmental issues is based on the idea that humankind's relation to nature begins at the individual level. If it is possible to alter the individual's conduct with regard to nature, substituting integration for aggression, a major step will have been taken towards adequate use of nature by humans and hence towards sustainable development.

2. Industrial information programmes

104. Utilization of a system for collecting and disseminating information on production techniques and technologies is an essential ingredient for achieving ESID. The importance of this system lies in providing innovation incentives for alternative production processes that can replace processes that consume the environment excessively or are aggressive towards it. Waste recycling, clean energy alternatives, substitute raw materials and changes in production processes leading to environmental gains are some of the items of information that should be studied and disseminated.

105. One of the most useful incentives for ESID is joint participation by producers and coordinators of environmental management in technical assistance programmes that would include the dissemination of information on the existing stock of technologies, the implications of their use and the gains producers can obtain by opting for non-aggressive technologies geared to ESID.

3. Environmental quality indicators

106. The utilization of environmental indicators has considerable influence on the positions taken by society with regard to these issues and on the decisions made by politicians and producers. Indicators must be presented to society in the form of benchmarks clearly showing the desired standard of environmental quality.

107. When data on environmental quality are disseminated, together with interpretations of them, awareness of problems is increased. Society starts

to demand that public institutions take the action required to tackle environmental problems. Such social behaviour will eventually enable the public to monitor the situation, verify whether the expected results are being obtained, and demand changes if they are not.

108. To quote from the 1989 Economic Commission for Europe report for WCED, "In Canada, considerable progress has been made in collecting and integrating environmental, economic, health and biomedical data. Work is currently under way to develop a concise set of environmental indicators. France, with its patrimony accounting system, and Norway, are two cases where resource accounting has been developed. In Portugal, an experimental matrix on natural resource consumption is presently being elaborated. Decision makers in the Byelorussian Soviet Socialist Republic, at the local and enterprise level, use indices showing the extent to which natural resources and primary raw materials are used. Many ECE countries are already publishing surveys, or will do so in the near future, on environmental data. In certain countries, at the enterprise level, environmental concern systems include resource accounting as part of a so-called environmental compliance audit. The audits have recently been advocated by the International Chamber of Commerce." 7/ The Commission on the Environment of the European Communities is also currently discussing the desirability of requiring all companies to perform annual environmental audits.

4. Improvements in the decision-making process and environmental impact assessment

109. The idea of planning corresponds to the idea of a system, i.e. the need to set objectives and recognize the interaction between environment, economic policies, political policies, energy policies and spatial-organization policies. This interaction is fundamental in the context of ESID strategies. With regard to the strictly environmental aspect, however, the planning approach requires clearly defined objectives, the technical, human, financial and legal resources for attaining these objectives and, equally important, the means to measure and evaluate results, so that a critical analysis of the strategy adopted can be performed, followed by any necessary corrections. It is equally indispensable to realize that environmental decision-making processes will only be improved if the professionals working in this field are adequately trained. Otherwise, even with excellent strategies, implementation and evaluation will be deficient.

110. One of the means of improving the decision-making process is through environmental impact assessment (EIA), which is a formal study process used to predict the environmental consequences of a proposed major development project. EIA concentrates on problems, conflicts or natural resource constraints that could affect the viability of a project. It also examines how the project might cause harm to people, their homeland or their livelihoods, or to other nearby developments. After predicting potential problems, EIA identifies measures to minimize the problems and outlines ways of improving the project's suitability for its proposed environment offering options to the decision makers.

111. According to the 1989 ECE report for WCED, "EIA is considered as the instrument par excellence for integrating environmental considerations into development planning. Having been used for many years, EIA is now compulsory in many cases when new projects with possible environmental impact are under consideration. However, in certain cases, some Governments consider that the scientific level of EIA studies needs to be greatly improved." 7/ A post-facto evaluation should be undertaken.

112. EIA could play an important role at various levels of the planning process or in the process of strategy and policy formulation. So far a number of methods at the plant/enterprise level are available. The environmental impact should, however, be assessed also at the subsectoral and sectoral level at the stage of the formulation of development strategies and policies. In the comparison between alternative policy options the environmental impact should also play its role. Adequate methods for EIA at these levels must be applied. Without this step ESID will not be achieved.

5. Technological capabilities

113. Taking effective action to protect the environment and manage pollution presupposes the acquisition of technical knowledge, the mastery of technology and the creation of adequate operational conditions. To ensure the existence of these conditions, specific development programmes must be set up, such as technical training programmes (short on-the-job courses, both local and international, specific consultancy and traineeships) and programmes to develop capabilities in laboratory work, environmental monitoring and management.

114. The search for energy-efficient pollution reduction and clean technology can be advanced through an ambitious R and D programme, including national and international scientific and technological exchange. This programme corresponds to the adoption of an innovative strategy and the engagement of research institutes, university and R and D laboratories in developing ESID. These actions will create real conditions for a stronger institutional framework, since they provide better grounds for establishing and applying regulatory mechanisms, and a more solid foundation for the decision-making process.

E. Government initiatives and the external context

115. The trans-boundary nature of many environmental problems and the financial resources needed to solve them necessitate some form of international cooperation. Such mechanisms can vary in kind, from international environmental funds and regional development funds to external debt conversion, subsidies and grants, tradeable licenses and consumption rights. It is worth raising two issues common to these mechanisms and relevant to the possibility of promoting ESID.

116. The first has to do with the international distribution of the costs of environmental damages. The second is related to the fact that a large part of the environmental deterioration in the developing countries is an effect of their dual internal structures, wherein a majority of the population is under the poverty line. In these cases, it is necessary to discuss the political possibility of reducing such dualities by reorganizing and restructuring the economy.

117. The issue of international cooperation between Governments as well as between other actors is analysed in detail in Working Paper V entitled "International cooperation for environmentally sustainable industrial development". It is therefore not further treated in the present paper.

F. Preliminary evaluation of government instruments

118. The pros and cons of the various government intervention instruments reviewed above are discussed in this section. Whereas the polluter-pays

principle may be considered as a general guide for developing environmental policies and for the use of policy instruments, it does not provide precise specifications for the choice of policy instruments in specific contexts. Examples of additional criteria for evaluating policy instruments are as follows:

"(a) Cost effectiveness: An instrument is cost effective if it results in achieving environmental policy goals at the lowest possible socio-economic costs. These costs can be direct costs linked to purification, costs of altering production or administrative costs linked to the implementation of the policy measures;

"(b) Management effectiveness: An instrument has a high degree of managerial effectiveness if it can achieve the stated goals with a high degree of certainty;

"(c) Impact on incentives for technological development;

"(d) Impact on other development and economic objectives (growth, equity, industry competitiveness etc.)." 8/

119. A summary of the relative advantages and disadvantages of the regulatory approach *vis-à-vis* the economic incentives approach for application in developing countries, keeping in mind the above criteria, is presented below.

120. Environmental regulations in developing countries have often been replicated from past regulations in developed countries, and have consequently not been tailored to local reality. Among the problems connected with the use of regulatory mechanisms are the following:

(a) Excess cost of achieving environmental quality objectives;

(b) Excessive cost of inspection and control to government agencies;

(c) Non-compliance in monitoring and enforcement of regulation, budgetary, labour force and administrative constraints;

(d) Traditional approaches to pollution management have tended to focus separately on air, water and soil pollution at the macro level, without considering the total emissions from each plant or factory, resulting in the shifting of pollutant loading from one media to another.

121. The latter problem is being addressed in Sweden and in the United States, by the use of a new regulatory tool known as "integrated permitting" and waste minimization audits that encourage pollution prevention and adoption of clean technologies rather than pollution control. The Blackstone Project in Massachusetts, United States, attempts to coordinate and integrate the permits for air, water and hazardous waste emissions and to develop regulatory procedures for treating industrial facilities as whole entities. The project also re-examines the existing enforcement regulations with a view to encouraging the adoption of toxic use reduction initiatives by State authorities and industrial firms. 9/

122. Sweden has adopted the cross-media integrated permitting approach whereby the type of industry, its location, level of technology, type and

amount of pollution generated and their environmental impact determine the pollution parameters and emission standards. This approach allows local, regional and national authorities to impose flexible standards for each plant. An integrated permitting mechanism, as described above, along with requirements for conducting waste-minimization audits for each corporation could induce industry to adopt pollution-prevention modes of production, rather than end-of-pipe pollution-control techniques. ^{10/} However, it tends to be resource-intensive.

123. Another area for improvement in regulatory regimes is to allow for more negotiation between the Government and the regulated community. This negotiation, sometimes called regulatory roundtables, allows for an open constructive dialogue. ^{2/} In most cases, the pollutant reduction standards emerging from these roundtables will be less stringent than the Government might have wanted. The advantage is that whatever is agreed to can probably be implemented and there will be some environmental improvement.

124. One such example is an effort to control tannery waste near Madras, India. In response to new national and state legislation, tanneries and the local government worked together to establish a central waste-treatment facility for a few dozen tanneries. The central facility recovers and properly disposes of chromium salt from the tannery wastewater. In this case, industry pays 75 per cent of the costs and government pays the other 25 per cent. ^{2/}

125. In spite of its inherent drawbacks, the reasons for using the regulatory mechanism may be sought, for example, in their apparent equality, in ethical arguments or in greater certainty for decision makers as to their impact. Another advantage that regulations have over economic incentives is that regulatory costs, including costs of compliance, loss of output and distortions, are less obvious to consumers and taxpayers and therefore are not so much in the public eye. ^{6/}

126. Unlike the regulatory mechanism, the economic incentives approach potentially "brings environmental resources into the market and 'prices' them at a level that reflects their true scarcity and the opportunity costs of their use". ^{6/} As such, the associated costs are more apparent. However, as was pointed out in an earlier section, in general, improved use of economic incentives can result in a better allocation of resources, economic growth and environmental conservation, as well as increased investment in human capital and technological development.

127. Not all types of market-based policy instruments are efficient or cost effective, however. A case in point is that of subsidies or tax write-offs for the adoption of so-called "clean technologies" or the construction of waste-treatment facilities. "They do not make waste treatment or waste reduction any more profitable; they simply subsidize the producers and consumers of the products of these industries ... Tax breaks, credits, depreciation allowances and subsidies are a drain on the government budget and [can be] a disincentive to industries which might have otherwise developed more efficient methods for reducing emissions." ^{6/}

128. The benefits of tradeable pollution permits or emission rights have been discussed above. Despite its merits, the system has so far not been applied in developing countries. One reason is that a workable system of the setting of charges requires a level of fine tuning that may become prohibitively

costly for Governments. "Ideally, charges for destructive use of the environment should be set equal to the damage or external cost that these activities generate. In practice, it is very difficult to estimate the full extent of environmental damage because they are widespread, often not easily quantifiable and take a long time to accumulate." 6/ In spite of the inherent difficulties, the advantages of emission charges over direct regulation favours its usage since they "minimize the costs of pollution control by leaving the level of individual pollution control and the choice of technology to the polluter ... Enforcement is easier and simpler because charges require no knowledge of the production and abatement technologies of different industries and no bargaining; the incentive structure facing the polluter is such that it promotes self-enforcement." 6/

129. According to the OECD Progress Report "Economic incentives have proved useful in raising revenue but in most cases have not been successful in changing behaviour or stimulating innovation". 4/ This conclusion, however, needs to be treated with some caution as economic incentives have a longer gestation period and take time to work since they are aimed at altering behaviour patterns.

130. In conclusion, the experience of Governments in this field is still at an early stage. It appears that the relative merits and demerits of using regulatory tools and economic incentives warrant a judicious mix of the two types of instrument, depending upon the nature and extent of environmental degradation being addressed. In reality the two mechanisms must co-exist along with some of the other measures outlined above.

IV. PROPOSED GOVERNMENT MEASURES AND POLICIES TO PROMOTE ENVIRONMENTALLY SUSTAINABLE INDUSTRIAL DEVELOPMENT

131. Underdevelopment and constraints on the process of economic growth represent the main causes of environmental deterioration in developing countries. Worsening economic and social indicators, accentuated in recent years by constrained foreign trade and capital balances, have forced countries to adopt strict measures, leading to reduced economic growth, as well as adverse environmental consequences manifest in reduced investments in sanitation, health and transportation facilities; declining housing standards; the occupation of areas subject to mudslides and flooding; the destruction of water sources; urban congestion etc.

132. Industrialized countries were the first to take steps to adopt regulatory and economic mechanisms for ESID. Political parties, non-governmental organizations concerned with environmental issues, business corporations, and consumers' organizations are taking active measures to promote environmental priorities. In spite of the general applicability of some of these experiences and the global approach to the management of the ESID process, it should be emphasized that developing countries face specific problems that could have an impact on their opportunities to adopt measures similar to those of the developed countries. The implementation of principles of action, which may be common to all countries regardless of their stage of development, would necessitate adaptation to differences between sectors and should respect the dual characteristics of society in economic and industrial spheres. Cultural and religious heterogeneity still exerts considerable influence on governmental decision-making in developing countries. However, an appreciation of sustainable development will be instrumental in the specification of details

necessary for the formulation of industrial strategies and policies conducive to sustainable development.

133. The implementation of an ESID programme depends on a number of factors directly connected to national Governments and the country's socio-economic structure. Some of the elements are as follows:

- (a) The acceptance, by society, of the environmental component as a development factor; and by firms, of the importance of environmental issues;
- (b) The need for political decisiveness by the executive branch;
- (c) The existence of qualified professional staff;
- (d) The technological and operating potential of environmental agencies;
- (e) The interaction of the executive branch with the legislative and the judiciary;
- (f) The level of organization and action by interest groups in society.

134. The extent to which the above conditions are prevalent in developing countries has implications for the nature and emphasis of the industrial strategy that needs to be adopted. In general, however, it is recognized that ESID should focus on the following policy areas/options:

- (a) General industrial policies and strategies utilizing an appropriate mix of policy instruments to foster sustainable industrial development;
- (b) Institutional strengthening;
- (c) Training and human-resource development;
- (d) Technology policy.

135. The following sections will elaborate on these policy areas with recommendations on proposed actions of a general nature. A set of guiding principles that may be applied when formulating ecologically sustainable industrial development strategies may be outlined. Not all of these principles may be relevant to all countries but the list could perhaps serve as a starting point for a discussion on country/sector specific ESID policies. The following principles are suggested:

- (a) Promotion of economic growth with equity giving priority to poverty alleviation;
- (b) Employment generation and creation of entrepreneurial opportunities for future generations, including adequate attention to the role and employment of women in achieving a better balance between economic, social and environmental concerns;
- (c) Ambient-quality targets attained by minimum costs, adherence to the polluter-pays principle and by maintaining the competitiveness between industries;

(d) An evolutionary transition to environmentally sound economic development i.e a gradually phased shift from high polluting to non-polluting industries and technologies.

A. General industrial policies

136. General industrial policies based for example on market integration, enhancement of the productive performance and industrial automation need not all be incompatible with ESID. What is required is that in their general economic and industrial policy, Governments must choose instruments that are compatible with achieving ESID. Some reasons why ESID oriented policies need not be an obstacle to economic and industrial growth or that industrial growth need not necessarily be a threat to the environment are as follows:

(a) Industrial development creates the resources required for maintaining and improving the environment;

(b) ESID-type technologies, new technologies and environment-friendly industrial structures are often more cost-effective and productive than others;

(c) More and more environmental awareness will impose standards and regulations on products in international trade. Those who start early will have a comparative advantage;

(d) The market for products to meet ESID requirements is a dynamic and booming one presenting good opportunities for early entrants. New, often small-scale, growth industries in the "environmental" area can be created.

137. In designing their policies, Governments will, in all likelihood, have to find a mixture between regulatory and economic mechanisms while strengthening the institutional mechanism. No guidelines can be given for how this mixture should be put together. However, Governments should undertake the following:

(a) Clearly define policy objectives, goals and targets for specific industrial subsectors integrating environmental objectives in long-term and medium-term strategic plans;

(b) Analyse existing industrial plans from an environmental angle, i.e. conducting an assessment of the environmental consequences of existing sectoral plans;

(c) Formulate alternative development scenarios at the subsectoral level that would take into account growth, efficiency, equity and ecological sustainability;

(d) Assess existing environmental laws, standards and the regulatory framework;

(e) Assess existing fiscal and economic policies, their impact on the environment, industrial competitiveness and growth of the subsector;

(f) Assess, based on the above and in coordination with the private sector, non-governmental organizations and other interest groups, and devise a strategy for the use of appropriate policy instruments that would lead to ESID.

138. These policies can be implemented by the use of appropriate instruments. The review made in chapter III can give a first indication of the various instruments that are available. However, the choice of an adequate mix of instruments must be made judiciously. As was pointed out above, instruments that have a proven positive impact on the environment may not be appropriate for all countries, for example due to lack of institutional infrastructure to enforce or monitor the measure in question. The environmental impact of a measure or a set of measures must be balanced against the impact on other government objectives.

139. It is a general belief that environmental regulation is biased against new technology in favour of the status quo. 11/ Typically, control works against new sources of technology and new products whereas old ones are tolerated. By using standards based on the best available technologies, for instance pollution prevention and minimization of waste, this could be avoided. On balance, OECD concludes that regulatory regimes potentially may lead to serious efficiency losses. The cost of distorted incentives may have a long-run impact on technological development and on economic growth.

140. It is also generally believed that economic incentives send clear signals through the price system: resources use and allocation will be optimized. Industry should be given incentives to use low and new waste technologies (clean technologies) including resource recovery, recycling and reuse. The incentives should be accompanied by innovative regulatory tools such as cross-media integrated permitting and waste minimization audits. As mentioned earlier, these tools are currently being introduced in Sweden and the United States (Blackstone Project in Massachusetts). The integrated permitting approach allows the imposition of flexible standards for each industrial facility based on total emission, for instance air, water and hazardous wastes. If these permits are accompanied by suitable fiscal measures, it would fall within the framework of the polluter-pays principle and ensure that industry adopts pollution prevention and waste minimization measures.

141. Governments should further explore the use of fiscal measures, such as a carbon tax, to promote energy efficiency and reduce carbon dioxide emissions.

142. Even though the largest, most immediate improvements in pollution management often emanate from large facilities, governments of developing countries also need to devote special attention to the pollution problems of small- and medium-scale industries. These industries are usually the ones for which it may not be financially feasible, at least in the short term, to invest in pollution-control mechanisms. Governments must intervene to shape the market to reward and promote environmentally friendly economic activity. Concessional financing, special credit lines and guarantee schemes for environmental-control projects as well as the setting up of common-treatment facilities for relocation to industrial-growth estates are some of the measures that may be devised.

143. Industrial location is another policy area that can result in a more meaningful use and allocation of resources. Industries, identified on the basis of locational comparative advantage, should be located to reduce congestion and pollution and also to provide employment opportunities in lagging areas. This may be done by a proper mix of policies, including the development of infrastructure and investment promotion.

144. Although the use of economic incentives and market mechanisms are acknowledged to be more efficient in principle, their evaluation is not unequivocal. Economic mechanisms may take longer to have an impact and the impact may not be so clear cut. They are sometimes perceived as less equitable than regulation for either industry or the tax payer. What is important is that the Government must have at its disposal a wide and flexible range of policy instruments so that the best combination can be selected for each set of circumstances and each set of objectives. 4/

B. Institutional and public-awareness policies

145. One of the priorities of Governments should be to strengthen the capacity of institutions charged with formulating and implementing a policy of ESID. It is essential that these institutions play a central role and are able to assert authority over the sectoral departments. Among others, such a policy should include:

(a) Ensuring capacities for assessing the impact on the environment of various industrial development options at the national and regional levels as well as at the subsectoral and plant levels throughout industry;

(b) The mobilization of various sectors of society and public opinion in support of ESID. The main actors to be considered are society as a whole, Governments and firms. Among the latter, multinational corporations have a key role to play by facilitating the transfer of technology needed for environmental protection. The dissemination of environment quality indicators by the Government, and the requirements for undertaking environmental audits by corporate enterprises are some of the measures that may be used to mobilize public opinion;

(c) Collection and dissemination of information on production techniques and technologies, the implications and environmental impact of their use including the gains to producers by adopting environmentally friendly techniques;

(d) Establishment of management and monitoring programmes for toxic and hazardous substances and wastes;

(e) Establishment of a decentralized and coordinated decision-making system with linkages between the national, regional and local planning levels;

(f) Ensuring capacities for prevention of industrial accidents by risk-assessment procedures, safety measures and materials-handling procedures;

(g) Development of infrastructure facilities geared towards waste minimization and disposal, recycling and reuse;

(h) Establishment of a monitoring system for the enforcement of regulations.

C. Technology policy

146. Dealing with the increasing pressures on natural resources without jeopardizing economic growth requires an increase in the resource efficiency of production, which in turn implies that technological transformation must be one of the primary strategies for developing countries. "Technological

transformation means widespread, continuing development and adoption of ever less polluting and more resource efficient products, processes and services." 11/

147. The barriers to technological change are very often embedded in social, economic and cultural factors and not necessarily in technical constraints. The structure of public and corporate policies must be reformulated to overcome these constraints.

148. Apart from the use of innovative regulatory tools and economic incentives to promote and encourage technological change, many of which have been discussed above, specific technology policies need to be adopted by Governments. Technology policy can be defined as "government actions intended to promote the development and diffusion of new technology ... a [government] policy for technological transformation should not concentrate on technologies of immediate commercial significance. Making money from new technologies should be left to the private firms. What government can do effectively ... is to support the technical areas on which commercial technology will be based." 11/

149. The range of mechanisms that can be applied includes R and D tax credits for giving incentives to industrial research; government-supported research consortia encouraging national and international technological exchange; programmes to develop capabilities in laboratory work, environmental monitoring and management; technical training programmes; technology transfer programmes that disseminate technologies from government laboratories to the private sector; government procurement etc.

150. Government procurement has been cited by the World Resources Institute as having the potential for becoming an effective mechanism for promoting environmental technologies. In the United States, procurement by the Defense Department has been one of the main means of creating markets for new technology. However, the procurement of environmentally sound technologies by the Government - purchases of recycled goods, solar-power application, and energy-efficient lighting - has so far been limited even in the developed countries. 11/ Given the extensive government purchase programmes in some developing countries, this policy has enormous potential for the promotion and development of environmental technology.

151. Research and development is another area where Governments can play a lead role, on its own and in joint activities with industry. National research in alternative energy sources; in material-separation technologies to improve the cost effectiveness of recycling low-valued wastes into high-valued goods; in new and improved electronics, optics, motors, engines etc. would not only improve industrial competitiveness but also influence the environmental performance of the manufacturing sector. Governments should also devote more attention to the analysis of positive and negative impacts of new technologies e.g. biotechnology, information technology and advanced materials.

152. The policy framework for international technology transfer is another key area that could have significant impact on the adoption of a sound environmental technology. In this respect, policies relating to the promotion of direct foreign investment, joint ventures, turnkey projects and the operation of multinational corporations would be instrumental in determining the types of technology that are transferred to developing countries. Many of these issues are being addressed also in current international efforts to implement new agreements to counteract depletion of the ozone in the upper atmosphere.

153. Further research is also needed for policy analysis that would explore innovative and well-articulated policy proposals to address the new global contexts. The design of regulatory standards and impact-assessment techniques have to be re-evaluated and experimental proposals utilizing some of the economic instruments reviewed in chapter III, above, should be formulated. Research of this nature should form a cornerstone of the technology policy in developing countries and should be supported by universities, research institutes, Governments and private enterprises.

154. This is the third of the three case-studies. It has been chosen to illustrate the need for an ESID strategy in Pakistan.

Case-study three*

155. Large-scale manufacturing industries in Pakistan are largely responsible for the discharge of toxic and hazardous wastes. Some examples of this are the effluents of the leather industry containing sodium sulphide and chromium pigments; toxic chemicals and dyes in the water discharged from textile mills etc. In addition, small-scale industrial units, located in densely populated areas often discharge their emissions into neighbouring ponds or sewage canals. Current industrial policies, the tariff structure in particular, do not address the problem adequately. The high priority given to chemicals, tanneries and metal products industries and the high effective rates of tariff protection for these industries could worsen the pollution problem unless appropriate action is taken. "Relaxed standards" for waste disposal were to be implemented in 1990, to be followed by more stringent ones. However, many industries are not even aware of these standards. Recycling or treatment of wastes is not a common practice and the attitudes of industrialists is quite negative in this respect. Factory owners do not have adequate incentives to adopt such practices given that there are as yet no functional laws on pollution control or waste-management services. Moreover, industrialists do not have an idea of the relative costs and benefits of installing pollution prevention mechanisms.

156. As noted in the Asian Development Bank study, "if the deteriorating situation is not dealt with soon, the eventual cost to reverse and repair the damage could be tremendous and far more than a developing country like Pakistan can afford. The situation demands immediate intervention". A number of immediate steps are recommended in the study, including:

(a) The operationalization of the institutional set-up dealing with industrial pollution prevention, in particular, and the updating and implementation of the existing Pakistan Environmental Protection Ordinance of 1983;

(b) The setting of realistic standards on wastes, the formation of a waste management body to deal with the treatment and disposal of industrial effluents, solid wastes and toxics;

(c) The establishment of obligatory environmental impact assessments (EIA) for all projects to be cleared by the Government, and of a database system on environmental pollution monitoring this, along with EIA would form the basis for decision making with regard to alternative policies for ecologically sustainable industrial development;

*Based on Economic Policies for Sustainable Development (Asian Development Bank, 1990), pp. 184-186.

(d) The strengthening of existing R and D institutions concerned with environmental pollution. R and D efforts should concentrate on the adaptation of technology, clean technologies, in-service training to industrialists etc.;

(e) Financial incentives to industry for waste treatment and pollution reduction.

D. Development policy for human resources

157. As mentioned earlier, competent human resources have a key role to play in reconciling economic and ecological objectives. Environmental education, in the long run, can steer the response of technology and industrial policy towards sustainable development. The Governments in developing countries can supplement economic incentives by playing an important part in the process, through both the formal and informal education systems.

158. Formal education, through various tiers of the school and university system, should attempt to incorporate and integrate environmental sciences, regulation and design into the existing curricula of course work. It has been argued that excessive emphasis on specific disciplines, such as ecology or separate environmental engineering courses, should be replaced by a multi-disciplinary approach so that environmental factors complement traditional disciplines and do not appear as an afterthought in the education system.

159. Governments may also devise programmes of informal education via the mass media, public hearings of environmental impact reports, political parties, business organizations etc.

V. RECOMMENDATIONS

160. Governments should integrate ESID more effectively into international, national and local planning for industrial development by:

(a) Building considerations of environment and sustainable development into economic planning activities at the policy and operational levels;

(b) Revising current legal and institutional mechanisms as needed, to achieve a better balance of regulatory and economic measures that will promote ESID and to eliminate or minimize existing measures that are counterproductive;

(c) Actively encouraging ESID through research, development, acquisition, and transfer of new technologies, as well as more rapid and efficient utilization of existing relevant technologies in the public and private sectors, and through public/private partnerships;

(d) Promoting technical and management training and education that incorporates ESID into a broad range of disciplines at the university and professional levels;

(e) Promoting ESID through environmental education and participation by the general public and interested non-governmental organizations, such as corporations, employees, consumers and environmental organizations;

(f) Cooperating in international efforts to achieve ESID;

(g) Supporting exchanges of information and experience on ESID among developing countries, as well as between developing and industrialized countries.

Notes

1/ United Nations Industrial Development Organization, Industry and Development: Global Report 1990/91 (UNIDO publication, Sales No. E.90.III.E.12), chap. III.

2/ F. Halter, "Toward more effective environmental regulation in developing countries". Organisation for Economic Co-operation and Development.

3/ Organisation for Economic Co-operation and Development, "The polluter-pays principle and the instruments for allocating environmental costs", in Pollution Taxes, Effluent Charges, and Other Alternatives for Pollution Control (Washington, D.C., Library of Congress, 1977).

4/ Organisation for Economic Co-operation and Development, Economic Instruments for Environmental Protection (Paris, 1989).

5/ World Health Organization. "Preliminary assessment of national programs for health protection against environmental hazards", Doc. No. PEP/85.8.

6/ T. Panayotou, "Economic incentives in environmental management and their relevance to developing countries". September 1990.

7/ Economic Commission for Europe. Synthesis paper based on the national reports submitted by ECE member Governments: Regional Conference at Ministerial Level on the Follow-up to the Report of the World Commission on Environment and Development in the E Region, Bergen, Norway, held 8-16 May 1990, October 1989.

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9/ Don Hinrichsen, "Integrated permitting and inspection in Sweden", in Integrated Pollution Control in Europe and North America, Nigel and Frances Irwin, eds. (Washington, D.C., The Conservation Foundation, 1990).

10/ Donald Huisingh, "Cleaner technologies through process modifications, material substitutions and ecologically based ethical values", Industry and Environment (UNEP), vol. 12, No. 1 (January-March 1989).

11/ Robert Repetto, "Promoting environmentally sound economic progress: What the North can do" (World Resources Institute, April 1990).

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