

**DRAFT**

**ENVIRONMENTALLY SUSTAINABLE INDUSTRIAL DEVELOPMENT IN DEVELOPING  
COUNTRIES: IMPLICATIONS FOR INTERNATIONAL COOPERATION**

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**April 1991**

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## **ENVIRONMENTALLY SUSTAINABLE DEVELOPMENT IN A CHANGING GLOBAL CONTEXT: PRINCIPLES AND CONTEXTUAL CONSIDERATIONS**

### **1. Overview**

The purpose of this paper is to examine and assess the potential for international cooperation in achieving environmentally sustainable industrial development (ESID) in developing countries. Concern about the environment is growing rapidly around the world and is being addressed by a vast spectrum of organizations and institutions: governmental, non-governmental, international, regional, national, voluntary and private.

The environmental issue affects virtually every aspect of social, economic and political activity today, and the questions it raises are complex, often contentious and difficult to solve. Furthermore, the environmental issue is inherently international in nature. The degradation of environmental assets and the "global commons" is a problem without national or geographical boundaries and the effects of specific actions in one location are felt eventually in others. Additionally, it is an intergenerational problem, current actions have future consequences in ways that are difficult to predict or control. It is also a problem for which the knowledge base and the analytical tools required to solve the many questions that arise, are still deficient or undeveloped. Economists, other social scientists, scientists and engineers, policy analysts and practitioners are all trying to deal with various aspects of the problem, and, as is to be expected, there are contending schools of thought with respect to the specific aspects of environmental sustainability, and an astounding amount of paper that has been produced on this subject. Finally, there is a strong moral or ethical dimension to the issue, which makes it even more intractable. Achieving environmental sustainability is not merely a technical problem calling for a technical solution -- it begs a more fundamental ethical question involving the relationship between humans and their natural environment and resources, across space and over time.

In sum, the environmental problem is serious, if not of crisis proportions, not very well understood in terms of its complexity, global in its ramifications, deeply embedded in a moral imperative and demanding of urgent action at all levels of human activity. The report of the World Commission on Environment and Development<sup>1</sup> has encapsulated all of these dimensions in its concept of sustainable development as that which, "meets the needs of the present without compromising the ability of future generations to meet their own needs".

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<sup>1</sup> World Commission on Environment and Development (1987), Our Common Future, Oxford University Press (The Brundtland Report)

As the United Nations Conference on Environment and Development (UNCED) scheduled for 1992 draws nearer, organizations from all countries, as well as international agencies and the United Nations system are building on the broad canvas presented by the WCED with more detailed, context, issue and sector specific analyses, studies, reports and background papers that will serve as the basis for discussions and negotiations at UNCED, and hopefully lead to positive actions with respect to sustainable development.

Within this broad context, the specific focus of this paper is on industrial development in developing countries and the potential role of international cooperation to achieve ESID. The entire question of industrial development within the new framework of environmental sustainability is a complex one. The post World War II period has seen a tremendous growth in industrial activity. As the Brundtland report pointed out, twenty five years ago the world was manufacturing one seventh of the goods it does today and one third of the minerals. This pace of industrialization has had serious effects on the environment and on the global natural resource base. On the other hand, industrialization has brought with it many benefits in terms of improved economic growth for some countries and most developing countries are eager to accelerate their processes of industrialization even though industrialization inevitably results in higher environmental degradation.<sup>2</sup> Clearly, in the long term, the development and implementation of environmentally sustainable industrialization is essential, but the issues involved are complex and wide ranging and will require actions at the policy level and at the level of the individual enterprise. This paper examines how international cooperation can make significant positive contributions towards this goal.

Towards this end, the paper is organized into the following sections: the first elaborates on the key implications of the tenets of sustainable development for industrial activity - what does ESID mean for industrial behavior and decision making in the sense of broad principles and ideals?; the second section examines how these principles fit in and relate to the global economic, social, technological and political context within which ESID is expected to occur - what is the relationship between the macro

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<sup>2</sup> Furthermore, there are indications that the rate of environmental degradation is higher than that of industrialization. For example, in the case of hazardous waste generation, Hirschhorn and Oldenburg find that, when highly industrialized, medium income and developing countries are compared, an increase of 25 times in GNP per capita is accompanied by an increase of 150 times in per capita hazardous waste generation. They also note that the big increase in hazardous waste generation occurs in the early stages of industrialization. See Joel S. Hirschhorn and Kirsten U. Oldenburg, Prosperity Without Pollution, Van Nostrand Reinhold, New York, 1991.

changes that are occurring in the world today in terms of technological advance, changing patterns of competition and manufacturing, shifting economic and political scenarios etc., and the specific behaviors and activities implicit in the concept of ESID?; the third section examines in detail a series of issues that emerge as a result - in terms of, for example, trade policy, economic instruments, financing, technology, firm level decision making etc. - and what these imply for international cooperation; the fourth section then assesses the current status and trends in international cooperation with respect to ESID - who are the actors, what are the priorities, what are the barriers and windows of opportunity etc.? The fifth and final section draws some conclusions and makes several recommendations in the arena of international cooperation for the achievement of ESID in developing countries.

## 2. Sustainable Industrial Development: Underlying Principles

The concept of environmentally sustainable development has been examined in considerable depth in a number of recent reports and studies<sup>3</sup> and an overview of the various definitions of sustainability, both broadly defined and within the context of industrial development, is contained in Working Paper I for this conference, prepared by Professor Robert Ayres and Anil Markandya.<sup>4</sup> Whereas the exact definition of sustainability will probably continue to be debated for some time to come, in this paper, the "strong" definition proposed by Ayres and Markandya is adhered to, one which emphasizes the non-substitutability of certain environmental resources and the maintenance of an adequate, or threshold, level of environmental resource endowment. In particular, those that are essential to life support on earth.

In the broadest sense, this definition recognizes irreversibilities in certain environmentally degrading activities, and hence to the non-sustainability of such activities, for example those that contribute to long term climate change, desertification, ozone depletion, drastic deterioration in genetic resources etc. It also recognizes that these thresholds are not time bound, but permanent, and hence apply equally across generations. What it does leave open

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<sup>3</sup> For example, John Pezzey, "Economic Analysis of Sustainable Growth and Sustainable Development", March 1989, The World Bank, Environment Department Working Paper No. 15; David Pearce, Edward Barbier and Anil Markandya, Sustainable Development: Economics and Environment in the Third World, 1990, Edward Elgar Publishing Co.

<sup>4</sup> Robert Ayres and Anil Markandya, "The Road to Ecologically Sustainable Industrial Development", Working Paper No. I, prepared for the International Conference on Ecologically Sustainable Industrial Development (ESID), Copenhagen, October 1991

and subject to discussion is the proper approach to the utilization of environmental assets above and beyond these thresholds, because this is where the economics of utilization of depletable environmental assets and issues of intergenerational equity arise, and with them the proper of choice of discount rates<sup>5</sup>.

What does this basic understanding of environmentally sustainable development suggest in terms of principles for ESID? As Ayres notes, "...sustainability can be regarded as a constraint on the long run direction of economic development. Not all economic development paths are sustainable. Sustainable industrial development must therefore be consistent with the general constraints on sustainability..."<sup>6</sup> In other words, by espousing the concept of ESID, we are tacitly accepting that it involves a departure in behavior from that associated with "normal" or "conventional" industrial activity.<sup>7</sup>

For present purposes, five broadly identifiable principles that serve to distinguish ESID based industrial activity from the more conventional form of industrialization initially suggest themselves, based on the interpretation of sustainability described above.

(a) The integration of environmental factors in the economics of industrial behavior, at the firm level and at the societal (national) level. ESID implies that the costs of using, depleting, degrading or altering environmental assets enter into the calculus of industrial decision making and of industrial policy broadly defined. Whether this is viewed in the form of "good economics is good for the environment" (as is the point of view of the World Bank), or "good environmental sense makes good economic sense" is not so important. What is important is the recognition that there are specific, often measurable costs associated with environmental

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<sup>5</sup> Paul Streeten, in "Mankind's Future: An Ethical View" Interdisciplinary Science Reviews, Vol. 11, No. 3, 1986, makes a strong argument against a positive time discount rate from an intergenerational justice viewpoint. See also Pearce et al for an extended discussion of discount rates.

<sup>6</sup> Ayres and Markandya, op cit, p. 4

This applies equally to developed and industrialized countries. Even though environmental degradation may appear to be more severe in the early stages of industrialization, and as such may be defended as the "price to be paid" for economic growth, the U.S., a highly industrialized nation, is the largest producer of hazardous waste on a per capita basis (2.3 tons per capita as compared to 0.01 for Japan, 0.1 for Germany, 0.03 for Denmark and 0.04 for the Netherlands (Hirschhorn and Oldenburg, op. cit)

assets and their depletion, and that these costs need to be properly included in any economic calculations and analyses with regard to industrial development. This principle has implications at various levels - for accounting, financial analyses and reporting by firms<sup>8</sup>, national resource accounting, including the calculation of GNP and GDP<sup>9</sup>, and measuring and assessing international flows of investment, aid, technology and raw materials.

(b) The importance of sustainability as a disciplining principle for industrial development. Industrial behavior is generally driven by the motives of profit and efficiency, and does not tend to be based on a recognition of the environmental effects of industrial production and consumption, even in the industrialized countries<sup>10</sup>. Yet, sustainability principles must be central

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<sup>8</sup> See, for example, United Nations, Report of the Secretary-General, "Information and Disclosure Relating to Environmental Measures", E/C/10/AC.3/1990/5, which covers the efforts of the Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting.

<sup>9</sup> See, for example, Robert Repetto, " "

<sup>10</sup> Though there is a greater awareness of the environmental problem in industrialized countries, and their governments have enacted stronger regulations and laws, this is not necessarily reflected in environmentally sound production and consumption patterns. William D. Ruckelshaus, Administrator of the U.S. EPA from 1983-1984 makes a strong point about the difference between intentions and actions, "In the U.S., which has a set of environmental statutes second to none in their stringency, and where for the past fifteen years poll after poll has recorded the American people's desire for increased environmental protection, the majority of the population participates in the industrialized world's most wasteful and most polluting style of life". p. 169, in William D. Ruckelshaus, "Toward a Sustainable World", Scientific American, September 1989, pp. 166 - 170).

On the other hand, some industrialized nations, such as Switzerland, Japan and Denmark, are relatively low polluters compared to their GNP levels, on a per capita basis. However, in absolute terms, the levels of environmental degradation by the industrialized countries is much higher than by the developing or newly industrializing countries. For hazardous waste generation, for example, Hirschhorn and Oldenburg (op. cit) estimate the total amount to be 300,000 tons for Switzerland, 583,000,000 for the U.S., 1,540,000 for Japan, 7,150,000 for Germany and 580,000 for the Netherlands, compared to 3,020,000 for Taiwan (one of the most polluted newly industrialized countries), 418,00 for Malaysia, 409,00 for South Korea, 165,00 for the Philippines and 163,00 for Thailand.

Of course, the role of developing and industrializing

to industrial decision processes if any progress towards ESID is to be achieved. This has implications for a wide range of industrial activities - sourcing of raw materials and production inputs, choice and acquisition of technology, product design, process engineering, quality control, industrial siting etc.

There are indications that the notion of sustainability is percolating into decision processes in industry, leading Mostafa K. Tolba, Executive Director to optimistically note, "A new bond is forming in which industry and environmentalists have stopped locking horns and are working together to find ways to reduce carbon dioxide emission, find viable CFC substitutes, and develop new agricultural and production methods".<sup>11</sup>

(c) The "global commons" aspect of ESID leads to a third principle, which has both ethical and practical dimensions. The use or "misuse" of the "commons" by industrial firms, and the degradation of these "commons" through industrial activities has hitherto not been systematically addressed, except through regulatory mechanisms relating to air or water pollution, waste disposal etc. Yet, industrial activities have far reaching effects on the environmental commonwealth, effects which are generally not considered in individual firm decisions and efforts, or even in industrial policy. The interconnection between firm level actions and the effects on the commons needs to be one of the pillars of ESID. This has implications for management ethics, education, and the relationship between a firm and its constituencies - consumers,

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countries varies somewhat depending on which aspect of environmental degradation one focuses upon, and there are wide differences in contributions by different countries within each category. For instance, in terms of net additions to the greenhouse heating effect, resulting from CO<sub>2</sub>, Methane and CFC emissions, the total for the whole world was 5,900,000,000 tons in 1987, which was regionally spread as follows: Africa 340,000,000; North and Central America 1,300,000,000; South America 800,000,000; Asia 1,600,000,000; Europe 1,100,000,000; USSR 690,000,000 and Oceania 76,000,000. But the five largest contributors to the greenhouse effect are U.S., USSR, Brazil, China and India.

<sup>11</sup> Mostafa K. Tolba, "Sustainable Industrial Development", Industry and Environment, Vol. 12, No. 3-4, p.2, July - December 1989, United Nations Environment Program, Paris, France. In the same article, Mr. Tolba discusses how industrial priorities and environmental concerns can coincide, first through the evolution of an environmental industry per se., and secondly through a change in the economic and investment planning horizons of industry. Governments and international agencies can play a pivotal role in creating and environment, through policies, treaties, standards etc., in which industry can make these changes easily and positively.

suppliers, shareholders, employees etc. It also highlights the need for congruence between industrial policy and policies towards the "commons" at the national and international levels, and to inter-generational issues. On the international level, the "commons" issue relates to the on-going discussions and debates about the relative roles of the developed and developing countries in the degradation of the "commons", about the rights of developing countries to continue to practice environmentally unsound activities in the pursuit of economic growth, and about the responsibility of the industrialized world for having "usurped" the "commons" for their own industrialization.

(d) The major changes taking place in the global marketplace are generating a variety of pressures and opportunities for firms wishing to compete in this market. Put another way, the goal of achieving ESID must be pursued with due regard to the fact that firms also need to be competitive in the world economy and that nations need to foster such competitiveness among their firms. A firm can be environmentally sound, but this does not in and of itself ensure its competitive success.<sup>12</sup> In fact, many of the initiatives to improve the competitiveness of industrial firms in developing countries may have unintended negative environmental consequences.

In addition, the trade and investment policies followed by many developing countries, aimed at attracting foreign investment, or achieving domestic industrial growth through protectionist measures, need to be examined for their environmental implications. In the industrialized nations, the tacit barriers resulting from tighter environmental standards need to be assessed for their impacts on the trade patterns of developing countries.

(e) The technological dimension of ESID. Technology is seen as both a cause and a potential solution to environmental problems, and both these dimensions need to be understood and elaborated within the framework of ESID. The implications of newly emerging technologies, particularly productivity enhancing technologies such as Flexible Manufacturing Systems (FMS) for achieving environmentally sustainable industrial behavior needs to be examined closely. Furthermore, the importance of "soft" technologies, and new management techniques to achieving ESID (Total Quality Management, Just in Time etc.) needs to be investigated. Finally, the implications of ESID for technological strategies with regard to choice and acquisition, transfer, R&D, licensing and innovation needs examination and appropriate action.

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<sup>12</sup> Though it can admittedly be argued that in an idealized world, environmentally sustainable industrial behavior is indistinguishable from perfectly efficient industrial performance.

These five principles provide a broad framework for a more detailed discussion of specific issues related to industrial development and the subsequent implications for international cooperation. First, however, it is necessary to examine how ESID fits into the broader changes that are occurring in the global economy.

## **ESID IN A DYNAMIC GLOBAL CONTEXT**

### **1. Changing Industrial Production Patterns**

Quite apart from the growing and serious concern with environmental issues, there are several changes occurring in the world that are important to recognize and understand since they, in a sense, define the context within which efforts to achieve ESID will be undertaken. In other words, ESID cannot be achieved by simply tacking environmental concerns onto existing industrial practices because these practices themselves, and the global context in which they occur, are changing rapidly. Industry is undergoing fundamental restructuring around the world and a new techno-economic paradigm is emerging based on new forms of manufacturing, competition, inter-firm linkages, market dynamics and the possibilities opened up by technological advances, particularly in the area of informatics and information based technologies.<sup>13</sup> Global economic growth is slowing and there is a resurgence of regional trading blocs (e.g the European Community, North America), commodity prices are falling in most instances and there is an increase in protectionist trade policies.<sup>14</sup>

As the ECLAC report prepared for the Latin American and Caribbean Regional preparatory Meeting for UNCED, held in March 1991 in Mexico City, notes, " International markets are now clearly in the process of globalization and regionalization. This process has been set into motion by a notable decrease in communications and transport costs, by the ability of some nations to incorporate technological progress and to disseminate it through their system

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<sup>13</sup> It is not intended to enter into a detailed discussion of the new techno-economic paradigm. However, recent work by Perez (1990), Piore and Sabel (1989), Hoffman (1989), Best ( ) and Jaikumar ( ) are important in this regard. It is notable that environmental concerns are systematically absent from the analyses of these authors.

<sup>14</sup> UNIDO's Medium Term Plan for 1990 -1995, presented at its General Conference in Vienna in November 1989 (GC.3/17, 14 August 1989), provides a succinct summary of the industrial outlook for the developing world in the changing world context. It stresses the severe impact of external imbalances on developing countries, and the seriousness of the debt burden.

of production, by entrepreneurship and by the incorporation of additional countries, particularly countries in South-East Asia, into the international market" (p. 90)<sup>15</sup>. The report also notes the importance of structural (or genuine) competitiveness to the ability to participate successfully in this process of globalization and regionalization and the increased spending in both developed and developing countries on research and development.

It goes on to state that, " In spite of this, however, it has proved impossible to exceed the growth rate of productivity recorded in the 1950s and 1960s. One possible explanation is that the emerging technological paradigm requires that enterprises, institutions and policy be so thoroughly overhauled that the effects of the new pattern will be felt only to the extent that these changes actually occur."<sup>16</sup>

While this is happening, comparative advantage based on the availability of natural resources is declining. Developing countries are therefore increasingly faced by the challenge presented by the new paradigm and the simultaneous erosion of the basis for their traditional comparative advantages. New forms of competitive behavior, which enable developing countries to capture key niche markets based on their own strengths, and to capture a greater portion of the value-added chain are called for, though it is as yet unclear as to whether this a feasible option for some countries, given their heavy debt burdens, weak infrastructures, shortages of human technical skills and lack of access to technology.

## 2. New Principles of Efficiency

The capabilities a firm needs to become globally competitive are being redefined in ways that offer both challenges and opportunities for ESID. Emerging principles of efficiency such as Just in Time, Zero Defect, Total Quality management and Concurrent Engineering have created financial incentives to reduce waste, improve equipment maintenance, improve process efficiencies and decrease energy consumption - all of which go hand in hand with the goals of ESID. Common to all these new approaches is a "process focus" which emphasizes continuous improvement throughout the manufacturing process. This is what distinguishes and ESID approach from an "end of pipe" approach where the problem is treated after it has occurred. In this sense, the basic assumptions and beliefs underlying the new efficiency principles for manufacturing are very close to those underlying ESID.

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<sup>15</sup> ECLAC, "Sustainable Development: Changing Production Patterns, Social Equity and the Environment", LC/G.1648 (CON.80/2), 18 January 1991, United nations

<sup>16</sup> ECLAC op. cit. p. 90

In many industries, a new efficiency principle - economy of scope - is emerging to replace economies of scale as the essential means of reducing production costs and enhancing flexibility and responsiveness to market demand. In a 1986 study<sup>17</sup> of flexible manufacturing facilities, Jaikumar concluded that globally competitive production could be carried out by as few as six people operating a single integrated workstation and producing a variety of tailored products. The growth of such small scale enterprises has important implications for ESID, as well for industrial development per se. In the industrialized nations, small technologically sophisticated firms are producing more jobs than the manufacturing giants and are becoming increasingly important as sources of innovations and suppliers to larger firms. For many developing countries, the small and medium scale sector similarly holds the potential for enhanced job creation.<sup>18</sup>

### 3. Technological "Multipolarity"

On another level, technology is proliferating and sources of technical innovation are expanding rapidly. Whereas the U.S. was once the main source of new technological improvements, Japan and Germany, as well as other OECD countries, and some of the NICs are now important sources of innovation. At the same time, firms are becoming more aggressive in seeking proper "rents" for their technological know-how, and as such, access to these technologies by developing country firms has not become easier simply as a result of technological "multipolarity" (the proliferation of potential sources of technology). This in turn is reflected in the on-going debates over international technology transfer and intellectual property rights, and the increasing need for mechanisms to facilitate the monitoring, assessment and sourcing of technologies on an international scale by developing countries.<sup>19</sup>

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<sup>17</sup> Ramachandran Jaikumar, "Post-Industrial Manufacturing", Harvard Business Review, Vol. 64, No. 6, 1986, pp. 69 -76

<sup>18</sup> UNIDO estimates that in developing countries, the formal small and medium size industrial sector contributes between 10 - 20% of industrial output but absorbs 40-60% of industrial employment.

<sup>19</sup> Technology Sourcing and Intelligence (TSI) is already an important activity for large transnational corporations, many of which have specialized TSI units directly reporting to corporate headquarters. Because of the increased importance of technology to competitiveness, and the enlarging sources of new technology, many TNCs have recognized the need to establish formal strategic endeavors to optimize the value of technology developed outside the company. On the other hand, several companies are also setting up internal technology licensing units to perform the opposite

#### 4. Trade and Environment

There are also important shifts in international trade policy that have implications for developing countries. As industrialized countries become more stringent with their environmental regulations and establish environmental standards for imports, developing countries face increased non-tariff barriers to the exports of their products to these markets.

As such, the implementation of environmentally justified restrictions on imports or exports of products results directly in constraints on international trade. Numerous examples exist of such restrictions.<sup>20</sup> As both trade and environmental issues become more international in scope, there is an increased potential for conflict between trade and environmental objectives. These conflicts are likely to revolve around concerns over the above mentioned trade effects of environmental regulations, as well as with natural resource depletion and trade practices, and the interactions between trade practices and international flows of technology.<sup>21</sup>

Many of these issues are now being raised within international fora, most notably the GATT. For example, Austria, on behalf of the European Free Trade Association (EFTA) members, proposed that GATT Council convene the 1971 Working Party on Environmental Measures

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function, to license out internally developed technologies for which the corporation has no use in an effort to recover some of the R&D and related costs. There is also a growing number of "technology brokers" and technology sourcing consultants who provide such services to companies, and more frequent technology "fairs" and shows. Taken together, this indicates an emerging technology marketplace, in which technology is bought and sold much as any other commodity. Developing countries could benefit by participating in this marketplace through the establishment of technology sourcing mechanisms, perhaps at the national or sectoral levels.

<sup>20</sup> For example, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), administered by UNEP. Various countries have imposed unilateral bans on furs, skins, leather products etc. In the industrial area, the Basel convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (adopted March 1989) and the Montreal protocol on Substances that Deplete the Ozone Layer (1988) have included restrictions which impact on countries that are not signatories to the conventions. See, Ebba Dohlman, "The Trade Effects of Environmental Regulation", OECD Observer, Feb - Mar 1990, pp. 28 - 32

<sup>21</sup> OECD, The State of the Environment, Paris, France, 1991

and International Trade in recognition of the wide disparities in environmental policies between countries and the likelihood of trade disputes. However, there is a feeling, mainly among developing countries, that perhaps GATT is not the appropriate forum in which to discuss environmental matters.<sup>22</sup> Much of this should, of course, be seen within the broader context of the status of the Uruguay Round and the broader set of conflicts that characterize these discussions.

## KEY ISSUES IN INTERNATIONAL COOPERATION FOR ESID

### 1. Integration of Economic and Environmental Analyses

The historic externalization of costs associated with the free use of "common goods" has led to economic measurement mechanisms at the firm, national and international levels that exclude the calculation and equitable allocation of these costs.

#### (a) Firm Level Considerations

At the firm level, the internalization of previously externalized costs requires complex new accounting standards and management tools. Issues related to this task include accounting for and allocating environmental expenses, determining the cost and likelihood of potential liabilities and the role of environmental audits.

There are no comprehensive accounting standards or widely accepted guidelines in the area of firm level environmental protection measures and few firms report detailed environmental data in their annual reports. A recent study by the Commission on Transnational Corporations<sup>23</sup> identified several reasons for non-disclosure including a lack of incentive to record liabilities, avoidance of measures that reduce income resulting from shareholder pressures to maintain high earnings and difficulty in separating environmental costs from other costs specifically in the case of investments.

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<sup>22</sup> See, for example, "Environment Initiative Sparks Debate on GATT Role", GATT Newsletter, 78, January - February 1991 and "Environment and Trade", GATT Newsletter, 77, December 1990.

<sup>23</sup> Commission on Transnational Corporations Economic and Social Council, "Accounting for environmental protection measures - Report of the Secretary-General," Program of work of the intergovernmental working group of experts on international standards of accounting and reporting: discussion of accounting and reporting issues identified during the eight session, United Nations, 11 February 1991.

In addition to difficulties related to defining what constitutes environmental expenditure, many environment related costs that are incurred are not allocated in a manner that would lead a manager to the more environmentally sustainable solution. For example, the costs of disposing toxic wastes may not be allocated to individual plants or profit centers responsible for producing the waste. As a result many opportunities for pollution prevention at the plant level, that would decrease the cost of waste disposal, are simply overlooked. Accounting mechanisms and incentive structures need to be reevaluated such that they support rather than inhibit or undermine environmentally sensitive decision making.

Another area of difficulty is the determination of reasonable estimates of future environmental obligations and liabilities. Uncertainties related to the cost and availability of future remediation technology and as yet unknown changes in laws and regulations, make it very difficult to estimate such costs and the likelihood that they will be incurred. Further research and guidance is clearly needed in this area if firms are to provide consistent and realistic disclosures. Guidance is also needed to assist firms in implementing the matching principle in which costs of remediation are matched with the revenues received from the products which are responsible for the waste.

The concept of "environmental auditing" has received a great deal of attention in discussions of firm level responses to environmental issues. There is some confusion however, as to whether the term refers to an internal management tool or an external auditing device. The International Chamber of Commerce in its booklet entitled "Environmental Auditing" defines the term as "a management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing with the aim of helping to safeguard the environment by:

- facilitating management control of environmental practices;
- assessing compliance with company policies, which would include meeting regulatory requirements."

The ICC's position that an environmental audit should be a purely internal management tool is not shared by all constituencies. There does, however, appear to be general agreement that they will play a significant role in firm level management of environmental issues.

Although guidelines for the accounting of environmental expenditures and liabilities are needed and a generally agreed upon role for environmental audits is necessary, they are simply tools that should be used in the service of well defined and articulated

corporate policies and strategies. In order to incorporate ESID into a company's operations, firms must develop a corporate culture supportive of both disclosure and creative solutions to environmental challenges.

#### (b) Policy Instruments

National governmental policies play a significant role in influencing firms to internalize environmental costs. The high costs of enforcement, the complexity of regulatory structures and the inability of command and control regulatory regimes to inspire technological advances beyond government requirements has led to the creation of market based approaches. Unlike regulatory instruments in which firms are either in compliance or not, economic instruments attempt to create a situation in which actors are free to choose among several alternatives. If the instruments work effectively, the most economically attractive alternatives are also the most environmentally sound.

According to the OECD's 1989 report, "Economic instruments for Environmental Protection", economic instruments fall into FIVE categories: charges, subsidies, deposit-refund systems, market creation and financial enforcement incentives. Charges are often designed as service fees and include effluent charges paid on discharge into the environment, user charges for treatment of effluent, product charges laid on the price of a finished product, administrative charges levied through registration fees and tax differentiation measures which favor environmentally friendly products over their competitors.

Subsidies aimed at motivating polluters to change their behavior include grants, low interest or "soft" loans and tax allowances. Deposit-refund systems encourage recycling or reuse by adding a refundable surcharge on potentially polluting products. Market creation instruments create markets for polluting rights. Examples include emissions trading, which provides an economic incentive to go beyond what is required by regulations, market intervention such as price guarantees designed to protect markets for valuable residuals or products capable of re-use, and liability insurance which results in lower premium costs for more environmentally sound processes.

Financial or enforcement incentives are designed to punish polluters for non-compliance. Non-compliance fees are one such mechanism. Charges are based on the profits made as a result of non-compliance. Performance bonds are a second instrument in which payments are made prior to compliance and refunded when compliance is achieved.

In practice, a hybrid regulatory system is emerging within OECD countries in which command and control regulations are used to meet long term performance objectives and economic instruments are

used to provide cost effective means of implementing change.

It is important to recognize that economic instruments can only work effectively within market-based economic systems that work efficiently. Government subsidies and policy interventions that distort market prices, specifically with regard to natural resource, often lead to market failures that undermine economic instruments designed to meet environmental objectives. As a result, policy integration aimed at institutionalizing environmental values into economic thinking and policy making across all government sectors is essential if progress toward ESID is to be achieved.

(c) Natural Resource Accounting

At the national and international levels, the lack of effective methods of resource accounting hinder a country's ability to effectively gauge the success of policies aimed at achieving ESID.

The United Nations System of National Accounts (SNA) methods of calculating Gross Domestic Product figures are inadequate in determining sustainable income. Two major areas of concern are that GNP calculations add the cost of "defensive expenditures" (those costs incurred to offset unwanted environmental effects of production and consumption)<sup>24</sup> as income and that they fail to calculate and subtract costs related to the depletion and degradation of a country's natural resources. As the World Resources Institute notes in its June 1989 publication "Wasting Assets: Natural Resources in the National Income Accounts,"

"A country could exhaust its mineral resources, cut down its forests, erode its soils, pollute its aquifers, and hunt its wildlife and fisheries to extinction, but measured income would not be affected as these assets disappeared."<sup>25</sup>

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<sup>24</sup> Lutz, Ernst and El Serafy, Salah. 1988. "Environmental and Resource Accounting: An Overview", The World Bank, Environment Department Working Paper No.6.

<sup>25</sup> Robert Repetto et al, "Wasting Assets: Natural Resources in the National Income Accounts", World Resources Institute, Washington D.C., 1989, p.

A recent World Bank survey of resource and environmental accounting in industrialized countries<sup>26</sup> identified four types of alternative approaches to dealing with GNP calculations. These were the identification and reclassification of pollution abatement and other environmental expenditures, physical resource accounting which tracks changes in resource stocks using physical units of measure, subtraction of natural resource depletion from GNP using monetary valuations, and a comprehensive restructuring of accounts to accommodate resource accounting in both physical and monetary terms.

The different approaches surveyed by the World Bank differed significantly in complexity and breadth of coverage and the implications for developing countries is unclear. Although developing countries can learn from the work being done by industrialized countries<sup>27</sup>, the appropriateness of different approaches will be country specific and successes determined on a country by country basis. As no definitive solution to the lack of a sustainable GNP is likely to be found in the near term, developing countries should seek to develop their own systems. In addition, given the high levels of resource dependence and environmental degradation in some developing countries data collection should begin immediately even if resource accounting systems are not yet finalized.

#### (d) Implications for International Cooperation

The interconnected nature of international economics, environment, and trade coupled with the complexities resulting from overlapping policy making bodies within and between countries can create significant barriers to international cooperation in achieving ESID. It does not necessarily follow, however, that strict harmonization of firm level accounting standards, national and international economic-environmental policies and national accounting practices are appropriate short to medium-term goals.

Different policy instruments and firm level and national level accounting systems will be appropriate dependent on a country's specific circumstances such as the level of natural resource dependency and the efficiency of its markets. The value of

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<sup>26</sup> Peskin, Henry M. and Lutz, Ernst. 1990. "A Survey of Resource and Environmental Accounting in Industrialized Countries," The World Bank. Environment Working Paper no. 37.

<sup>27</sup> Of particular interest is the successful application of Robert Rapetto's approach in Indonesia which is under consideration in China, Costa Rica, and the Philippines and the United Nations Statistical Office's (UNSO) planned "handbook" guide to potential pilot projects designed to test the feasibility of their system.

harmonization, or perhaps as suggested by the OECD "coordination,"<sup>28</sup> is dependent on the issues at stake in a specific situation. For example, in some situations general agreement on common principles such as the "polluter pays principle" is sufficient to avoid international conflicts of interest. Other issues such as global and transfrontier pollution problems may require strict harmonization of policy instruments.

In the long term a new System of National Accounts (SNA) which incorporates ESID and firm level accounting standards that isolate and allocate environmental expenditures and liabilities are necessary for benchmarking, policy making etc. In the mean time the lessons learned from experiments with alternative approaches will be essential to the development of such common principles and guidelines.

## 2. Environmental Sustainability and Industrial Activity

### (a) Defining Environmental Sustainability

For industrial activity to be environmentally sustainable, sustainability criteria need to become an integral basis for decision making with regard to industrial development. This immediately raises a problem because as yet there is no universally accepted definition of sustainability except in the broadest of terms<sup>29</sup>. An operational definition of sustainability for the industrial sector is needed, one which is specific enough to be meaningful to decision makers and managers, and comprehensive enough to be applicable to a wide range of industries in a variety of countries. It should also be pertinent to different scales of industrial operation - from small enterprises to large multinationals. Admittedly this is a difficult task, and may in fact be impossible. An alternative may be to take a more empirical approach - to analyze specific instances of industrial activity that demonstrate sustainable behavior in a number of settings, and to glean from these the essential principles of sustainable industrial development.

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<sup>28</sup> "Guidelines for the Application of Economic Instruments in Environmental Policy," Environment Committee Meeting at Ministerial Level, Organization for Economic Co-operation and Development, Paris, January 1991.

<sup>29</sup> According to the OECD, there are at least 64 definitions of sustainability extant. Wisely, no attempt is made to add one more. Instead, the OECD identifies several economic principles that underlie the concept of sustainability.

(b) Firm Level Barriers

Apart from the problems of definition, there is the problem of acceptance of the tenets of sustainability by industrial firms. Traditionally, firms have evolved without having to pay too much attention to the long term effects of their activities on the environment. This was not as a result of any malicious intent, but the fact that the reward and incentive structures and legislative norms did not encourage such behavior. More recently, tighter environmental legislation has altered this scenario somewhat, but for the most part these "command and control" mechanisms tend to be viewed with some resentment by industry. Proper resource pricing and market based mechanisms are now being viewed with more favor than the "command and control" types, though the ideal may be a hybrid mix of policy options<sup>30</sup>. In any event, there is general agreement that measures are needed to address problems created by "market failures" and "government intervention failures". In developing countries, this is further compounded by a lack of information on environmental effects of industrial activity and poor or ineffective monitoring systems.

The basic challenge is to create a situation in which it is in the best interest of industry to pursue sustainable activities - to enable industry to internalize what have conventionally been treated as externalities to the extent possible. This can be achieved through economic measures such as proper pricing and incentive schemes, getting markets to function properly, through appropriate forms of education and training and by enlightened policies for promoting more productive relationships between the public and private sectors, such that channels of communication are kept open and flexible. Organizations such as the International Chamber of Commerce, manufacturers associations, and industry special interest groups become very important in this regard.

In an operational sense, several industrial activities need to be examined from the viewpoint of sustainability.

For example, the sourcing of raw materials and products by large corporations (either domestic to developing countries or TNCs), may involve environmentally unsound practices such as intensive land use and deforestation (as in the case of beef farming and cash cropping), "dirty" production processes (sometimes as a result of weak environmental standards in the host country, which in turn allow for lower production costs and hence appeal to large customers faced with tighter regulations in their own country) and intensive raw material extraction (perpetuated by falling commodity prices).

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<sup>30</sup> See OECD, " " for a detailed 18D of this issue.

The entire system of customer-supplier relationships and modes of sub-contracting needs to be examined from an environmental perspective. On the one hand, the purchasing power of large customers (TNCs, large national corporations, government agencies) could be harnessed to influence the environmental soundness of industrial suppliers. On the other hand, though, the very ability to manufacture under low environmental standards may be the competitive advantage that makes these suppliers attractive in the first place, and the imposition of environmental requirements may erode this advantage.

Another problem is the lack of acceptable international standards for industrial products and processes, which would enable the "benchmarking" of products on an international scale. The issue is further complicated by the fact that most environmental standards for manufactured goods apply to the final product itself, and not to the process by which it is manufactured. Environmental labelling schemes also tend to suffer from this drawback. As a result, products that prima facie are "green" can appear on the market even though the processes by which they are made have negative environmental effects.<sup>31</sup> In developing countries, where consumer awareness of environmental issues is generally lower, and monitoring of labelling practices is weak, are other factors to consider in the effectiveness of labelling schemes.

Even where there is a recognition for the need for sustainable industrial activity, the lack of information about alternatives in terms of inputs, technologies and processes remains a barrier for most developing country firms. Improved availability of information on environmentally sound options and alternatives is essential to the achievement of ESID in developing countries, with an emphasis on practical and proven information and technology. In this regard, the clearinghouse role of the International Environmental Bureau is a noteworthy initiative.

### (c) The "Development Imperative"

An issue that can potentially confront the sustainability concern directly is what may be referred to as the development imperative - the pressing importance in developing countries to alleviate the problems of poverty, unemployment, malnutrition etc. The Brundtland report makes it quite clear that sustainable development refers to development with equity and growth, and not at the expense of either. Yet, there are clearly situations where

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<sup>31</sup> There are some efforts, however, to address this problem. The "Position Paper on Environmental Labelling Schemes (ELS)" of the international Chamber of Commerce notes that many programs include labelling of products to describe appropriate use and disposal practices, emergency response procedures, control of waste disposal methods, training programs etc.

the interest of environmental soundness may not coincide with the priorities of reduction of poverty and unemployment. For example, any efforts to reduce the levels and rates of extraction of raw materials in developing countries must address the fact that for many countries the natural resources sector is the largest component of the economy, and that any shrinkage of this sector will result in the elimination of jobs and incomes for large sections of the population, unless compensatory actions are undertaken.

This tension between environmental sustainability and the "development imperative" can potentially be resolved, but only if there are drastic changes in the structure of global economic relationships - in trade, technology transfer, tariffs, etc. In this context, the South Commission stresses:

"Fast and sustained economic growth is an inescapable imperative for the South. A rapidly expanding production of goods and services is the only material basis for improving the well-being of its people. It is estimated that 360 million persons will be added to the labor force of developing countries in the 1990s. Only rapid economic growth can ensure that they will have the chance of earning a decent livelihood. A slow rate of growth will condemn developing countries to increasing poverty and under-employment... The process of growth has to be oriented so as to raise the income and productivity of the poor and to promote a sustainable use of the scarce natural resources and the environment. All this requires a careful examination and modification of the development strategies of the past".<sup>32</sup>

#### (d) Policy Integration and Coordination

Finally, and related to the above, policies oriented towards ESID need to be developed and implemented in coordination with other national policies with respect to, for example education, health, agriculture, foreign trade, technology etc., lest advances in one domain are thwarted by negative consequences in other areas. The World Commission made a special point of the need for better integration of environmental and sectoral policies and for tools and methods to ensure that the "environment" is not simply tacked on to existing policies. In particular, price support systems, subsidies and regulations affecting the use of natural resources that tend to skew economic activities in directions harmful to the environment need to be closely examined. The protection of non-competitive industries, which are often polluting as well, needs to be reassessed. and a balance found between the need to preserve jobs and income in the short term, and achieve ESID in the long term. In many cases, improved access to technologies, better

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<sup>32</sup> The Challenge to the South, The Report of the South Commission, Oxford University Press, 1990, pp. 82 -83.

environmental training, and appropriate policies could contribute significantly to a smooth transition to ESID without an adverse effect on growth, income generation and employment creation. The evolution of an "environmental industry" based on new techniques for pollution prevention, recycling, waste disposal, etc. could itself offer developing countries windows of opportunity to enter into commercially viable, job producing activities which are also environmentally positive.

A particularly important issue in this context has to do with the environmental impacts of the Structural Adjustment Programs (SAP) that many developing countries are pursuing. The strict conditionality imposed on loans from the World Bank, which has been a champion of SAP, takes little account of the social and environmental consequences of these programs. As Jim MacNeill, Secretary-General of the World Commission on Environment and Development notes,

"...structural adjustment programs, as such measures are known, have taken no account of their potential impact on the environment and ecological resources of the country concerned. Measures to reduce budgetary deficits often have a disproportionate impact on such resources. With little else to fall back upon, resource based economies have to draw down on their ecological capital even faster than they would otherwise in order to earn the foreign currency required for debt repayment...Policies requiring industry and local government to introduce pollution control measures and programs aimed at providing clean water, sewerage and sanitary facilities are ...dropped or not implemented".<sup>33</sup> The World Bank is now attempting to address this issue in its lending programs, but the issue points to the need for a careful reappraisal of the policies of international financial mechanisms and their implications for the environment.

### 3. The "Commons" and Industrial Development

The global commons are defined in Our Common Future as "those parts of the planet that fall outside national jurisdictions."<sup>34</sup> Common goods or "free goods" such as the air and the oceans that are held in common but can provide individual benefits to those who use them are vulnerable to over exploitation and degradation.

Issues related to the degradation of the commons can more specifically be seen as issues related to the problem of open

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<sup>33</sup> Jim MacNeill, "Strategies for Sustainable Economic Development", Scientific American, September 1989, p. 164.

<sup>34</sup> WCED, op. cit. p.261

access and of difficulties in managing common property. The commons problem which is composed of the two elements of non-exclusivity and the pursuit of individual gain are closely tied to exclusion and coordination costs.<sup>35</sup> If the cost of coordination is high and the cost of exclusion is low, property tends to be held privately. When the reverse is true, property tends to be held in common. High exclusion and coordination costs leads to open access which is problematic when resources become scarce and when access to markets provides opportunities for private gain.

(a) Managing the Commons

The recognition of scarcity when exclusivity is very costly or impossible (as in the case of air and often water) leads to the development of institutional mechanisms such as taxation, quantity controls, privatization and nationalization. This shift away from open access to management mechanisms has significant implications for international cooperation in achieving ESID including high monitor and control costs, resistance by large and often powerful users and difficulties in determining an equitable distribution of access to resources.

These issues are of particular concern given the North's intensive use of the commons as compared to the South. Industrialized countries are the major contributors to global environmental problems such as air and water pollution, CFC generation and other green house gas emissions. Having pushed the earth's ecosystems to their limit, industrialized countries who are largely responsible for having created the problem are asking developing countries to refrain from advancing their economies through similar patterns of industrialization.

International cooperation to maintain the global commons is also hampered by scientific uncertainties surrounding the impact of industrial activity on natural ecosystems. For example, the unknown relationships between green house gases, clouds, oceans and global climate change coupled with the inherent unpredictability of weather patterns makes it impossible to state with complete certainty that wealthy countries must drastically reduce carbon emissions for the good of maintaining the commons. In addition, the uncertainties related to the cost and availability of technologies that would enable them to make such a transition make it difficult to determine the appropriate level of carbon tax or the level of reductions attainable in any given time frame.

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<sup>35</sup> See Magrath, William. 1989. "The Challenge of the commons: the Allocation of Nonexclusive Resources." The World Bank. Environment Working Paper No. 14. for an analysis of economic theory as it relates to the "tragedy of the commons."

Moreover, once the type of management mechanism is chosen, whether it be through some form of private ownership or through commons management, decisions must be made as to how resources can be managed to achieve sustainability. Intergenerational use of the commons becomes an important issue and the efficacy of using discount rates to make resource use decisions comes into question. The use of very high discount rates that all but negate the ability of future generations to meet their needs brings us back to the open access situation in which depletion and extinction are inevitable.

#### (b) Firm Level Commons Issues

At the firm level companies seeking to acknowledge and avoid a "tragedy of the commons" can do so by reevaluating and lengthening the payback period required of environmental projects and investments. Thorough consideration should be given to longer term issues and the concerns of all relevant constituencies when using net present value calculations for project evaluation. Firms can also design programs aimed at instilling a sense of respect for the commons and promoting the concept of sustainable development within the work place. Employee education and PR programs can be used to align the company's values with those of its constituencies and support creativity in the pursuit of environmentally sound innovation. Company initiatives such as 3M's "Pollution Prevention Pays" program and the Chemical Manufacturers Association's Responsible Care program are good examples of such approaches. In international terms, maintaining the global commons requires firms to assess local level activities in terms of their impact on the commons.

Although the internalization of the tenets of sustainability at the individual and firm level will foster innovation beneficial to both companies and their communities, internal firm level economics will depend heavily on national and international environmentally focused market interventions, fiscal policy and regulatory structures.

#### 4. ESID and International Competitiveness

While concern over achieving ESID grows, this is occurring within a context of increasing emphasis on the international competitiveness of firms. As the ECLAC report notes, "International competitiveness based increasingly on the incorporation and dissemination of technical progress in a context in which great economic and political value is attached to environmentally sustainable development in many parts of the world will probably be one of the hallmarks of the 1990s" (p.89). There are several important dimensions to this issue:

(a) The Changing Basis of Competition

Firstly, the bases of competition are themselves are changing. The new form of competition is based on principles of continuous improvement, flexibility, customer responsiveness, total quality management and new inter-firm arrangements.<sup>36</sup> The production philosophy underlying these new principles has taken hold more firmly in the industrialized nations, particularly those dependent on foreign oil. As Best notes (p. 3), "Faced with surging energy bills and fearing depreciating currencies, enterprise managers and economic policy makers concentrated their attention on strategies for advancing export revenues from manufacturing". In this sense, the emergence of the new competition is at least partly in response to an economically experienced environmental condition. However, this does not logically imply that the new form of competition is implicitly compatible with the principles of ESID.

(b) Implications for Developing Countries

The second aspect relates to the potential role for the developing countries. Clearly, some countries, such as the Four Tigers, have made rapid advances by pursuing a mix of policy measures aimed at maximizing their competitive position in key markets and industries in the global economy. But the more general question of whether developing country firms can stand to gain by incorporating these new principles and the enabling technologies remains relatively unexplored. Viewpoints range from those who claim that the advent of the new technologies based on flexible specialization will make it more difficult for developing countries to compete - because access to technology will become more difficult, to those that emphasize the "soft" aspects of the new paradigm of competition, and claim that these new principles are within the grasp of developing countries and can yield relatively large competitive gains.<sup>37</sup>

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<sup>36</sup> Several authors have examined this changing pattern of competitiveness in the global economy, including Michael Piore and Charles Sabel, The Second Industrial Divide: Possibilities for Prosperity, Basic Books, New York, 1984; Carlota Perez, "Technical Change, Competitive Restructuring and Institutional Reform in Developing Countries", The World Bank, Strategic Planning Review, Discussion paper No. 4, December 1989; Michael H. Best, The New Competition: Institutions in Industrial Restructuring, Harvard University Press, Cambridge, 1990; and Michael E. Porter, "The Competitive Advantage of Nations", Harvard Business Review, March - April 1990;

<sup>37</sup> See, for example, Kurt Hoffman, "Technological Advance and Organizational Innovation in the Engineering Industry", World Bank Industry Series Paper, No. 4, March 1989.

(c) Lessons from the NICs

Admittedly, significant growth has been achieved in many developing countries over the past generation, but it has not come easily. The "success" stories, such as the Asian NICs, have greatly increased their economic strength, but at significant environmental cost. It could be argued that in these instances, the environment has been traded for industrial growth. It is only relatively recently that countries such as South Korea and Taiwan have enacted stricter environmental legislation and policy and are actively encouraging local firms to acquire environmentally sound technologies.<sup>38</sup> Both countries have government agencies dedicated to environmental regulation and monitoring - the Environmental Protection Agency in Taiwan and the Environment Administration in South Korea. The following extract from a recent article about Taiwan's environmental legislation is revealing:

"Decades of neglect and industrial growth have turned Taiwan into one of the most polluted places on earth. The government, in response to a public outcry, has changed its policy in the last few years: instead of emphasizing economic achievement only, it will balance environmental considerations with commercial concerns.

Currently, Taiwan is the thirteenth largest trading nation in the world and second only to Japan in foreign exchange surplus. The Island has prospered as a nation known for its abundant cheap labor and business unfettered by environmental regulation. This reputation attracted major international investment and trade. With the worsening ecological situation and the emergence of a vocal environmental movement, an environmental regulatory scheme is now being developed that will affect industrial and commercial activity on and with the Island."<sup>39</sup>

The article also notes that the effects of such legislation on the economy and on its attractiveness to investment is uncertain, but given Taiwan's rich financial reserves, such short term costs could be absorbed.

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<sup>38</sup> For example, the U.S. Trade and Development Program has sponsored a number of "reverse trade" missions from Korea and Taiwan in the pollution control and waste treatment areas. In this case, of course, there is an underlying interest in promoting the sale of U.S. environmental technologies and products, but it does indicate how issues of ESID and international are intertwined.

<sup>39</sup> Michael Scott Feeley Esq. "Environmental Protection: New Regulations Changing the Way to do Business", East Asian Executive Reports, November 15 1990, Washington D.C. pp. 15-17

But Taiwan, and the other NICs are in a different situation than most of the developing world in that they enjoy a certain level of economic strength. For these "latecomer" countries, continued and rapid industrialization is essential to their survival, and the concern over environmental sustainability simply adds one more dimension of complexity to their problems. In many of these countries, the natural resources sectors are major components of the economy. In Argentina, Chile and Venezuela 75% or more of the 10 largest enterprises, with sales totalling close to 30% of GDP, are in the natural resources sectors. In Brazil and Mexico, the sale of the 10 largest corporations amount to 15% of GDP and close to 60% are associate with the natural resources sectors.<sup>40</sup>

#### (d) Constraints for Developing Countries

Thus, though developing countries recognize, as well as the industrialized countries, the need for ESID, the means of achieving it in the context of changing patterns of international competition are unclear. The traditional bases of competition for the developing countries, natural resources, cheap labor and large domestic markets are not completely eroded, and will continue to influence industrial activity in the developing countries. And for most developing countries, faced with the need for foreign exchange, and burdened by large populations, external debt and declining terms of trade, the pursuit of industrialization based on their traditional sources of comparative advantage is not an option but a necessity. Yet, this has serious environmental implications that must be addressed in order to move towards more environmentally sustainable industrial development in developing countries.

Additional difficulties include: a lack of options for alternative forms of industrialization; lack of access to the technologies and financing needed to undertake ESID type of activities; an international commodities market that continues to work against their interests, and a series of protectionist and regulatory barriers in the industrialized countries that hinder their capacity to develop their export potential in non-natural resource based industries. For example, there is the issue of quotas governing imports of textiles and garments. These are relatively labor intensive industries that could serve as options to many developing countries striving to move away from a dominant dependence on natural resource based industry. Yet, there are limits to how much can be imported into the industrialized countries.

Furthermore, as the OECD countries enact tighter environmental legislation, "One important consequence of this may be the already perceptible emergence of protectionist barriers raised on the

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<sup>40</sup> ECLAC 1991, p. 93

assumption that other countries have failed to comply with environmental standards relating to products, manufacturing processes and raw materials".<sup>41</sup>

In this context, international fora for negotiations about the rules and norms of international trade - GATT, GSTP and international trade associations are critical to the success of ESID. It is in these fora that issues related to environmental regulations as they affect imports and exports can be discussed and hopefully resolved.

(e) Harmonization of Standards

The harmonization of environmental standards could also be discussed in these fora. Within the OECD, some attention is already being given to international differences in environmental standards in such areas as automobile products and chemicals with a view to avoiding their leading to non-tariff barriers. Uneven standards lead to trade distortions with potential negative environmental consequences.

In this regard, the position of the U.S. EPA, as stated in a recent report, is noteworthy:

"Internationally accepted standards to limit the exchange and use of polluting products and technologies could clearly help to achieve the goal of global environmental protection. The Board believes that the U.S. should spearhead a movement toward the adoption of environmental standards, both health and performance based, by all nations, covering imports and exports of products, equipment and processes...The U.S. government should also stress the need to incorporate sound environmental standards in the agenda for the next GATT round. An effective first step toward a leadership role would be the imposition of such standards on American suppliers".<sup>42</sup>

At present there is wide disparity in standards, stemming partly from differences in industrial structures and environmental goals. In the developing countries, additionally, the harmonization of standards must also deal with the deep set problem of enforceability due to a lack of required skills and institutional structures.

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<sup>41</sup> ECLAC 1991 p. 94

<sup>42</sup> U.S. Environmental Protection Agency, "Final Report to the Administrator of the U.S. Environmental Agency from the International Environmental Technology Transfer Advisory Board", Washington D.C. 1990 p.15

Environmental labelling, discussed earlier, also needs to be standardized and harmonized. In many instances, "green product advertising and environmental labelling have developed in a frequently uncontrolled and misleading fashion".<sup>43</sup> Differences in labelling schemes can be a source of distortions and problems in international trade and this is an area again where international cooperation is required. In the industrialized countries, industries which have been able to develop products that are environmentally sound or "friendly" have gained a competitive advantage in some areas. On the other hand, poor labelling of products from developing countries can have a negative impact on their attractiveness to consumers in industrialized nations. A standardized system of labelling would be an important step in overcoming such problems.

(f) Trade and Environmental Regulations

As discussed earlier, an examination of the trade policy implications of environmental regulations would be very valuable. Though there is no clear evidence at the moment that tighter trade regulations have an adverse impact on trade, it is only reasonable to expect, as the ECLAC report points out, that this can lead to non-tariff barriers to exports from developing countries.

(g) Emerging Opportunities in the Environmental Area

Looking at the issue from another perspective, the growing concern with environmentally sustainable alternatives could yield specific but time bound opportunities for developing countries. A new "environmental" industry is emerging, involving waste treatment, recycling, energy efficient alternatives etc. This market could offer entrepreneurs in developing countries the opportunity to enter new areas of business. Every new piece of legislation aimed at controlling or preventing environmentally adverse activities leads to a demand for new goods and services. Though precise figures are not available, the U.S. EPA estimates that 1.7% of U.S. GDP was spent on environmental protection measures. In the Federal Republic of Germany it was 1.5%, United Kingdom 1.3% and France 0.9 (1985 figures).

Furthermore, there is an increasing number of trade shows that focus on environmental services and goods and there do not seem to be serious barriers to entry into this industry. Also, a large percentage of firms that specialize in these services are small or medium sized and therefore may be suitable for developing countries. In sum, while the dynamics and trends in the environmental business are still not well understood, there are good indications that there may exist specific windows of opportunity for developing countries to participate in this business.

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<sup>43</sup> OECD, The State of the Environment, Paris, 1991 p. 274

## 5. ESID and Technological Change

The Brundtland report notes that, "technology will continue to change the social, cultural and economic fabric of nations and the world community. With careful management, new and emerging technologies offer enormous opportunities for raising productivity and living standards, for improving health, and conserving the natural resource base. Many will also bring new hazards, requiring an improved capacity for risk assessment and risk management".<sup>44</sup>

In effect, this summarizes the central issue with respect to technology and ESID, that technology has both the potential for contributing to ESID, and that it can have harmful effects on the environment. The proper approach, therefore, is to pursue strategies and policies for the development and use of environmentally sound technologies, and to undertake measures to minimize the negative effects of environmentally unsound technologies.

Having said this, the technology issue is not quite so simple as implied above. Several factors need to be taken into consideration with respect to technology and ESID.

### (a) Rapid Technological Change

There are rapid advances occurring in a number of areas of technology, information based technology, biotechnology, materials, alternative energy technology etc. In some cases, these changes are associated with dramatic changes in the structures of production patterns and manufacturing systems, for example the development of flexible manufacturing systems. As noted above, the emergence of flexible manufacturing technologies offers the possibility of reducing the scale of manufacturing activities, which could prove advantageous from the standpoint of ESID in developing countries. Industrialization based on mass production has almost always resulted in massive rural - urban migration, leading to overcrowding that outstrips the ability of existing infrastructures to prevent severe environmental damage. The new manufacturing technologies permit the decentralization of industrial activity, which could spread employment opportunities more evenly throughout a country and provide rural areas with an alternative to over-cultivation and deforestation.

In other areas of technological change, for example biotechnology, the environmental consequences, and also the ethical implications of advances in genetic engineering are still being debated. There is concern as well over the implications of advances in biotechnology for the protection of biodiversity, the rights of corporations that have developed new strains or organisms to patent protection, and the rights of indigenous people who have cultivated

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<sup>44</sup> WCED, 1987, p. 217

and developed various crops over generations.

In other cases, such as materials research, there are emerging prospects for the development of new materials which are environmentally more sound and offer sensible options to traditional natural resource based materials.

(b) Intellectual Property Rights

The entire question of intellectual property needs to be examined, and is already a growing issue within the environment context. On the one hand, it is argued that access to environmentally sound technology is essential if developing countries are to achieve ESID. However, the developers of these technologies, in many cases TNCs, seek to receive adequate "rents" for their investments in these technologies - and thus demand appropriate protection of their intellectual property. This translates itself into high costs for acquiring these technologies by developing countries, most of which are already saddled by heavy debt burdens, lack of foreign exchange and poor negotiating capabilities. Add to this the general weakness of technological capabilities in developing countries and the lack of good information on available technologies, and you have a fairly difficult situation.

The IPR aspect of ESID is beginning to be addressed in various fora. For example, UNEP, in cooperation with WIPO organized a meeting of experts to discuss the role of intellectual property in technology transfer within the context of the Montreal Protocol.<sup>45</sup> Particular emphasis was given to the potential role of compulsory licensing, while noting that governments did not have the power to compel industry to market products internally or internationally.

(c) "Soft and "Hard" Technologies

The concept of technology is itself changing to include more "soft" technologies - organizational and managerial techniques that can yield significant efficiency and productivity improvements. To a large extent, the achievement of ESID is compatible with the achievement of ever increasing levels of efficiency in industrial activity. In the past, productivity improvements were seen as largely deriving from improvements in the productivity of capital and labor, (total factor productivity), and through technological innovation (in the sense of hardware). More recently, the importance of "soft" technologies to productivity enhancement has

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<sup>45</sup> UNEP, "Meeting of Experts Organized in Cooperation with the World Intellectual Property Organization on the Role of Intellectual Property in Technology Transfer as Provided for Under the Montreal Protocol", Geneva, Draft Report, 26-27 April 1990. Also, WIPO, "Basic Notions of Industrial Property and Licensing", WO/INF/51, Geneva, April 20 1990.

been highlighted by the success of the "Japanese" model and by the emphasis on "Total Quality Management".<sup>46</sup> These techniques lay heavy emphasis on the productivity enhancing aspects of waste reduction, improved process efficiency, proper maintenance of equipment, optimal utilization of material inputs and efficient materials handling etc., all of which have direct environmentally positive implications.

Hirschhorn<sup>47</sup>, in the context of pollution prevention technology, states, "The software of pollution prevention is as significant as its hardware. Speaking of pollution prevention technology, therefore, is not as meaningful as speaking of add-on pollution control technology. Every detailed study of pollution prevention in the United States has concluded that industrial implementation has been limited more by the soft side of pollution prevention than the absence of technology. Another proof of this is that a few companies have reported impressive reductions in waste generation, whereas the majority of companies in the same industry have not. The difference is not due to technology, government policies, or consumers, but rather to internal management commitment." (p. 3)

The critical need in this regard, therefore, is to enhance the awareness and commitment of management in developing country firms to the potential for environmentally sound industrial development through the implementation of "soft" technologies in addition to the more conventional emphasis on "hard" technologies, and simultaneously facilitate their access to the know-how in these areas. Particularly useful here would be the exchange of

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<sup>46</sup> The other aspect of the change in notions of productivity relates to the proper accounting of resource costs. As Repetto and Pezzey (1990) note, "...whenever productivity is measured as output per worker or "total factor productivity, an important dimension has been ignored -- the efficiency with which the services and materials generated by natural systems are used. Since natural resources and environmental assimilative capacities are limited, the rate of improvement in this environmental dimension of productivity largely determines whether continuing gains in economic welfare can be sustained. In a proximate way, environmental productivity can be measured by levels of output per unit of natural resource input, and per unit of waste discharged. Governments and academic economists should devote the same attention to measuring and analyzing this aspect of productivity as conventional indicators of economic efficiency." (p. 5)

<sup>47</sup> Joel Hirschhorn, "The Technological Potential: Pollution Prevention", Background Paper for the Symposium, Toward 2000: Environment, Technology and the New Century, sponsored by the World Resources Institute and the Organization for Economic Cooperation and Development, Annapolis, Maryland, June 1990

experiences from other developing countries with "soft" technologies that have proved to be environmentally positive.

Finally, it is important to note that while new technologies can play a significant role in achieving ESID, the role of minor, more conventional product and process innovations and creative organizational change should not be underemphasized. There are scores of examples of companies achieving significant productivity and environmental improvements through the introduction of small changes.<sup>48</sup>

(d) Criteria for Environmentally Sustainable Technological Development

This does not, of course, imply that conventional hardware does not have an important role to play in ESID. In this regard, the on-going activities of the U.N. Center for Science and Technology for Development (CSTD) to develop guidelines, analyses and methodologies for environmentally sound technology assessment, and the efforts of the Center for Transnational Corporations (CTC) to develop options for facilitating access by developing countries to environmentally sound technologies are noteworthy.<sup>49</sup> Private corporations are also turning their attention to the development of environmentally sound technologies, as illustrated by the recent decision by Dupont to halt CFC production and develop non-fluorocarbon alternatives.<sup>50</sup>

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<sup>48</sup>       <sup>48</sup> Hirschhorn (1990) for example cites several such examples: "A plumbing equipment manufacturer was producing hazardous from a electroplating line. A significant part of the waste resulted from plating parts which were found to be defective after plating. The simple waste reduction solution: inspect parts before plating rather than afterward...."

Dow Chemical had plans to install a coagulation system to remove suspended solids in large volumes of 'whitewater' in a latex process. The system was estimated to cost \$250,000 in capital and \$70,000 a year in annual landfill costs. The waste reduction solution was simply to implement an intensive maintenance program to improve seals and close off leaks. Only \$10,000 was spent for a tank to hold the remaining latex leakages for recycling back into the process." (p. 15)

<sup>49</sup> Center for Science and Technology for Development, "Environmentally Sound Technology Assessment", United Nations, New York, 1991; and Center for Transnational Corporations, "Options for Facilitating Access by and Transfer to Developing Countries of Environmentally Sound Technologies", United Nations, New York, 1991

<sup>50</sup> F.A. Vogelsberg, Jr., "A Perspective on Technology Transfer and Assistance to Help Less Developed Countries (LDCs) Phase out Chlorofluorocarbons (CFCs)", Dupont Co. October 11 1989,

In a similar fashion, technology policies and firm R&D strategies should be oriented towards the encouragement of environmentally sound technologies. International alliances between firms and research institutes can be a powerful mechanism for achieving such goals. Simultaneously, there is a need to systematically compile an inventory of technological needs in developing countries vis a vis ESID, to overcome barriers to technology transfer (for example resulting from patent protection, high licensing and royalty fees, poor information on alternatives, lack of financing, and limited awareness of environmental problems in industry in developing countries), and to improve the technological capabilities of developing country firms so as to enhance the quality of technology transfer.

(e) Technology Cooperation

Technology cooperation is one of the most important approaches to ESID. Given that many of the needed technological resources for ESID are housed in TNCs or corporations in developed countries, and that the market for ESID type technologies is likely to grow, not only in the industrialized countries but the developing ones as well, it would serve the interests of all parties concerned to encourage and undertake technological cooperation at all levels - governmental and enterprise. A recent paper by the International Environmental Bureau (ABBE), emphasizes the importance of company to company cooperation for achieving ESID.<sup>51</sup>

"The cooperation process should be such that both parties win - medium and long term - socially and commercially, e.g. by each helping the other to obtain access to new markets and by producing goods and services more efficiently and more sustainably. The most successful cases of technology cooperation in business and industry occur when mutual benefit by both contracting parties is maximized.

The successes of technology cooperation associated with cross-licensing arrangements, with technology-equity exchanges, with joint ventures and with strategic alliances show how emphasis should be placed upon the long term commercial and strategic strengthening of both partners rather than upon the immediate narrow financial aspects of the deal" (p. 5)

Cooperation at a broader level is also important, and the experiences of international technology cooperation programs such as Eureka should be examined for their lessons for ESID based cooperation.

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<sup>51</sup> International Environmental Bureau, "Technology Cooperation for Sustainable Development", Paper Presented to WICEM II, 11 April 1991, Rotterdam.

## **CURRENT STATUS OF INTERNATIONAL COOPERATION FOR ESID**

### **1. Overview of Development Cooperation Activities for ESID**

In broad terms, the development assistance agencies in the industrialized countries have begun to give increased attention to environmental concerns in the design of their assistance programs. The Development Assistance Council (DAC) of the OECD has issued guidelines for assessing the environmental impact of assistance projects and has called for an increased commitment by member countries to reduce poverty and control population in developing countries.

However, strains still appear to exist between the donor and recipient communities. At the 1972 Stockholm Conference, developing country representatives insisted that environmental degradation was primarily due to excesses of wealthy countries and that their belated efforts in environmental protection were sapping resources from more immediate development needs. For several years after the Conference, these two issues - development and environment - remained separate issues that competed for financial support. In 1987, the publication of the Brundtland Report, which proposed the new concept of "sustainable development," effectively linked the two issues and opened the door for international cooperation efforts that would foster industrial growth that would be sustainable over the long term because it would not deplete the natural resource base. Both the donor community and the recipient countries are coming to realize that development that requires degradation of the forests, soil, water and air is not really development at all, because it will not improve the quality of life in the long term.

The Montreal Protocol on Substances that Deplete the Ozone Layer is an example of the linkage between environmental and developmental concerns, developed and developing countries, and the public and private sector, that can be achieved under the rubric of "sustainability." The Conference achieved an international agreement on an ambitious timetable to reduce CFC emissions, and provided an additional flow of funds from the donor community to developing countries. The recipient countries agreed to make important concessions in terms of the CFC usage.

Although it is evident that concern within the donor community for improving the environmental soundness of projects is increasing, there is less evidence to indicate that a common understanding is emerging of what environmental improvement actually means. At present, the scientific, technological, political and social understanding of environmental impact is inconsistent. The definition of "sustainable" is not, as yet, sustainable.

International cooperation offers several advantages beyond harmonizing criteria and procedures. It also facilitates the exchange of ideas between participating organizations. Ultimately, the consistency that is required for efficient cooperation must be the result of give and take between countries from all regions. Each country has so far pursued environmental protection in its own way, which has had the negative result of creating a confusing variety of environmental standards, regulations and trade regulations. But it has also given the world about 25 years of experimentation with different policy mixes. Through cooperation, it is possible to take the best from each policy regime.

However, several issues crucial to ESID have yet to be resolved or even addressed by the international community. There is no code of conduct for multinational corporations to guide them in their foreign investment decisions, no global mechanism for monitoring the use and disposal of toxic exports, no consistent regulation of high risk technology transfers, and, above all, there is no mechanism to facilitate the harmonization of national environmental standards for products and processes.

For international cooperation to be successful, there must be broad consensus regarding certain basic issues. Among these are the basic causes of environmental degradation, the minimum acceptable standards for environmental sustainability, and standards for judging the "environmental soundness" of industrial products. DAC members are now in the process of developing common policy orientations regarding programs to assist developing countries to strengthen their environmental impact assessments (EIAs) of the industrial development projects they undertake, harmonizing EIAs of aid supported projects, and exploring ways to address environmental issues for each industrial sector that receives assistance. There is also general agreement on three basic components in aid policy as it affects the environment: the need for additional projects to be added to the aid agenda which have as their sole purpose the upgrading and rehabilitation of the environment; measures to strengthen the ability of developing countries to deal with environmental issues; and EIA procedures that can be incorporated into traditional development projects;.

As regards the first component, new programs have apparently increased rapidly in recent years, but most of them deal with forestry and soil conservation and greatly resemble projects that were once categorized as "rural development." It is not yet clear whether these projects actually represent new initiatives, or whether they are simply a reclassification. Genuine "additionality" will require a net increase in total assistance funds available to developing countries in their pursuit of ESID. The critical lack of capital in most developing countries does not permit a net gain in environmental sustainability without a real increase in assistance programs and investments.

The second component, strengthening the ability of developing countries to achieve environmental sustainability, raises the related issue of "conditionality," which refers to the conditions attached grants and loans for development activities. Conditionality can be used by development assistance agencies and banks to provide ESID related incentives for developing countries in need of capital by requiring, for example, that emissions must be kept below a certain threshold in industries receiving funds.

But it is also important to realize that "strings" attached to funding significantly increase the complexity of negotiating for funding and that conditions force on developing countries by outside funding sources are less likely to become internalized within the local society. From the standpoint of international cooperation, differences in conditionality, which can arise as a result of variation in negotiating skills on the part of recipients, can hinder regional integration and foster the emergence of an "uneven playing field" in global development.

Regarding the third component, all DAC members have adopted some form of EIA for assistance projects and are in various stages of establishing institutional structures to carry them out. Some have identified a particular point in the project design process where the environmental impact is formally assessed. Others have chosen to treat the environment as a cross-cutting issue requiring input at all stages of project appraisal. In the former case, environmental offices or departments have been established within the agency bureaucracy. In the latter, individuals with environmental impact expertise have been placed throughout the organizations.

As of this writing, eleven DAC members have established formal procedures for implementing EIAs for their activities. Others are currently designing procedures. According to the DAC Chairman's annual report for 1990, there is a good deal of harmony among the emerging approaches. Procedures generally involve an initial screening of projects to identify those that have the potential to impact the environment. However, there is some divergence in the criteria used to determine such impact. If the potential for impact is significant, there is an initial environmental examination of the project to determine whether a more extensive EIA is necessary. If an EIA is conducted, the project must incorporate measures to decrease environmental impact and procedures for monitoring impact must be included.

The OECD Council Recommendation of 1985 on "Environmental Assessment of Development Assistance Projects and Programmes" recommends EIA for projects that involve: substantial change in renewable resource use, i.e., converting land to agricultural use, or forest into pasture land; changes in farming or fishing practices; infrastructure; industrial activity, particularly extractive industry; waste management and disposal.

The DAC members that have not yet established formal guidelines, including the EEC, intend to use these DAC guidelines as a model. But even among those members that have formalized procedures, experience in implementing them remains very limited. It is encouraging to note that several development assistance agencies, including ODA in the United Kingdom and AID in the United States, are making extensive use of local consultants in the recipient countries during these early stages, which provides valuable local input not only into developing criteria that will have global application, but in project prioritization as well.

While these procedures are likely to reduce environmental damage, they do not reflect the proactive, systemic approach to sustainable development characteristic of ESID. However, as an initial step, these assessment procedures will expose projects under consideration to closer scrutiny. New approaches to project design, which reduce environmental impact, will eventually become standard. Nonetheless, it must be said that our analysis of development assistance agencies in the OECD countries does not reveal a significant increase in projects that are designed specifically to promote ESID. Rather, the trend is toward preventing negative environmental impact from projects that are otherwise as close to conventional as possible.

## 2. Initiatives within the Development Assistance Community<sup>52</sup>

The US AID and CIDA in Canada have been leaders in the development of country-specific EIA procedures. Of all OECD aid agencies, US AID has the greatest experience with EIA and requires and Initial Environmental Examination (IEE) for all projects. Based on the results, a project is either approved as environmentally sound or subjected to more extensive study.

CIDA adopted an Environmental Assessment Framework in 1986 which has become the basis for EIA procedures in its bilateral branches, the Business Cooperation Branch and the Special Programmes Branch. The procedures apply the same guidelines as the Canadians use domestically. At the initial project identification stage, potential environmental "significance" is assessed using a checklist. Subsequent assessments are conducted concurrently with other feasibility studies prior to project approval. To conduct the assessments, expert staff within CIDA's Environmental Division establish terms of reference for outside consultants who implement the process.

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<sup>52</sup> Much of the material in this section is taken from Development Cooperation: Report of the Chairman of the Development Assistance Committee, OECD, Paris, France, 1990

These two agencies have accumulated the greatest amount of experience with EIAs, but instances in which they are used are relatively rare. In the case of US AID, research, training, extension and institution-building projects are categorically excluded for assessment beyond an IEE. Since the agency currently finances very few capital projects, there are very few assessments beyond the IEE. Approximately 10 percent of all CIDA projects require some form of environmental assessment, but less than 1 percent receive detailed study. Still fewer receive a full scale EIA, which is reserved for very large scale projects or those with transboundary impacts. As a result, there is only sparse data on the effectiveness of EIAs and on the indirect environmental impact of projects that require limited scrutiny, such as training programs that impart skills in the use of industrial processes that may have negative affects on the environment.

Even when screening and assessment procedures are used more broadly, the actual implementation of guidelines by agency personnel can vary significantly. FINNIDA of Finland, for example, developed draft guidelines for EIA for developing country projects in 1987, but discovered two years later that initial screening procedures were not being used consistently. All agency personnel were trained in the use of EIA guidelines during January of 1990. The affect of this training has not yet been assessed. FINNIDA uses relatively extensive environmental assessment at the prefeasibility or project proposal stages, which are integrated with cost-benefit and engineering feasibility studies. The first projects with built-in environmental monitoring and auditing procedures have only recently reached the implementation stage and there are no guidelines as yet for assessing their effectiveness.

Germany, which has had EIA procedures for development assistance projects since 1988, has extensively codified their assessment procedures to achieve greater consistency. Project officers use a detailed document that summarizes the environmental aspects of projects in the areas of land use, infrastructure, mining, industry, trades and crafts and a list of international environmental standards and information on environmental protection agencies in 50 developing countries.

Other countries have combined the use of codified procedures in the early assessment stages with input from experts in instances where a project is deemed to have environmental significance. In the Netherlands, DGIS staff responsible for project development receive instructions and a checklist for assessing environmental impact, but in the approval phase a project is examined by the Technical Advisory Unit to assess all technical ramifications, including those affecting the environment.

A final element of assessment procedures deserving our attention is the extent to which different DAC members use local expertise. At JICA in Japan, judgments about environmental

soundness are made based on past experience with similar projects. For each project, a scope of work is drafted for discussion with the recipient country, and if environmental impact is a concern, the discussion must include individuals whose sole responsibility is to measure environmental impact.

In Norway, NORAD has prepared a booklet on initial EIA screening for desk officers. At later stages, assessments are made by staff in recipient countries in cooperation with local authorities.

The use of local experts and authorities in the determination of environmental soundness can help in the development of conditionalities that are satisfactory to both parties. If this type of cooperation becomes more common in the future, it could be valuable in promoting the development of consistency in the negotiation of conditionalities between donor and recipient countries, and in arriving at a consistent definition of ESID itself.

### 3. Cooperation Among Developing Countries

Information flows in the developing world tend to be predominantly North-South, as opposed to South-South. Developing countries have very limited information on other developing countries, their institutions, products or capabilities. However, there has been significant development in many of these countries in recent years, to the point where cooperation between them could have a meaningful impact on development generally and on ESID in particular. Many developing countries have greatly diversified their economies and achieved high levels of industrialization in recent decades. Potential complementarities should no longer be ignored.

The multilateral financial institutions of the developing world have been instrumental in promoting developing country cooperation, especially in improving infrastructure. Other important institutions include the Global System of Trade Preferences among Developing Countries, the Non-Aligned Movement, the Group of 77, and the Summit Level Group of South-South Consultations and Cooperation.

Foreign exchange shortages continue to force rather strict limits on credit arrangements, but there are potentially valuable creative financing and credit arrangements that could be tried, provided there is an adequate political commitment.

As a result of their financial difficulties, developing countries often have to rely on the IMF and the World Bank for much of their financing. However, many countries resent the extensive conditionality attached to these loans, but they are ill-equipped to effectively negotiate these complex issues. The Group of 24 is

now working with these countries to coordinate and harmonize the negotiating position of developing countries to strengthen their bargaining power.

In its recent report, "The Challenge to the South," the South Commission has joined a growing list of development analysis organizations in calling for the creation of a "South Bank" for pooling capital to finance development efforts. Calling it a "compelling necessity," the Commission recommends that the Bank be used to finance joint ventures and provide export credits, arrangements for commodity stabilization, and balance-of-payments financing. The Commission further suggests that it may be wise for developing countries to expand their network of trade preferences, to create a trading block resembling those of North America and Europe. Within this context, the Global System of Trade Preferences, which came into effect in April of 1989, is a major advance in developing country cooperation.

Countertrading is also a useful mechanism for getting around a lack of export credits and foreign exchange. The emphasis on trade between developing countries as a means of acquiring hard currency would have to be reduced and replaced by an emphasis on acquiring needed goods and services through balanced barter relationships. Technologies offered by developing country firms tend to be more labor intensive, more tailored to the use of local resources as opposed to imported inputs, and less costly than equivalent technologies obtained from industrialized countries. According to the 1990 report of the South Commission, terms of technology transfer between developing countries are generally more favorable for the purchaser than deals made with developed country suppliers. Developing country technology suppliers are less likely to demand a large equity share in joint venture development agreements than multinational corporations.

If the number of intra-developing country technology transfers could be increased, the growth in options available to technology buyers would give them more leverage in their dealings with multinationals. Also, developing country firms should become more aware of the potential usefulness of indigenous industrial and agricultural practice, which have demonstrated their sustainability, often over many centuries. Every opportunity to adapt these practices to development efforts should be seized upon.

Commodities trading is critical to economic growth in most developing countries. Unstable international prices and declining demand from industrialized countries have left many commodities industries in the South vulnerable. A crucial issue in commodities is control of supply. Cooperation between developing countries to more effectively manage commodities supply could reduce price fluctuations and would encourage industries around the world that require these inputs to use them more efficiently.

In the area of human resource development to improve scientific and technical capabilities, there are a variety of opportunities for expanded developing country cooperation. Efforts to improve institutions of higher learning, perhaps by reducing redundancy among major universities to allow each to devote its resources to excellence in fewer fields, would give students access to a much cheaper quality education than is generally available in the industrialized world and could go a long way towards reducing the "brain drain" from developing countries. To organize efforts in this area, there are several effective non-governmental organizations already in existence, including the Third World Academy of Sciences and the Third World Network of Scientific Organizations.

#### 4. Multilaterals and Financing Institutions<sup>53</sup>

By the nature of their organization, multilateral agencies such as the United Nations, the World Bank and the regional banks provide a focal point the development of international cooperation strategies to promote ESID. Following are brief descriptions of the relevant activities of several of these groups.

UNEP was established in 1972 to coordinate the environmental activities of the United Nations in environmental assessment, management and support measures. Initiatives in these areas are based in the UNEP Earthwatch programs, which include the Global Environment Monitoring Systems (GEMS), which coordinates activities of other monitoring systems and fills gaps as needed; INFOTERRA, a database of environmental information from around the world; and the International Register of Potentially Toxic Chemicals (IRPTC), which supplies information on potentially hazardous chemicals to local authorities responsible for environmental protection and public health.

In natural resource management, UNEP provides expertise in the planning and design of UN development activities that may impact a developing country's natural resource base and assists countries in developing responsible standards and regulations.

UNEP also has a library to promote environmental education and has training programs to assist policy makers in analyzing the environmental consequences of various public policy alternatives. Since 1980, UNEP has been assisting several multilaterals in developing environmental criteria and procedures for assistance projects.

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<sup>53</sup> This section draws heavily on the DAC 1990 Report (OECD 1990), and World Resources Institute, "Natural Endowments: Financing Resource Conservation for Development", Washington D.C. 1989.

UNDP initiatives to develop and implement a holistic environmental approach to development are carried out in the office of the assistant administrator for policy planning, and Inter-Bureau Consultative Group on the Environment, and an Environmental Action Team within the Bureau for Program Policy and Evaluation. UNDP has cooperative arrangements with several governments and organizations. With the World Meteorological Organization, UNDP has developed monitoring systems to assist countries and regions to assess climate change and air quality. Working in conjunction with UNEP and the World Bank, UNDP has recently launched the Global Environmental Facility (GEF). In this endeavor, UNEP will provide overall policy guidance and act as a clearinghouse, and UNDP and the World Bank will be responsible for operations at the country and regional levels of the technical assistance and pre-investment phases as well as for capital investment activities. It will also provide a framework for providing operational experience in funding environmental aspects of development and for complementary financing arrangements with NGOs, entrepreneurs, bilateral and multilateral agencies and governments. The joint UNDP/World Bank Energy Sector Management Assistance Program (ESMAP) has been promoting the use of natural gas as an energy source instead of coal or hydrocarbons. This initiative has significance for ESID not only because natural gas burns more cleanly, but because considerable but underused gas reserves exist in many developing countries.

In addition to these initiatives, UNDP implements many training programs and basic technical assistance to developing countries, including country-specific ESID workshops. In 1990 UNDP introduced the Sustainable Development Network (SDN) in which all 113 field offices to coordinate the promotion and management of ESID programs.

In 1987 the World Bank established an Environment Department and four regional Environment Divisions to promote environmental activities within the Bank. About one-third of the Bank's loans in 1989 were for projects that had environmental concerns built in. The Bank is also conducting in-depth studies of key environmental issues on a continuing basis, including country-specific action plans which include suggestions for governments. Several of these plans are currently underway, including environmental policy development, investment strategies and criteria for prioritization.

The Bank has also instituted codified procedures for environmental assessment to screen projects with potential environmental effects and to enhance borrowers' capabilities to deal with environmental issues, often through institution building. The Bank has also taken an active role in the Environmental Plan for the Mediterranean and in studying the desertification in sub-Saharan Africa.

The Environment Division of Asian Development Bank examines all AsDB projects for environmental soundness, in close cooperation with member states and other international organizations involved in development. The Division is directly involved in the implementation of projects dealing with natural resource use and training of Bank staff. Since 1989, AsDB has been involved in institution strengthening programs to enhance environmental protection in Bangladesh, Fiji, India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Western Samoa and Vanuatu.

The Environmental Unit within the Central Projects Department of the African Development Bank has a small staff responsible for coordinating all technical aspects of programs related to the environment, developing environmental assessment guidelines and training other Bank staff. Since 1989, Bank policy has mandated a greater emphasis on environmental concerns in lending programs in agriculture, transportation, industry, and health and education.

The Environmental Management Committee of the Inter-American Development Bank embarked on an Environmental Work Plan in 1987 to propose environmental protection and mitigation measures for Bank programs and can propose abandonment of projects it believes will result in serious environmental damage. IDB and OAS work jointly on feasibility studies of watershed management projects in the region and with the Pan-American Health Organization on projects related to health, water and sewage. In addition, the Bank provides training to public agencies in developing countries of the region in the areas of conservation and natural resource management.

#### (a) Financial Flows and Policies

As the above descriptions indicate, multilateral and bilateral agencies have been treating the environment as a special, high priority issue for only a few years in most cases. Very few projects now being implemented have ESID as their primary objective. Rather, sustainability is being incorporated into projects through EIA, conditionality structures that promote clean technology use, reductions in population relocation requirements, etc. The projects themselves, however, continue to be categorized under traditional industrial development headings. It is therefore difficult to measure financial flows specifically for ESID. Nonetheless, it is safe to say that the attention of the development community is becoming increasingly focused on environmental issues, and that the same is true for private corporations, foundations and NGOs.

In addition, there appears to be consensus within the international community that achieving ESID will require a significant net increase in aid assistance. Precise cost figures are not available, several analysts have estimated costs for various aspects of ESID. The World Resources Institute estimates that it will cost \$20 to 50 billion per year for ten years to meet

the natural resource conservation needs of developing countries, which is approximately 1 to 2 per cent of the aggregate GNP of the developing world. Given the severe debt crisis these countries face, such a financial commitment is clearly beyond their means, without some form of assistance. Debt-for-Nature swaps are one promising way to create capital. Private banks in developed countries, which hold the paper on these loans, could of course be of considerable help in such an effort. Alternatively, funds could be raised directly from firms that contribute to environmental problems through levies on greenhouse gases, toxic wastes, etc. to create an environmental trust fund for dealing with industrial pollution on a global basis.

However, when considering the financial requirements of ESID, it is important to bear in mind that funds expended for this purpose do not represent a loss. Rather, they could provide a significant infusion of capital into the economies of recipient countries. For example, the World Resources Institute recommends the creation of a pilot venture capital fund for the environmental entrepreneur.

Financing mechanisms of this type fit well with the trend in developing countries toward privatization in that they use free market forces to promote the development of clean technologies as well as efforts to clean up past environmental damage.

#### 5. The Role of Private Corporations

As sources of a great wealth of information on the use of hazardous materials, environmental management techniques, pollution abatement equipment and cleaner production technologies, and as major producers of environmentally damaging products, by-products and activities, private corporations, more specifically transnational corporations, will be expected to play a major role in the transition to ESID.<sup>54</sup>

In order to effectively implement strategies designed to achieve ESID, transnational corporations (TNC) must accept their role as social actors within a community and internalize the tenets

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<sup>54</sup> For a more detailed discussion of the role of transnational corporations in achieving sustainable development see Hansen, Peter, "Criteria for sustainable development management of transnational corporations," UNEP Industry and Environment July - December 1989 and "Transnational corporations and issues relating to the environment: the contribution of the commission and UNCTC to the work of the preparatory committee for the United Nations Conference on Environment and Development," Economic and Social Council, Commission on Transnational Corporations, United Nations, February 1991.

of sustainability.<sup>55</sup> The "them" and "us" approach to regulation compliance in which companies simply react to regulations and comply only when the cost of non-compliance exceeds the cost of compliance is neither socially acceptable nor strategically sound. The strengthening of regulations and enforcement procedures in developed countries, the increasing sophistication of the media, consumer groups and governments to mobilize consumer purchasing power in favor of socially responsible and/or environmentally sound products<sup>56</sup>, and the tendency for developed country companies' activities in developing countries to be judged by their home country criteria (as illustrated by the historic Nestle baby food case) give transnational corporations a strong incentive to pursue ESID nationally and internationally.

Once an internal commitment to ESID is made, private firms need to determine how it relates to their products and processes in national and international activities. Many sets of guidelines are available including UNEP's environmental guidelines, the International Chamber of Commerce environmental guidelines, OECD guidelines on multinational enterprises, the Chemical Manufacturers Association's Responsible CARE program and the UNCTC's criteria for sustainable development management. Participation in national and international forums on ESID and establishing working relationships with environmental policy, research and advocacy groups along with community groups and regulating agencies provides an opportunity to understand the concerns of a firm's constituencies and gives a firm access to new ideas and sources of information.

Having studied the implications of and requirements for achieving ESID within their organizations, private firms should seek out current win/win situations and design and implement programs to capitalize on them. For example, "pollution prevention pays" programs, materials substitutions, and Total Quality

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<sup>55</sup> The concept of industrial ecosystems as put forward by Robert A. Frosh and Nicholas E. Gallopoulos in their article "Strategies for Manufacturing," Scientific American, September 1989, provides a useful analogy. They suggest that "In such a system the consumption of energy and materials is optimized, waste generation is minimized and the effluent of one process...serve as the raw material for another process." This concept goes beyond "clean technology" and waste minimization broadening the sustainability criteria to include the utilization of all products and by products indefinitely.

<sup>56</sup>This trend towards mobilizing consumer purchasing power is evidenced by the publications of such books as The Green Consumer Guide and Shopping for a Better World, the introduction of "green" labeling systems and the growth of socially responsible investment funds.

Management (TQM) approaches to minimizing the quantity and toxicity of industrial effluent can have significant short term financial benefits. Through implementing these changes in those cost and regulatory environments that create a win/win situation, companies can cost effectively develop systems and procedures that can be transferred to or adapted for other facilities.<sup>57</sup>

ESID practices that are not currently economically feasible can be defined as current win/lose situations. The structural and financial barriers to implementing such programs should be identified and monitored and the need to overcome these barriers should be the topic of discussions with the companies' many constituencies including governmental and non-governmental organizations.

Transnational corporations will increasingly be called on to implement the best available techniques (BAT) in all of their facilities throughout the world. As necessary as this is, regulating agencies and policy makers need to be aware of those situations in which attempting to implement BAT creates a win/lose situation for companies. Consequently, fiscal, economic and regulatory policies need to be designed to transform these situations into win/win scenarios.

Within their own companies and subsidiaries transnational corporations can significantly aid international cooperation in achieve ESID in the areas of financial support, technical cooperation, R&D, education and training and information exchange. Their international nature, organizational structures and vested interest in the long term success of their enterprises makes them ideally suited to implementing ESID. However, their size, capital investment in less-than-clean technologies, vested interest in maintaining profitable but environmentally damaging product lines, resistance to change and the competitive nature of their environment create many barriers to achieving ESID. International trade policies and international property rights in particular will have a significant impact on the willingness of companies to transfer

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<sup>57</sup> There is a growing literature and base of experience of the business benefits of environmentally sound industrial practices. For example, Anne Ferguson, "Five Top Companies Prove Good Environment Ethics Pays - With Quality, Efficiency and Respect", Management Today, February 1989, pp. 46 -50; Minda Zetlin, "The Greening of Corporate America", Management Review, June 1990, pp. 10 -17; Elizabeth Dougherty, "Waste Minimization: Reduce Wastes and Reap the Benefits", R&D Magazine, April 1990, pp. 62 -68. For developing countries, the ECLAC Report (op. cit.) contains several case studies of the environmentally oriented practices of some Latin American corporations. UNEP's Industry and Environment newsletter also contains several developing country experiences

technologies not only to other firms but to their own operations in high risk environments.

##### 5. The Role of Industry, Trade, Professional and Scientific and Engineering Associations

Industry, trade and scientific organizations can play a major role in assisting developing countries and small and medium sized companies to employ ecologically sustainable technologies and processes and to purchase and produce environmentally sound products. These organizations provide a valuable forum for the exchange of information and the establishment of industry wide codes of conduct.

The extremely high level of activity among trade associations, research and policy organizations etc. is a strong indication of the far reaching implications of ESID. Although many of the industrial organizations focus on the needs of transnational corporations and developed country companies, many are specifically targeting the needs of developing countries.

The International Chamber of Commerce (ICC), as previously mentioned, has developed environmental guidelines for world industry. Through its International Environmental Bureau (ABBE), ICC provides technical information sharing on environmental issues to the developing world and seeks to generalize the best existing practices of their members to the business community at large. The World Environment Center (WEC) is directly involved in technology transfer, training, and institutional and factory assessments in the developing world through its International Environment and Development Services. WEC's International Environment Forum whose membership includes 57 multinational corporations encourages the inter-sectoral exchange of information and experience and provides assistance in international environmental management and environmental auditing.

Many trade and professional associations are taking a leadership role in addressing environmental issues. The International Federation of Consulting Engineers, a federation of national associations of independent consulting engineers, has an environmental mandate designed to enhance professional environmental services and formulate codes of professional conduct. The American Institute of Architects is currently producing an Environmental Resource Guide, the Chemical Manufacturers Association's has an aggressive Responsible CARE program, and the National Association of Manufacturers is currently preparing a seminar on pollution control and energy exports to Eastern Europe and the Third World.

ESID related conferences, programs, mandates and publications are being initiated by the International Council of Scientific Unions (ICSU), the International Institute for Advanced Systems Analysis (IIASA), the Commonwealth Consultative Group for

Technology Management (CCGTM), and The Club of Rome to name a few. In addition, new organizations such as the Global Environmental Management Initiative (GEMI), the International Institute for Sustainable Development (IISD) in Winnipeg, Manitoba and the Business Council on Sustainable Development in Geneva are in the early stages of their development at the time of writing this paper.

## CONCLUSIONS AND RECOMMENDATIONS

From the foregoing discussion, it is evident that the scope for international cooperation to achieve ESID is vast and also complex. Clearly the political will to pursue environmentally sound industrial development at all levels is essential to its achievement. In addition, the proper knowledge base, institutions, infrastructures, skills, regulations and international agreements are needed in order to implement ESID strategies. The UN System, and in particular UNIDO, can play a key role in this regard, but their success will depend heavily on the support and cooperation of both developing and industrialized country governments, private corporations, the donor community and other relevant international organizations.

Based on the analysis presented in this paper, several sets of recommendations are suggested below for consideration by international organizations, national governments and the United Nations system, with particular emphasis on the role of UNIDO.

### 1. Diagnostic and Analytical Studies

Efforts are needed to improve the understanding of the environmental dimension of industrial development, in terms of better information (for example, on levels of pollution, waste, etc.) and more comprehensive analyses of needs in terms of skills, technologies, finances etc. Also important is the development of generally acceptable procedures and guidelines for environmental accounting and auditing, GNP calculations which include the environmental costs and benefits of industrial activity, and improved analytical models of the linkages between the various stages of industrial activity in developing countries and broader environmental concerns.

Specifically, a variety of studies are required to establish a sound knowledge base upon which ESID strategies can be built.

(a) Diagnostic Studies, which assess the "demand" aspect of ESID in various sectors and countries, in terms of technological, financial, human resource, infrastructural and institutional needs.

These studies could be conducted for different "scenarios" of industrial development, based on different assumptions of growth, resource availability, national objectives, market conditions and

technological development. UNIDO, in cooperation with organizations such as the International Institute for Advanced Systems Analysis (IIASA), the World Federation of Futures Studies, the Club of Rome or the World Development Institute at Boston University, could undertake the development of such scenarios, which would provide developing countries with the basis for designing and implementing appropriate industrial development strategies to achieve ESID. UNIDO's previous work in the leather tanning, non-ferrous metals, pharmaceutical and fish processing industries would be useful in this regard. Such an effort would also be useful as an input into the developmental assistance programming of donor agencies.

(b) Analytical Studies, which examine in depth the implications of ESID strategies and actions for international trade and technology transfer, natural resource flows and financial flows would be useful in improving the understanding of how ESID is likely to impact on important international issues for developing countries and also serve as a basis for discussions in international fora such as GATT. Also important in this regard is the development of methodologies for natural resource accounting and GNP calculations that incorporate realistically the environmental costs and benefits of industrial activity. This would be valuable for making inter-country comparisons, development assistance programming and national industrial policy formulation. A complementary effort that is required is the preparation of guidelines and methods for firm level accounting and auditing of environmental costs and benefits for use by firms in developing countries.

## 2. Information Exchange

There is a clear need to improve the quality, flow and exchange of information between countries and at the enterprise to enterprise level on environmentally sound technologies, management experiences, resources, skills etc. In this context, UNIDO could:

(a) Develop an Information Clearinghouse to facilitate the exchange of information on experiences of individual firms trying to improve the sustainability of their operations. Case studies focusing on technology acquisition, R&D, employee training and strategic management would be helpful to developing country enterprises interested in reducing their environmental impact but lacking the experience needed to do so effectively. In structuring such a clearinghouse, UNIDO could build on the experiences of the International Environmental Bureau (IEB) of the International Chamber of Commerce, which helps small and medium sized businesses obtain information to improve their environmental performance.

(b) Assemble a Directory of Organizations, including IEB, UNEP and INFOTERRA, that can help developing country firms to develop and implement an ESID strategy.

### 3. Mechanisms and Policies for Technology Transfer and Development

It is necessary to improve the terms and conditions which influence the access to environmentally sound technologies by developing countries, and to develop science and technology policies at the national and international levels which would encourage the generation and use of such technologies at the local level.

Clean technologies present more than a potential source of profit for the firms that develop them. In many cases, they also represent an important means for ensuring the sustainability of the planet. Regional trade barriers and conflicts over intellectual property rights and patent protection are impeding the flow of these technologies into the developing world, which poses a serious threat to ESID in these regions. If technologies that reduce greenhouse gases are not accessible to developing countries, the continued depletion of the ozone layer caused by industrial activity in these countries will impact the quality of life in all countries. No single country can achieve a sustainable global environment on its own, so the technological tools that promote ESID must be spread as widely as possible.

To promote the international flow of ESID technologies, UNIDO could consider:

(a) Assessing Firm Needs in developing countries for sustainable technologies and identifying sources and emerging R&D trends in relevant technology areas. This effort should build on existing information systems such as the Network for Environmental Technology Transfer (NETT) in Brussels, which identifies potential matches between vendors and purchasers, and the International Cleaner Production Information Clearinghouse (ICPIC) at the Paris office of UNEP.

(b) Assessing Modalities of Technology Transfer (i.e. joint ventures, licensing, distribution agreements) and trade policies affecting them (i.e. intellectual property rights, tariffs and patent protection).

(c) Assisting Developing Countries in a Review of Technology Policies, with an emphasis on guidelines and criteria for ESID technology development, and improved integration of science and technology policies with other national policies, particularly those that foster industrial development.

(d) Identifying the Financial, Scientific and Human Resource Requirements for the domestic generation and utilization of ESID technologies in developing countries.

(e) Initiating Dialogue with TNCs about prospects for technology transfer to developing countries, factors impeding such transfers and steps that could be taken to alleviate barriers.

#### 4. Development of International Norms to Harmonize Standards

Wide variations now exist in the product standards and specifications of different countries. To some extent this is inevitable, given the unique circumstances of each country in terms of economic development and international trade relations. However, because of the inherently transnational nature of the environment, and therefore of ESID, standards that relate directly to environmental products need to be harmonized to some degree to permit the widest possible distribution of environmentally sound products and processes. Currently, clean technologies developed in one country have limited application in many other countries, in part because of variations in standards and rapid rate at which they are changing. This limits the market for such technologies, which in turn reduces the incentive for firms to invest in the R&D required to improve the environmental soundness of industrial products and processes. Firms making transnational purchases of clean technologies are often forced to make extensive modifications, which places developing country firms with limited technological capability at a disadvantage. Therefore, UNIDO could consider:

(a) Cooperating with Multilateral Organizations, TNCs and Governments to promote the harmonization of environmental standards at a level that will encourage sustainability, so that sustainable technologies will have the largest possible market.

#### 5. Development and Coordination of Policy Instruments for ESID

It is clear that governments must play a key role in promoting ESID through the design and implementation of policy instruments that take into account the specific structural characteristics of developing countries in terms of markets, the role of the state, availability of information etc., structure of industry and effectiveness of monitoring.

While there is considerable experience now with a variety of policy instruments of both the regulatory and economic types in the OECD countries, the implications and lessons of these experiences for developing countries need to be studied and assessed. A variety of actions are required:

(a) Sharing of Experiences with different policy instruments that have been used in developing countries to promote ESID, with particular emphasis on the barriers to successful implementation and the impact on the competitiveness of industrial firms.

(b) Integration of ESID Policies with other national policies - technological, financial, trade, human resource etc. Again, OECD experiences will be valuable to draw lessons from, but the experiences of other developing countries also need to be analyzed.

(c) Training of Policy Makers, in techniques and tools for ESID policy analysis, perhaps with the cooperation of environmental agencies of industrialized countries and the UN system.

(d) Preparation of Manuals for developing country policy analysts on ESID policy instruments.

## 6. Financial Flows and Mechanisms

Development of specific guidelines and principles with regard to the financing of industrial development at the international and national levels, and the identification of innovative mechanisms to improve the level and quality of financial resources available for ESID oriented development are needed. To this end:

(a) Development Assistance: The donor community should unambiguously acknowledge the need for additional funding to promote ESID in developing countries. Furthermore, accurate and reliable data on ESID assistance are needed so that the degree of additionality can be measured and the effects of ESID programs carefully assessed. At present, ESID initiatives by donors tend to be subsumed within larger industrial development projects, so that data sources such as DAC do not provide enough statistical analysis of ESID itself, either to allow an assessment of its impact or to develop recommendations for improving ESID approaches. Reporting requirements for DAC, bilateral aid agencies, UNDP, UNIDO and other assistance organizations should be revised to facilitate the monitoring and improvement of ESID aid strategies.

(c) Innovative Financing Mechanisms: Aid agencies should encourage the establishment in developing countries of venture capital funds and other innovative mechanisms to encourage the growth of an "ESID supply sector" and to provide financial resources for ESID projects and programs. Much of the technological and managerial changes that promote ESID in firms present profitable business opportunities for small and medium sized local suppliers, particularly those capable of providing custom equipment. Mechanisms such as the Nordic Environmental Financing Corporation (NEFCO) which serves as a source of venture capital for the financing of joint ventures between Nordic and East European companies should be studied for their relevance to developing countries.

## 7. Identification of key areas of opportunity for developing country industries

The global concern with environmental issues could conceivably offer some "windows of opportunity" for developing in the emerging

international market for environmental goods and services. Efforts are needed to identify those specific areas or "niches" where developing countries may have a competitive advantage (e.g. in certain parts of the materials or product loops referred to by Ayres and Markandya, in activities that are inherently labor intensive, or small scale in nature).

Specific policies and mechanisms could be developed to encourage the development of such industries in developing countries based on detailed assessments of the areas of opportunity.

#### 8. Training and Education

It is clear that the success of ESID will depend heavily on the availability of the proper sets of skills at all levels. Efforts are therefore needed to develop technical and managerial skills in developing countries through training programs, changes in curricula in schools, vocational training institutes and universities and the development of educational materials for dissemination to industry. Executive seminars designed to show industrialists the business benefits that can be derived from environmentally sound activities would be particularly useful.

In this regard, UNIDO could consider developing international training workshops and seminars for senior managers from developing countries on ESID topics such as Environmental Auditing, Environmental Quality Management, Technology Acquisition and Licensing, etc.

#### 9. A Dynamic Public - Private Partnership for ESID

The active involvement of the private sector, including both small and large enterprises, is essential to ESID. Efforts are needed to develop dynamic mechanisms that promote the participation of the private sector in ESID efforts of governments and international agencies. Specific actions that are recommended include:

(a) Participation in International ESID Activities by firms from developing countries - for example the International Chamber of Commerce.

(b) Development of Industry Liaison Mechanisms to engage industrialists in dialogue with governmental officials at the policy level.

(c) Strengthening of Relevant National Industry Associations through training, technical assistance and financial support for improving their capacity to promote environmental concerns among their memberships.

(d) Compilation of Directories of national and international industry associations involved in ESID activities.

#### 10. Broad Based Involvement in International Negotiations

ESID has implications not only for industry, but a wide range of other groups - including consumer associations, trade unions, the scientific and engineering community, non-governmental organizations etc. It is critical that the perspectives of these groups are reflected in national and international discussions concerning issues that affect ESID, for example, trade negotiations and trade and investment policy, environmental standards, intellectual property rights, technology transfer etc. Efforts are needed to include these inputs in the official positions of governments in international discussions and in national level debates. UNIDO could play a positive role by assisting governments in developing mechanisms and organizing meetings involving the various constituencies of ESID for such purposes.

#### 11. Promoting Industrial Efficiency

Underlying all of these suggested recommendations, however, the importance of efforts to improve the efficiency, broadly defined, of industrial activity in developing countries must always be recognized. Enhanced productivity and efficiency and balanced industrial development in developing countries is a principle that must be followed in order to achieve ESID and equitable growth the long term. The contributions of new management techniques and "soft" technologies for productivity enhancement within the context of ESID need to be more fully explored. In this regard, the activities of organizations such as the Global Environmental Management Initiative (GEMI), with its focus on applying Total Quality Management principles to environmental management are particularly relevant.