

Transnational Corporations and Management Division
Department of Economic and Social Development

World Investment Report 1992

Transnational Corporations as Engines of Growth



United Nations New York, 1992

Chapter IX

TRANSNATIONAL CORPORATIONS, ENVIRONMENTAL QUALITY AND SUSTAINABLE GROWTH

Transnational corporations, in addition to affecting economic growth in host countries through the channels described in the four preceding chapters, also influence the *quality* of the physical environment, with implications for the long-run sustainability of growth. The relationships of TNCs, environmental quality and economic growth to each other are complex. The present chapter identifies the principal relationships, presents evidence on the environmental role of TNCs and outlines some policy implications.

Section A traces the relationship between economic growth and environmental quality, which has given rise to the concept of sustainable development, arguing that in some areas a tradeoff exists but in other respects the two are mutually reinforcing. The section also points out some deficiencies of the conventional national income accounting system due to incorrect inclusion or exclusion of items relating to costs and effects of environmental protection or degradation and of natural capital depletion, and notes that steps are being taken recently for the incorporation of environmental externalities into the measurement of growth. In section B the role of TNCs—positive and negative—in determining environmental quality is examined, with special attention to their role in developing countries. The final section contains a discussion of policy issues arising from the intersection of TNCs and environmental concern and emphasises the importance of coordinating efforts among national Governments, the international community and TNCs.

A. Economic growth and environmental quality

1. Conceptual linkages

The early theoretical view of the relationship between economic growth and environmental quality was of a simple trade-off between growth and the environment. Rapid economic growth increased environmental stress. Conversely, environmental protection slowed economic growth. Two mechanisms were at work. Economic growth, that is, growth of production, created environmental stress in the extraction of natural resources (evident in agriculture, mining and forestry) and multiplied pollution (that is, waste-disposal) problems. Environmental protection diverted real and financial resources from the production of conventional goods and services and hence slowed GDP growth. The implication of that simple view appeared clear. Industrial countries, burdened by the “effluents of affluence” and enjoying high incomes, could and should trade off some economic growth for higher environmental quality. Developing countries, burdened by poverty, should strike a different balance, with more attention to growth and less to environmental protection.

There remains an important kernel of truth to this simple trade-off view. But it is deficient in four important respects. First, the attributes of poverty themselves—unsanitary water supplies, endemic disease, overcrowding, urban squalor—are now considered environmental problems, whose existence restrains economic growth.¹ In that sense, the trade-off collapses, and environmental improvement and economic growth are reinforcing, provided that the economic growth is equitably distributed and reaches the poor. Second, and perhaps more important, environmental resources are inputs into conventional production and must be conserved for sustained economic growth. The environmental resources—land, water, forests, fisheries—play a larger role in economic production in developing countries, and hence their conservation is essential for long-term growth.² Again, the simple trade-off dissolves. Third, it has become apparent that poor people, at the margin of survival and with worsening ratios of natural resources to population, frequently undermine the productivity of the resource base itself. In technical economic terms, their personal time preferences heavily discount future versus present consumption. The examples are frequently drawn from agriculture, where population pressures and poverty force the cultivation of marginal lands and result in erosion and exhaustion of soil nutrients. Again, strong economic growth may contribute to improved resource conservation, modifying the growth-environment trade-off. Finally, there is today a greater appreciation of the need for strong economic growth to provide the real financial resources for environmental protection. Available evidence suggests that the demand for environmental quality is income elastic, and rising per capita income translates into effective political demand for environmental protection, again modifying the earlier simple view of a trade-off.

The concept of “sustainable development”, while not subject to a single precise definition, captures the newer, more sophisticated understanding of the relationship between growth and the environment, taking into account the various elements discussed above. It modifies the conventional view of economic growth as GDP growth to incorporate a new balance between economic growth and environmental

quality; it also recognizes that environmental quality and economic growth can be mutually reinforcing at all income levels.³

2. Sustainable development and the measurement of growth

Traditional measures of aggregate economic activity and economic growth—the national income and national product accounts—are deficient as measures of sustainable development.⁴ There are three principal sources of error. First, national income and product statistics include certain expenditures that defend against environmental damage (that is, pollution control and pollution cleanup), but that do not contribute to improving productivity. Second, the statistics fail to account for certain welfare reductions from residual environmental damages. Both the incorrect inclusions and exclusions tend to overstate national income and economic growth. Finally, and most serious for developing countries that rely heavily on natural resources in production, conventional national-income accounting fails to include the depletion, depreciation or degradation of natural capital. That failure can substantially overstate real income and economic growth, and can contribute to a poor resource-management policy.⁵ Those accounts are used as management tools in policy formation. If they do not accurately measure what they purport to measure, serious mistakes in resource-management decisions can result.

There has been some progress in modifying conventional national-income accounting systems.⁶ Two approaches to adjusting for natural capital depletion have been proposed. One would parallel current treatment of man-made capital. In essence, it would calculate a monetary value for the change in natural capital, and subtract that value from GNP to derive an adjusted figure for net national product and net national income. The second approach, called the user-cost method, separates receipts from depletable asset sales into two components, a user cost and a true income component.⁷ In that fashion, gross and net product are adjusted for capital consumption, but still include true (sustainable) income from asset sales. Empirical applications of the adjusted measures of growth are now being undertaken.

3. The role of policy

Increased understanding of the interrelationship between economic growth and environmental quality highlights the role of policy in sustainable development. Environmental deterioration is now seen as the consequence of pervasive externalities in the extraction, processing, transport, consumption and disposal of goods and services. Externalities are simply costs not borne by agents engaged in economic activity—consumers, businesses and Governments. It is now generally accepted by all, including the business sector, that Governments have a major role to play in improving social welfare by correcting the distortions in the price/market system arising from the externalities. In some instances, the role involves the use of either command-and-control environment regulations and/or “market-friendly” type government measures in order to improve social welfare. It follows that regulation of externalities, and the search for efficient policy measures, are also central elements of sustainable development.

At the same time, there is an increasing recognition that inappropriate government policies themselves are a serious source of environmental deterioration. The effect is most visible when government subsidies distort the price of environmental and natural resources. Examples can come from both industrial and developing economies. The Government provides subsidies for energy, water, pesticides, land, livestock and below-market charges for grazing and timber-harvesting, all of which can lead to excessive use.⁸ Sustainable development suggests very sparing use of government subsidies that have incidental, adverse environmental effects. In that connection, some observers have argued that a liberal trade and investment policy itself may contribute to environmental degradation.⁹ Others feel that the problem lies not with trade and FDI, but with the failure of Governments to regulate externalities and to scale down abusive environmental subsidies as described above. Obviously, if Governments fail to correct externalities and distortive subsidies, any production, whether for domestic or international markets, will involve environmental damages.

B. Transnational corporations and environmental quality in host countries

1. The extent of transnational corporation involvement and influence

While all firms—domestic private, state enterprises and TNCs—affect and are affected by environmental quality, TNCs possess certain characteristics that support specific analysis:

- First, TNCs tend to be more mobile and to have greater discretion in the location of production than domestic firms,¹⁰ which suggests the possibility that TNCs have greater leverage in negotiating favourable environmental regulations, permits and exemptions with host countries.
- Second, TNCs are extensively involved in environmentally significant activities. According to a recent UNCTC study that focused on six major areas that contribute significantly to global environmental problems and account for roughly 80 per cent of anthropomorphic greenhouse-gas generation, TNCs have a large influence, direct or indirect, in those areas. Among other things, they are the primary producers and intermediate consumers of chlorofluorocarbons, which are the principal cause of stratospheric ozone depletion and account for at least 15 per cent of greenhouse-gas emissions.¹¹ One chemical company alone, E. I. DuPont de Nemours and Company, accounted for 25 per cent of world production of CFCs. It has also been estimated that the 20 largest international pesticide manufacturers accounted for 94 per cent of world agrochemical sales in 1990.¹² Furthermore, TNCs are reported to have extensive involvement in most pollution- and hazard-intensive industries as measured by environmental control costs.¹³
- Third, many TNCs tend to have financial, managerial and technological resources superior to those of local firms. The superior position both raises expectations and allows TNCs to exercise

leadership in environmental protection. The importance of technology, in particular, is self-evident; not only do TNCs generally have access to clean technology, developed in response to stringent environmental protection among industrial countries, but they possess skills in the safe handling, transport, storage, use and disposal of hazardous materials, and in the development of pollution-abatement technology itself. The technology advantage is reinforced by sophisticated management skills, again refined by long experience with environmental and resource management in highly regulated industrial countries.

- A fourth characteristic of TNCs that bears on their environmental performance is their relatively greater visibility and vulnerability, which takes two forms. On the one hand, TNCs are guests in the host country and, compared to local firms, often must strive harder to maintain good relations with host governments and local communities. On the other hand, large TNCs have a global image to protect and tend to be quite conscious of public and stockholder opinions, and of the potential for restrictive home country regulation, even for their foreign operations.

It is, however, not easy to evaluate the impact of TNCs on the environmental quality in host countries, and this impact cannot be easily gauged from their direct role in aggregate economic production (box IX.1). As noted in chapter II, the direct role of TNCs in total investment in host countries is quite modest, especially as it concerns investment in developing countries. The average ratio of FDI inflows to gross domestic capital formation was 4.1 for developed countries and 4.4 for developing countries for the period 1986-1989 (chapter II). Investment inflows accounted for less than 5 per cent of gross domestic capital formation in more than half of the countries for which data are available (annex table 6). The implication of those figures is that the challenge of maintaining environmental quality and securing sustainable development is principally a domestic task, although it may need to be supplemented by international assistance and co-ordination.

To rest the case on such aggregate data alone, however, would be misleading. For one thing, the significance of FDI varies considerably among host countries; some of the differences among developing countries, by region and by income group, have been highlighted in chapter II. Further, in many host countries, FDI is concentrated in a relatively few industries, which may be the most important in terms of their impact on the environment. Finally, TNCs have many non-equity relationships and various backward and forward linkages in host countries that give them additional opportunities to influence the environmental quality of growth.

2. Assessing the environmental impact of transnational corporations

To assess the impact of TNCs on environmental quality in host developing countries, it is necessary to examine the extent to which TNCs are involved in environmentally significant activities outside their home countries, and in developing countries in particular. One approach towards gauging the environmental effects of TNCs in host countries is by establishing a ranking of environmentally sensitive industries in each country and looking at the importance of FDI in each industry.

At a very general level, one might argue that the primary and secondary sectors, which roughly correspond to the extractive and the manufacturing sectors, involve greater environmental risk than the tertiary sector, involving services. By that indicator, the environmental impact of FDI should be decreasing, at least in relative terms. As the data in table I.3 show, the tertiary sector increased significantly its relative share in FDI outward stock of major home countries for the period 1975-1990, whereas the share of the primary sector fell over the same period. The correlation, however, between the importance of the primary, secondary and tertiary sectors in FDI and the extent of environmental stress is far from perfect. For example, construction and tourism, which fall in the services sector, often involve significant environmental degradation.

Two approaches have been taken to measure the pollution intensity of industries within the manufacturing sector, a far narrower question than determining the environmental sensitivity of all

Box IX.1. Transnational corporations and tropical deforestation

Tropical deforestation provides a good example of the difficulties in assessing the importance and performance of TNCs in environmental problems. That tropical deforestation is a serious environmental concern is widely acknowledged, with the annual rate of deforestation estimated to range from 2.2 per cent for Brazil to 0.1 per cent for Gabon.¹ The proximate causes of deforestation are conversion to agricultural and livestock production, fuelwood demand, commercial logging and mining. But the relative contributions of the different activities are not clear. It has been estimated that 18 per cent of deforestation may be attributed to commercial logging and mining.² Even if correct, the 18 per cent may not accurately reflect the direct and indirect effects, as logging can create serious environmental damage without deforestation.³ Moreover, logging increases access to remote areas, opening them to agricultural conversion and associated environmental degradation.

Assessing the role of TNCs in commercial logging presents further difficulties. The available evidence from a 1981 study suggests that, by the early 1980s, United States TNCs had almost totally withdrawn from direct forest management and harvest, and their activities affected only about 7300 hectares (or 0.1 per cent) of total tropical forests logged per year. The same study concluded that United States and Canadian firms operating in the tropics followed generally good practice in forestry where ownership and concession agreements permit.⁴ In contrast, the involvement of European firms in logging tropical forests, mainly in Africa, appears to be extensive, at least recently. It was estimated that foreign interests controlled 90 per cent of logging in Gabon (1982), 77 per cent of logging in the Congo (1984), virtually all logging concessions in Liberia and, together with joint venture partners, 88 per cent of concessions in Cameroon (1970s).⁵ Other evidence shows a considerable involvement of Japanese firms in South-East Asia, with sometimes considerable negative environmental effects.⁶ Another study found that, in earlier years, two types of firms dominated logging in Indonesia - large TNCs based in industrial countries and smaller firms based in neighbouring Asian developing economies (for example, Malaysia and Hong Kong); larger TNCs showed somewhat greater concern for environmental and resource-conservation issues, but not to the degree which the size difference between them and the small TNCs might have suggested; in any event, the larger TNCs were held to a higher implicit standard owing to their superior financial and technological capabilities.⁷ Even if not directly involved in logging, TNCs often participate in processing, distribution and trade.

/.....

categories of economic production.¹⁴ One involves ranking industries by the measured release of toxic substances after an effort has been made to control pollution. Table IX.1 is an example. While useful, the approach does not measure environmental damage, which is a function of the time, place, concentration, composition and disposal method of the released materials. Nor do the data on release reflect the quantity of pollution that has been successfully abated.¹⁵ A second approach is to rank industries within the manufacturing sector by pollution-abatement expenditure, taking these expenditures as an indication of the pollution-intensity of an industry. Table IX.2 is an example. There is a reasonable correlation between the two methods of ranking, and they contain few surprises.¹⁶ Chemicals, petroleum products, petrochemicals, pulp and paper and metals, for instance, are highly polluting industries.

Turning to FDI, data on the share of four pollution-intensive industries (chemicals, petroleum and coal products, metals and pulp and paper) in total inward FDI stocks, in both developing and developed

(Box IX.1, continued)

While further, updated research on the role of TNCs in deforestation would be useful, it can tell only part of the story. Transnational corporations operate within a policy framework set by Governments. As was shown in a study of deforestation in Brazil and Indonesia, national policies matter.⁸ In Brazil, Government fiscal and financial incentives have encouraged deforestation in the Amazon region. In Indonesia, the Government log export tax and subsequent log export ban induced local processing and inefficient use of logs, leading to excessive rates of harvest. Thus, the experience of both countries shows that tropical deforestation is the outcome of the interaction between Government policy and the operations of TNCs and domestic firms.

1 World Resources Institute, *World Resources 1990-1991* (New York, Oxford University Press, 1990), table 19.1. Deforestation estimates are controversial. For details, see Carlos Alberto Primo Braga, "Tropical forests and trade policy: the case of Indonesia and Brazil", in Patrick Low, ed., *International Trade and the Environment*, World Bank Discussion Paper, No. 159 (Washington, D.C., The World Bank, 1992), pp. 175.

2 Brian Johnson, *Responding to Tropical Deforestation: An Eruption of Crisis - An Array of Solutions* (London, Conservation Foundation, 1991).

3 Napier Shelton, "Logging vs. the natural habitat", *Ambio*, vol. 14, No. 1 (1985), p. 39. A Malaysian logging operation can reduce canopy from nearly 100 per cent to an average of about 50 per cent for the concession.

4 James Bethel, et al., "The role of U.S. multinational corporations in commercial forestry operations in the tropics". Report submitted to the United States Department of State, March 1981, by the College of Forestry Resources, University of Washington.

5 Francois Nectoux and Nigel Dudley, *A Hardwood Story: Europe's Involvement in the Tropical Timber Trade* (London, Friends of the Earth, 1987).

6 Francois Nectoux and Yoichi Kuroda, *Timber from the South Seas* (Gland, Switzerland, World Wildlife Fund International, 1989).

7 Malcolm Gillis, "Multinational enterprises and environmental and resource management issues in the Indonesian tropical forest sector", in Pearson, ed., *Multinational Corporations, Environment and the Third World* (Durham, North Carolina, Duke University Press, 1987), pp. 64-89.

8 Braga, op. cit., pp. 173-193.

Table IX.1. Toxic release intensities by manufacturing industries

Industry	Total pounds per million output in 1987 dollars after abatement	Risk factor weighted exponential
Other industrial chemicals	52 260.3	96 660.0
Basic industrial chemicals	32 254.6	609 770.9
Leather and leather products	15 380.7	268 922.3
Synthetic resins	14 002.9	544 602.8
Plastic products n.e.c.	9 335.0	175 559.9
Non-ferrous metals	9 334.3	151 219.2
Other paper products	8 741.7	61 291.0
Iron and steel	7 642.8	349 897.7
Printing, publishing	7 513.9	109 252.0
Pulp, paper	6 225.9	98 109.5
Furniture, fixtures	5 366.8	61 291.0
Metal products	4 592.5	166 930.2
Wood products	4 399.4	137 294.6
Drugs and medicines	3 966.7	42 819.7
Non-metal products, n.e.c.	3 853.8	349 897.7
Petroleum refineries	3 757.9	78 634.6
Pottery, china etc.	3 614.5	29 164.7
Other chemical products	3 563.8	58 049.0
Other textile production	3 502.2	51 086.7
Spinning, weaving	3 106.7	154 381.3
Rubber products	2 934.2	26 305.2
Other industries	2 706.8	42 682.7
Shipbuilding, repair	2 546.5	17 426.9
Petroleum and coal products	2 544.1	29 444.3
Footwear	2 277.7	11 695.0
Radio, television etc.	1 808.3	29 207.4
Other electrical machines	1 797.3	38 967.4
Wearing apparel	1 744.8	17 515.8
Other machinery, n.e.c.	1 596.2	39 165.8
Glass and products	1 481.2	43 583.8
Transport equipment	1 007.8	28 055.7
Professional goods	887.6	16 127.0
Food products	781.6	20 776.7
Motor vehicles	669.9	15 733.1
Tobacco	489.0	5 308.9
Office and computing machines	303.3	3 163.4
Beverages	205.1	4 647.5

Source: Adapted from Robert E. B. Lucas, David Wheeler and Hemamala Hettige, "Economic development, environmental regulation and the international migration of toxic industrial pollution: 1960-1988", in Patrick Low, ed., *International Trade and the Environment*, World Bank Discussion Paper, No. 159 (Washington, D.C., The World Bank, 1992), p. 70.

Note: The first column reports total release of 320 toxic substances (atmospheric, effluent and solid) per million output in 1987 dollars; it was originally derived from the United States Environmental Protection Agency's Toxic Release Inventory for 1987. EPA uses a four-category ordinal ranking of toxic pollutants (1-mild; 4-very serious); the final column assumes exponential risk weights (1, 10, 100 and 1000) so that one pound of category 4 release is weighted 1000 times as heavily as one pound of category 1 release. The abbreviation "n.e.c." means "not elsewhere classified".

host countries, indicate that for a number of countries, the share has decreased somewhat during the 1980s (annex table 12). Data for the outward FDI stocks of major home countries confirm the trend during the 1980s (table IX.3). But the decline largely reflects the slower expansion of FDI in the industrial, as opposed to the services sector, during the 1980s. If only the shares of pollution-intensive industries in total manufacturing FDI are considered, no clear trend emerges. It is noteworthy, however, that the share of pollution-intensive industries in total manufacturing FDI has been relatively high, and remains at 20 to 50 per cent in developing countries and 30 to 60 per cent in developed countries. Furthermore, while developing countries experienced a declining share of those industries during the 1970s and a somewhat rising share during the 1980s, developed countries observed the opposite pattern, except for the United Kingdom (annex table 12). At the same time, the share of pollution-intensive industries in outward manufacturing FDI stock did not exhibit a clear pattern between the mid-1970s and the end 1980s: in the cases of the Federal Republic of Germany, Japan and Sweden, it declined; in the cases of France, the United Kingdom and the United States, it increased. In the area of trade, however, there was a 5 percentage point shift towards developing countries in the origin of pollution-intensive trade for the period

Table IX.2. United States pollution abatement costs, by industry, 1988

Industry	Millions of dollars		Abatement costs as percentage of output value
	Total gross abatement costs	Total industry output	
Petroleum and coal products	2 005.5	131 414.8	1.53
Primary metal industries	1 809.0	149 079.8	1.21
Chemicals and allied products	3 074.9	259 699.1	1.18
Paper and allied products	1 343.3	122 556.2	1.10
Stone, clay and glass products	438.5	63 059.4	0.70
Fabricated metal products	761.9	158 833.8	0.48
Electric and electrical equipment	659.3	186 950.8	0.35
Lumber and wood products	236.1	72 065.4	0.33
Food and kindred products	1 160.1	351 514.9	0.33
Furniture and fixture	118.4	39 226.1	0.30
Rubber and miscellaneous plastic products	278.0	94 200.2	0.30
Transportation equipment	974.5	354 047.8	0.28
Textile mill products	177.0	64 767.9	0.27
Leather and leather products	23.1	9 663.7	0.24
Miscellaneous manufacturing industries	76.7	34 869.4	0.22
Machinery, except electrical	429.7	243 260.8	0.18
Instrument and related products	197.7	114 528.4	0.17
Tobacco manufactures	37.6	28 831.8	0.16
Printing and publishing	206.4	143 906.8	0.14
TOTAL	14 008.6	2 617 476.9	0.54

Source: United States, Department of Commerce, *Manufacturers' Pollution Abatement Capital Expenditures and Operating Costs* (Washington, D.C., Government Printing Office, 1988), as cited in Patrick Low, "Trade measures and environmental quality: the implications for Mexico's exports", in Patrick Low, ed., *International Trade and the Environment*, World Bank Discussion Paper, No. 159 (Washington, D.C., The World Bank, 1992), p. 107.

1975-1988 (table IX.4). No information is available to attribute that shift to either TNCs or domestic firms. Although further data and analyses are needed to draw any general conclusions regarding the environmental role of FDI and TNCs in host developing countries, the data presented above do not suggest any systematic trend towards an increasing pollution intensity of FDI.

A number of studies have attempted to throw light on the location of pollution-intensive FDI by TNCs. An early study on United States FDI in pollution-intensive industries (chemicals, metal, pulp and paper, petroleum refining) found that such investment went mainly to other industrial countries, suggesting that United States FDI in developing countries was not mainly in pollution-intensive industries.¹⁷ A study on "pollution havens" in Asia did not support the hypothesis that the growth of

**Table IX.3. Share of pollution-intensive industries^a in outward investment stock
(Percentage and millions of local currency)**

<i>Economy and year</i>	<i>Total FDI</i>	<i>Total FDI in manufacturing</i>	<i>Chemicals</i>	<i>Pulp and paper</i>	<i>Petroleum and coal products</i>	<i>Metal</i>	<i>Total (1)^b</i>	<i>Share of (1) in total FDI</i>	<i>Share of (1) in total FDI in manufacturing</i>
<i>France</i> (French francs)									
1975	15 159	5 786	730	--	--	2 609	3 339	22	58
1980	55 120	22 699	2 670	--	--	11 549	14 219	26	63
1989	433 131	116 615	28 989	4 774	--	39 682	73 445	17	63
<i>Germany, Federal Republic of</i> (Deutsche marks)									
1976	49 081	23 711	8 928	316	187	1 973	11 404	23	48
1980	84 485	40 175	14 921	557	207	3 229	18 914	22	47
1989	206 555	86 223	32 244	1 802	137	4 765	38 948	19	45
<i>Japan</i> (United States dollars)									
1975	15 943	5 164	887	512	--	782	2 181	14	42
1980	36 497	12 573	2 626	758	--	2 619	6 003	16	48
1989	253 896	66 128	8 649	2 654	--	9 261	20 564	8	31
<i>Sweden</i> (Swedish kroner)									
1977	26 782	10 429	400	1 148	--	1 717	3 265	12	31
1988	153 000	115 980	10 710	16 830	--	--	27 540	18	24
<i>United Kingdom</i> (Pounds sterling)									
1974	10 436	6 936	1 153	451	--	273	1 877	18	27
1981	28 545	16 167	4 533	884	--	321	5 738	20	35
1987	86 727	29 860	8 172	2 507	--	636	11 315	13	38
<i>United States</i> (United States dollars)									
1977	147 206	70 045	11 864	3 178	8 026	4 626	27 269	19	39
1980	220 178	107 801	18 877	4 301	18 509	6 322	48 009	22	45
1990	423 183	187 403	38 754	11 590	19 183	9 776	79 303	19	42

Source: Transnational Corporations and Management Division, *World Investment Directory: Developed Countries* (New York, United Nations, 1992).

a The coverage of data for different industries may vary from country to country.

b Total FDI in the industries shown only.

pollution-intensive industries in that region was a result of an environmentally-induced relocation; rather, it was market expansion that explained the growth of such industries.¹⁸ Another study found that pollution-abatement costs did not explain the sectoral composition of *maquiladora* activity in Mexico, which is largely comprised of FDI.¹⁹ Evidence of industrial relocation does exist in certain selected industries (for example, asbestos, heavy metals and leather tanning),²⁰ but the balance of the research suggests that environmental cost differences have not been a major determinant of FDI, and that major shifts through FDI have not occurred because of differences in national standards. That is also the general conclusion of six major empirical studies of industrial relocation owing to environmental cost differences, although some relocation in high control-cost industries cannot be ruled out.²¹

Table IX.4. Sources of pollution-intensive products in world trade
(Percentage)

Source	1965	1975	1988
Developed countries	78	78	74
Central and Eastern Europe	5	6	4
Developing countries	17	17	22
Total	100	100	100

Source: Adapted from Patrick Low and Alexander Yeats, "Do 'dirty' industries migrate?", in Patrick Low, ed., *International Trade and the Environment*, World Bank Discussion Paper, No. 159 (Washington, D.C., The World Bank, 1992), p. 94.

It is important to note, however, that the direct involvement of TNCs in the production process of pollution-intensive industries, even if adequately measured, provides only an incomplete description of their role in determining environmental quality. Transnational corporations exercise considerable influence on environmental variables through a wide variety of non-equity relationships, which include turnkey and plant-leasing operations, management contracts, subcontracting, supplier relations, franchising, licensing etc. As in direct production, the non-equity relations of TNCs have positive or negative impacts. For example, TNCs may choose to avoid responsibility by using subcontractors for hazardous operations. Conversely, they can insist that subcontractors and suppliers adhere to high environmental standards, and provide them with technical and managerial help in that respect. Finally, TNCs exercise a major influence on the innovation of new products, including the packaging, use and disposal characteristics of such products. Environmental stress occurs not only through production, but also through the use and disposal of products and services. The dominant position of TNCs in product design and development provides an additional important channel for determining environmental quality.

There have been very few studies that compare the environmental performance of TNCs with that of state enterprises or domestic firms. In principle, such comparisons should be made by pairing TNCs and domestic firms in the same industry, controlling for the age structure of plants, and then measuring various dimensions of environmental performance such as energy use, materials recycling, pollution discharge, workplace standards etc. Two studies on Asia found that, although TNCs adopted lower environmental standards in their operations in developing countries than in developed ones, they maintained a better track record in environmental management than local firms, using their superior technological, financial and managerial resources.²² The findings are consistent with two earlier studies

on Malaysia and the Philippines.²³ The general impression is that, because of their visibility, resources and access to clean "off-the-shelf" technology, large TNCs may have better environmental records than local firms, that they may be more interested in environmental protection than their local joint-venture partners and that small- and medium-size firms, whether foreign or local, have the worst record.²⁴

Considering their direct role in production, the sectoral and country concentration of their activities, their dominant role in the development of technology, their non-equity links and their product-development roles, one can conclude that TNCs exert considerable influence in many aspects of environmental quality and hence on sustainable growth in host countries. On the whole, there is little evidence of a shift in the international pattern of FDI owing to variations in national environmental regulations. The principal reasons are that, for most industries, factors other than environmental control costs are much more important in determining locational decisions of TNCs, and that such costs typically account only for a small share of total production costs. (As table IX.2 shows, the weighted average pollution-abatement costs as a percentage of output value for a number of high-pollution industries is 0.54 per cent.) Another explanation is that TNCs sometimes anticipate stricter regulations and fear possible liabilities that may arise later. For a number of TNCs, adopting high environmental standards in home and host countries is therefore the least-cost approach to deal with those possibilities, apart from other considerations that might make the world-wide introduction of environmentally sound practices throughout the corporate system advisable.

In fact, the relatively greater vulnerability of TNCs noted earlier appears to have improved their environmental performance in their world-wide operations, at least for large firms. Transnational corporations with a vice-president for environment, health and safety (generally the larger firms) spent more time on environmental policy tasks in their foreign operations than did TNCs without such a position, although in all categories of environment, health and safety activities, firms spent more time in their home (United States) operations than in their foreign operations.²⁵ Attention to environmental auditing and inspection of foreign facilities was also positively related to the size of environmental staff, a proxy for TNC size. In the UNCTC *Benchmark Corporate Environmental Survey*, three fourths of corporate respondents stated that they had corporate environmental policies that went beyond those required by national legislation in foreign operations; it also found that the largest firms were most likely to have environmental, health and safety programmes.²⁶ The *Benchmark Survey* did note a regional difference between TNCs. In general, Japanese TNCs reported greater details on policies and procedures than did North American firms, while EC firms generally ranked below the other regions in that regard. Anecdotal evidence tends to confirm the importance that large TNCs attach to public opinion of their environmental performance. For example, it has been observed that TNCs are more open to closer scrutiny by national politicians and journalists than domestic firms, and tend to respond faster when asked to correct environmental problems.²⁷

C. Some policy implications

The preceding discussion raises a number of policy questions and provides the basis for outlining several policy implications. The main task is to devise a framework within which market-based solutions can be pursued and which, specifically, encourages approaches that compensate for market failures and maximize the positive contributions that TNCs can make towards sustainable growth.²⁸

That task has to be accomplished largely on the basis of national policies. At the macroeconomic level, sustainable development needs to be supported by sound policies that aim at promoting economic growth and eliminating poverty; a reduction of poverty, in particular, would contribute considerably to the preservation of the environment.²⁹ But since TNCs operate within a price and market system, they cannot afford to override price signals and incur large environmental protection costs on their own, unless that is being done on the basis of a regulatory framework applicable to all firms. Moreover, as shown above, an essential element of environmental deterioration consists of externalities which, if left unregulated, represent a potent example of the failure of private markets to achieve socially optimal growth. Thus, Governments have a leadership role in guiding TNC activities towards sustainable development (see box IX.2 for a list of some of the challenges for Governments). In general, the responsibilities of Governments are fourfold: to eliminate subsidies to natural resource users that encourage overuse and abuse; to internalize environmental externalities through market reform (including appropriate combinations of pollution taxes and abatement-subsidy schemes); to establish effluent and emission standards; and to institutionalize a liability and compensation system. Put somewhat differently, prices must reflect the full social costs of production (including on-site and off-site environmental effects), if TNCs are to conduct their activities in accordance with sustainable development. If TNCs confront an efficient set of prices, they tend to engage in socially efficient production, and to reorient technology and product development towards sustainable growth.

Many developing countries now have regulatory frameworks for environmental protection. Many of them, however, lack the scientific infrastructure, the administrative arrangements and the staff for an efficient operation of their legal framework. In that context, two points are relevant. First, the transparency and stability of environmental regulation is often more important than the strictness of the regulation itself.³⁰ For example, Singapore, which is well known for strict but stable environmental regulations, has had no difficulty in attracting large flows of FDI. In contrast, uncertainty and delay in acquiring environmental permits, and the possibility of subsequent revisions of environmental standards, can inhibit investments.³¹ Second, corporate environmental impact statements, if properly prepared, are a very useful tool for improving the environmental performance of TNCs. Such statements can not only form the basis for subsequent environmental monitoring, but also convey important cost and technology information to regulators and, if publicized, put a valuable public check on government-TNC agreements regarding environmental protection. Many host Governments now have some formal review of the environmental aspects of new foreign investments;³² it might be useful to examine the effectiveness of such reviews in order to strengthen policy implementation. This might involve, among other things, an

expanded use of environmental impact-assessment procedures and the use of environmental performance bonds.

A major issue for host countries in that context relates to the appropriate environmental standards to which TNCs should be held. The traditional arguments for nondiscrimination, or national treatment,

Box IX.2. Selected tasks for Governments to support the transition to sustainably managed corporations¹

As part of the preparations for UNCED, a review was made of the tasks necessary for Governments to implement in order to guide and encourage corporations to adopt management practices conducive to sustainable development.

Managerial tasks for Governments and international organizations include:

- Make sustainable development objectives and aims as clear, stable and understandable to corporations as possible; adopt sustainable developments criteria and guidelines in government regulatory requirements and incentive programmes; devise regulatory and/or incentive frameworks in order to encourage a "cradle-to-grave" product life-cycle approach;
- Remove price distortions arising from governmental programmes affecting land, water, energy and other natural resources;
- Remove existing accounting and reporting regulations and develop new ones that require more transparent reporting; and
- Develop methods and rules for accounting for sustainable development, including the "polluter-pays" principle.

Capacity-building tasks for Governments and international organizations include:

- Assist small- and medium-size enterprises in developing countries in the education and training of management and employees in sustainable development issues;
- Support practical research for the development of new prototype statements and methods for valuing all environmental resources;
- Encourage the retaining of auditors in environmental accounting and reporting so that they can verify that the financial statement gives a true and fair view of the activities of the enterprise and reflects the environmental costs of production;
- Develop incentives which encourage corporations to adopt sustainable development policies and programmes; and
- Enforce environmental laws and regulations, regardless of forms of ownerships.

Source: UNCTC, "Transnational corporations and sustainably managed corporations: recommendations of the Executive Director" (E/C.10/1992/2, 16 December 1991).

¹ A complete list of tasks is contained in the source.

of FDI are relevant with respect to environmental practices as well. There is little reason to hold TNCs to strict standards, while permitting domestic firms or state enterprises to operate under lesser requirements. In principle, the determination of the appropriate level of environmental protection in a country for all investment, domestic and foreign, should proceed from a careful assessment of benefits and costs, taking into account national assimilative capacity as well as industrial structure, income levels and environmental preferences. That does not mean, however, that the appropriate standards for developing countries are inevitably less stringent; as mentioned earlier, environmental damages to productive resources and the degradation of renewable resources undermine sustainable development and can slow long-term economic growth. At the same time, specific environmental regulations should be tailored to the particular circumstance of each developing country. For example, generally lower levels of worker training and lesser attention to equipment maintenance suggest that additional safeguards for worker health and safety need be in place for hazardous operations in developing countries. Examples are the Bhopal incident (in which training and supervision were apparently insufficient), and the need for special labelling and use-instructions for pesticides where literacy levels among farmers is low.

Several innovative measures have been devised by Governments to implement regulatory measures to control pollution and other negative impacts, and to maximize positive environmental contributions by domestic firms as well as TNCs. Among others, the measures include marketable permits and investment offsets. In the case of the former, permits are initially allocated by auction or by assignment on the basis of "grandfathering", with (polluting) firms receiving allocations on the basis of a predetermined set of criteria. The permits so allocated then command a market price and can be sold or leased. Such a system has been in effect in the United States since 1975. In principle, marketable permits could also be traded internationally.³³ An offset investment is a financial arrangement in which an industrialized country foregoes a domestic investment in environmentally sound technology to finance a more environmentally cost-effective programme in another country whose harmful technology undermines the anti-pollution effects of the industrialized country.³⁴

Finally, while appropriate national policies in host countries have the most important role to play in ensuring that investments by TNCs are environmentally sustainable, home-country policies can also contribute to that end. Home-country Governments that encourage and assist FDI can take the environmental aspects of an investment into account. For example, the United States Overseas Private Investment Corporation, a quasi-governmental agency, has had for many years procedures for ensuring the sound environmental performance of the projects it assists.

An appropriate national regulatory framework for all firms, which compensates for imperfections in market mechanisms, provides an enabling framework within which TNCs can establish environmental practices conducive to sustainable growth. Regardless of the regulatory framework, however, TNCs undertake environmental protection in their self-interest. Many TNCs rely directly or indirectly on the natural-resource base and conserve renewable resources for future production needs. New energy and resource-sparing technology is also likely to be less pollution-intensive, and may be introduced by TNCs to save direct costs. Recycling and resource recovery have been shown to be commercially attractive in many instances. Above all, TNCs can make a very important contribution in the development and transfer

of environmentally sound technologies (box IX.3). The development of such technology will, in any event, become more important for many TNCs in response to the heightened environmental awareness in most home countries. Transnational corporations may benefit from the introduction of this technology,

Box IX.3. Examples of the transfer of environmentally sound technology

Asea Brown Boveri in Poland

Asea Brown Boveri (ABB), an electro-technical equipment, energy and transportation TNC headquartered in Zürich, Switzerland, is a major supplier of combustion technologies for energy generation and of environmental-control technologies. It initiated a joint venture in Poland in 1989 which converted a former state-owned operation into a privately owned company, ABB Zamech.

In a large turnaround programme, restructuring projects retrofitted new combustion and power generation technologies and know-how, providing simultaneous productivity gains and pollution abatement. The total quality management practices of ABB were transferred, together with environmental management practices and extensive functional training of staff. The venture has been very successful so far. Results for the first operating year gave a return on sales of 5.2 per cent and a return on equity of 43.7 per cent.

Du Pont in Thailand

Having sold crop protectives in Thailand since the 1960s, by the 1970s Du Pont was dependent on bulk imports packaged by a local company in a fast-growing and competitive market. This was limiting Du Pont's ability to meet customer needs, and the corporation was not satisfied with local contractor fire and occupational health protection. It could not contract with other TNCs in the area because proprietary information would be put at risk; Thailand lacked patent protection until 1979. Thus, Du Pont decided to build its own plant, to respond to customers more quickly, and to adapt products to local humidity and temperature conditions. Bangpoo, an industrial estate near Bangkok, which was a joint venture of the Government of Thailand and the private sector, was chosen as the site.

The Bangpoo plant started up in 1982, with a Thai woman who had been one of the project planning group as the plant manager. The determinants of safety, health and environmental protection were Du Pont's internal corporate standards, because Thailand's regulations were weak. Plans included processes for recycling and an in-plant incinerator, because there were no incinerators or landfill sites satisfying Du Pont's requirements. The contractor, however, reduced costs by building at close to cost in exchange for learning Du Pont's design and construction approaches. Du Pont was able to recreate its United States technology and its corporate culture at the site.

Safety and environmental stewardship extends to product distributors and farmers, teaching application methods and supplying protective clothing at cost. Through the Thai Pesticides Association, Du Pont has shared its safety and health practices. Bangpoo won the national first prize in the small industry category for occupational safety and health in 1986.

Source: Adapted from Business Council for Sustainable Development, "Report on technology cooperation" (Geneva, BCSD, 1992), pp. 8 and 31.

not only in their home country operations, but also in their host-country ones, for example, because of economies of scale, especially to the extent that technology developed under the imperative of home-country requirements is of a customized variety. The greater environmental consciousness in many developing countries and the potential adverse consumer reactions are also likely to persuade firms to avoid using less environmentally-friendly technology in host countries, including developing ones. Beyond that, the need for TNCs to maintain long-term good relations with host and home governments, local communities, stockholders and consumers is likely to encourage additional environmental protection measures, at least among larger firms. Thus, many TNCs have adopted policies for managing corporate growth in an environmentally safe and sustainable manner (see chapter III). They lead their industries and provide important examples, particularly for other corporations that have not yet implemented such policies.³⁵ It is on such positive contributions that one should build further.

Although many firms have taken significant steps to bring their activities into conformity with sustainable development objectives, much remains to be done at the level of the firm. Transnational corporations need to accelerate the establishment of corporate environmental protection and natural-resource conservation programmes. That requires a strong public commitment by chief executives, and the necessary procedures and staffing within firms for compliance and monitoring; a redirection of corporate R&D towards resource conservation, pollution abatement and the development of products whose use and disposal do not create environmental damages; and the development and implementation of internal, corporate, environmental and resource-auditing procedures for tracking natural resource use, waste-disposal flows, toxic materials etc.

As industry leaders, TNCs also have an opportunity to assist in improving the environmental performance of firms with which they have direct business relations: joint-venture partners, suppliers, subcontractors and licensees. The specific channels include technology transfer, technical training, product specifications and, in some cases, the provision of joint waste-disposal services. At a broader level, corporate policy could include some responsibility for and monitoring of the resource-use and pollution-abatement practices of direct business partners (for instance, in the case of lending practices of banks). The divestment of hazardous operations to subcontractors is not desirable.

The relations of TNCs with host government regulators, non-governmental organizations and local communities are a third area in which significant progress can be achieved.³⁶ Transnational corporations can be an important source of technical and cost information that is badly needed by regulators, especially in developing countries, and they should be forthcoming in supplying non-proprietary information. Transnational corporations could also work with government authorities of host countries in areas such as developing joint waste-disposal facilities and in applied research on, for example, product safety and toxicity. A cooperative relationship with non-governmental organizations and local communities is likely to pay dividends for firms. It also implies much greater transparency in environmentally sensitive decision-making, including siting and emergency preparedness plans. Finally, TNCs have educative outreach possibilities. They range from support for local technical schools to support for national environmental-protection campaigns.

None of those steps—establishing strong internal policies, assisting their direct business partners or improving relations with regulators, non-governmental organizations and local communities—need be of great expense to a firm. But all of them require an explicit commitment by TNCs and an active, not passive, search for sustainable corporate practices (box IX.4).

In addition to firm-level measures, TNCs have also cooperated internationally, including through the adoption of common guidelines and codes for environmental protection. As discussed in chapter III, environmental performance has been a major focus of self-regulation by industry at the international level.

But here, too, international self-regulation by business needs to be embedded in firmer frameworks. In particular, the possibility of pernicious competition in attracting FDI on the basis of lax environmental regulations (or, more likely, lax implementation and enforcement) suggests a need for internationally agreed codes and guidelines. It also suggests the need for some efforts at international harmonization of environmental regulations to preclude major production-cost discrepancies, a step which major corpora-

Box IX.4. Corporate steps towards sustainable development management

The United Nations Centre on Transnational Corporations (now the Transnational Corporations and Management Division of the Department of Economic and Social Development of the United Nations), responding to a request by the Economic and Social Council during its July 1989 session, elaborated a set of "Criteria for sustainable development management" ¹ to strengthen the participation of large industrial enterprises in efforts for environmental preservation and protection. The Criteria incorporate a new management approach that has the potential to strengthen and direct efforts towards a stable and balanced relationship between business activity and the environment and make a positive contribution to sustainable development by maintaining economic growth while reducing environmental risk and resource over-exploitation. The Criteria conclude with 10 short initiatives that might guide a firm in beginning the implementation of practices consistent with sustainable development:

- Establish and publish a transnational, corporate, sustainable development policy statement emphasizing sustainable growth, environmental protection, resource use, worker safety and accident prevention. Translate the policy statement into all the working languages of affiliate enterprises.
- Review strategic planning, resource acquisition plans, and operating procedures so as to align them with the sustainable development policy. Announce significant efforts to reduce the use of natural resources and minimize the generation of wastes.
- Review and modify corporate structure, lines of responsibility and internal reporting mechanisms to reflect the sustainable development policy. Encourage overseas affiliates to modify procedures in order to reflect local ecological and social realities.
- Educate staff on the ways in which sustainable development affects their firm and how they can utilize these criteria in their specific tasks. Reward employees who discover and report environmental problems or who recommend new, environmentally sound products and processes.

/.....

tions themselves appear to support. Two recent UNCTC surveys of TNCs indicate that corporations would prefer the establishment of international standards, presumably to forestall competitors from exploiting production-cost differences arising from different national environmental standards.³⁷

Uniform international standards, however, could override legitimate differences among countries in the supply of, and demand for, environmental services and would oblige countries to take on unwarranted cost burdens. Transnational corporations with the bulk of their production in industrial countries could find uniformly high standards attractive in so far as their competitors in developing countries are forced into higher cost structures. The preferable approach would be to establish national environmental-protection standards, adhering to minimum international standards, but reflecting national conditions and objectives.

International cooperation at various levels is, therefore, essential for directing the activities of TNCs towards more sustainable growth patterns. Both the involvement of TNCs in critical global-environmen-

(Box IX.4, continued)

- Prepare sustainable development assessments of all major upcoming investment and operating decisions. Distribute them to affiliate offices as models for their own sustainable development assessments.
- Perform an environmental audit of ongoing activities, particularly those in developing countries, to verify that the criteria have been adequately considered. Establish a comparative scale for identifying affiliates with strong and weak environmental track records.
- Report publicly on the enterprise's most hazardous products, processes and toxic emissions. Distribute widely information on the methods in place to reduce these potential hazards and to cope with unanticipated emergencies.
- Institute research and development work on the reduction and/or elimination of industrial products and processes which generate greenhouse gases. Arrange for environmentally safer technologies to be available to affiliates in developing countries without extra internal charges.
- Inform joint venture partners and subcontractors about the corporate sustainable development policy. Establish ground rules for discontinuing business relationships with associated firms which operate with disregard for basic health and environmental concerns.
- Disseminate these criteria to other firms in relevant trade associations, local areas, or affiliated companies. Share the experiences with these criteria with local governments, national authorities, and the United Nations.

Source: UNCTC, "Criteria for sustainable development management", in *The CTC Reporter*, No. 30 (Autumn 1990), pp. 1-3.

1 The Criteria are set forth in *The CTC Reporter*, cited above.

tal interdependencies and the limitations of national frameworks underscore the need for international action on environmental issues. Among others, such cooperation and action could take the form of multilateral or regional agreements, guidelines or codes of conduct (binding or non-binding) negotiated by Governments. During the past decade, such international environment regulation has increased significantly, at both the global and the regional levels, with global regulation oriented towards combating specific threats such as ozone depletion.³⁸ Further progress in that direction would strengthen the role of TNCs in environmentally sustainable growth.

Notes

¹*Development and Environment: Report and Working Papers of a Panel of Experts Convened by the Secretary General of the United Nations Conference on the Human Environment (Founex Report) (Paris, Mouton, 1972).*

²In technical terms, environmental services enter directly into utility functions as they are directly consumed, but also enter production functions, supporting conventional economic output.

³For an in-depth discussion, see The World Bank, *World Development Report 1992: Development and the Environment* (Washington, D.C., The World Bank, 1992); see also Patrick Low, ed., *International Trade and the Environment*, World Bank Discussion Paper, No. 159 (Washington, D.C., The World Bank, 1992).

⁴Yusuf Ahmad, Salah El Serafy and Ernst Lutz, *Environmental Accounting for Sustainable Development* (Washington, D.C., The World Bank, 1989); Kirit Parikh, "Toward a national resource accounting system" (Bombay, Indira Gandhi Institute of Development Research, 1991), mimeo.

⁵For example, Robert Repetto, et al., estimated Indonesia's adjusted real growth rate to be 4.0 per cent annually, not the recorded 7.1 per cent for the 1971-1984 period. Robert Repetto, et al., *Wasting Assets: Natural Resources in the National Income Accounts* (Washington, D.C., World Resources Institute, 1989).

⁶Relevant work is being done at the World Bank, the United Nations Statistical Office and at various private research groups.

⁷The user cost is that fraction of current receipts from the sale of depletable assets which, if set aside and invested, would cumulate to an amount sufficient to yield a permanent income stream, when the resource is exhausted, equal to the true income component.

⁸See for example Robert Repetto, *The Forest for the Trees? Governmental Policy and the Misuse of Forest Resources* (Washington, D.C., World Resources Institute, 1988); Robert Repetto, *Paying the Price: Pesticide Subsidies in Developing Countries* (Washington, D.C., World Resources Institute, 1985).

⁹See, for example, Charles Arden Clarke, "The General Agreement on Tariffs and Trade, environmental protection and sustainable development" (Gland, Switzerland, WWF International, June 1991), mimeo. For a discussion on trade and the environment, see General Agreement on Tariffs and Trade, *International Trade 90-91*, vol. 1 (Geneva, GATT, 1992), pp. 19-39.

¹⁰But not all investment is mobile. For instance, investment meant to jump trade barriers or to obtain access to domestic markets is not mobile. Also, once investments are made, they become fixed costs, and mobility diminishes.

¹¹UNCTC, *Climate Change and Transnational Corporations; Analysis and Trends* (United Nations publication, Sales No. E.92.II.A.7).

¹²UNCTC, "Contribution of the Commission and the United Nations Centre on Transnational Corporations to the work of the Preparatory Committee for UNCED" (E/C.10/1991/3, 31 March 1991).

¹³Electric utilities are an exception. UNCTC, *Environmental Aspects of the Activities of Transnational Corporations: A Survey* (United Nations publication, Sales No. E.85.II.A.11).

¹⁴Pollution is only one form of environmental damage; serious environmental disruption also occurs outside the manufacturing sector in, for example, the extractive, transport and utilities industries.

¹⁵If abatement is 100 per cent effective, the industry would exhibit no toxic release.

¹⁶Robert E. B. Lucas, David Wheeler and Hemamala Hettige, "Economic development, environmental regulation and the international migration of toxic industrial pollution: 1960-1988", in Low, ed., op. cit., pp. 67-86.

¹⁷H. Jeffrey Leonard, *Are Environmental Regulations Driving United States Industry Overseas? An Issue Report* (Washington, D.C., The Conservation Foundation, 1984).

¹⁸ESCAP/UNCTC Joint Unit on Transnational Corporations, *Transnational Corporations and Environmental Management in Selected Asian and Pacific Developing Countries*, ESCAP/UNCTC Publication Series B, No. 13 (ST/ESCAP/608, 1988).

¹⁹Gene Grossman and Alan Krueger, "Environmental impacts of a North American Free Trade Agreement", National Bureau of Economic Research Working Paper No. 3914 (Cambridge, Massachusetts, November 1991), mimeo.

²⁰See Barry Castleman, "Workplace health standards and multinational corporations in developing countries", in Charles S. Pearson, ed., *Multinational Corporations, Environment and the Third World* (Durham, North Carolina, Duke University Press, 1987), pp. 149-172; Jeffrey Leonard, "Environmental regulations, multinational corporations and industrial development", *Habitat International*, vol. 6, No. 3 (1982), p. 9.

²¹The studies have been reviewed in UNCTC, *Environmental Aspects*, op. cit., Charles S. Pearson, "Environmental standards, industrial relocation and pollution havens", in Pearson, ed., *Multinational Corporations*, op. cit., pp. 113-128, and Judith M. Dean, "Trade and the environment: a survey of the literature", in Low, op. cit., pp. 15-28.

²²ESCAP/UNCTC Joint Unit, *Transnational Corporations*, op. cit., and ESCAP/UNCTC Joint Unit on Transnational Corporations, *Environmental Aspects of Transnational Corporation Activities in Pollution-Intensive Industries in Selected Asian and Pacific Developing Countries*, ESCAP/UNCTC Publication Series B, No. 15 (ST/ESCAP/857, 1990). The two studies are summarized in ESCAP/UNCTC Joint Unit on TNCs, "Environmental aspects of TNC activities in the ESCAP region", *The CTC Reporter*, No. 30 (Autumn 1990), pp. 4-6 and pp. 21-22.

²³Michael Royston reported two surveys conducted in Malaysia and the Philippines which suggested that TNC performance was somewhat better than that of local firms. Michael Royston, "The role of multinational corporations in environment and resource management in developing countries". Paper prepared for the World Resources Institute Conference on "The role of multinational corporations in environmental and resource management in developing countries", Washington, D.C., 14-16 June 1984.

²⁴"Natural allies? The roles of business and Government in environmental management in Asia and Pacific". Report of a conference sponsored by the World Resources Institute, the East-West Center and UNEP, Asia-Pacific Regional Office, Bangkok, January 1986, mimeo.

²⁵Margaret Flaherty and Ann Rappaport, *Multinational Corporation and the Environment: A Survey of Global Practices* (Boston, Center for Environmental Management, Tufts University, 1981). The study found that firms in the United States responded most to laws and regulations; in South-East Asia and Japan, consumer influence dominated community opinion in firms' decisions; and in Africa, firms exhibited strong concern for high visibility accidents.

²⁶UNCTC, *Benchmark Corporate Environmental Survey* (New York, United Nations, forthcoming).

²⁷Foão Carlos P. Pimenta, "Multinational corporations and industrial pollution control in Sao Paulo, Brazil", in Pearson, ed., *Multinational Corporations*, op. cit., pp. 198-220.

²⁸See The World Bank, op. cit.

²⁹To quote the Development Committee of the International Monetary Fund and The World Bank: "At the national level, developing countries will require a threefold strategy. First, the mutually-reinforcing roles of sustainable development and environment must be vigorously exploited through sound macro-economic policies which will promote growth and reduce poverty. The fight against poverty helps to preserve the environment. Second, such policies must be supplemented by an incentive structure which will discourage overuse of natural resources; developing countries will need external support for technology transfer and for capacity-building in the environmental area. The top sectoral priorities for direct national action are clean water and sanitation, air quality, soil, water and agricultural productivity, and natural habitats. Thirdly, people and institutions (in

public and private sectors alike) should be motivated to adopt less damaging behavior by bringing environmental considerations into their decisions -- wherever possible by the use of market-based instruments which have the advantage of allowing reduction of environmental damages in the most cost-effective way." *Communiqué*, 28 April 1992, p. 3.

³⁰See Charles S. Pearson, *Down to Business: Multinational Corporations, the Environment and Development* (Washington, D.C., World Resources Institute, 1985).

³¹This plays a role, for instance, in Central and Eastern Europe. Uncertainties concerning environmental standards and future liabilities concerning environmental damages are one of the reasons only TNCs hesitate to invest in the country of that region. See Marlise Simons, "Pollution blights investment, too, in East Europe", *The New York Times*, 13 May 1992.

³²UNCTC, *Transnational Corporations and Industrial Hazards Disclosure* (United Nations publication, Sales No. E.91.II.A.18).

³³For details, see UNCTC, "Draft papers on options to facilitate transfer of environmentally sound technologies to developing countries on favourable terms" (New York, UNCTC, 1991), mimeo.

³⁴*Ibid.*, p. T-13, provides examples, including those of offset investment by Finland (in Murmansk, Russia), Norway and Sweden.

³⁵See UNCTC, *Benchmark Corporate Environmental Survey*, *op. cit.*

³⁶The successful Japanese experience of curbing pollution is discussed in the World Bank, *op. cit.*, box 4.5, p. 92.

³⁷UNCTC, *Benchmark Corporate Environmental Survey*, *op. cit.*, and Flaherty and Rappaport, *op. cit.*

³⁸See Transnational Corporations and Management Division, *Emerging Trends in International Environmental Regulation at the Regional and Global Level: Implications for Transnational Corporations* (New York, United Nations, forthcoming).