UNCTAD/DITC/TED/9

Making FDI Work for Sustainable Development

United Nations Conference on Trade and Development
and
Sustainable Business Institute at the European Business School

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NOTE

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PREFACE

The subject matter of this study is at the heart of two key policy objectives of our times: promoting foreign direct investment (FDI) in developing countries, and achieving sustainable development.

Cross-border environmental management by transnational corporations (TNCs) plays a decisive role in pursuing these objectives. However, this role is perceived in different, and sometimes opposite, ways. Pessimists keep testing the "pollution haven" hypothesis; optimists tend to put a premium on TNCs as a vehicle for promoting environmentally sound technologies and management systems. The truth lies somewhere in between. Various private and public interests in economic development and environmental protection are far from converging. At the same time, there is no doubt that TNCs have great – and largely unexplored – potential to contribute to sustainable development in "host countries".

It is important to realize that environmental management is not just about traditional concerns over pollution. It is also about scale. A lot of environmental problems, actual and potential, have to do with the sheer size of TNCs' operations rather than merely the way they conduct their business. For the developing countries, the issue of environmental protection is also about time, or rather the lack thereof. The pressure of delivering high growth rates and securing FDI means that policy decisions often have to be taken in response to immediate output and employment objectives. The lack of resources and expertise in monitoring and enforcement, and sometimes the inability to work collaboratively with TNCs, adds to the problem.

Cross-border environmental management tends to be seen as a difficult balancing act for TNCs and host countries, an act that requires the right mix of policies and goals in terms of investment, output, job creation and environmental protection. It is nonetheless important not to lose sight of the fact that home countries, too, have an important role to play through their laws, regulations, policies and guidelines.

Regulatory and ethical considerations are, and always will be, important. However, they are no longer the only major determinants of the interface between FDI and the environment. The focus of attention – and action – has shifted to market-based approaches and measures. The simple strategies of compliance are giving way to eco-performance considerations, the lifecycle approach to products and production processes, and the internalization of environmental costs.

Managing environmental risks has become a standard feature of corporate behaviour as TNCs seek to improve their competitiveness and environmental performance. How responsible – and how successful – are TNCs in cross-border environmental management and the transfer of environmentally sound technologies? What lessons can we learn from their success stories and failures? Does ownership matter? What can policy makers do to accentuate the positive contribution of TNCs and reduce their negative effects? Finding answers to these questions is important if we are to make an assessment, or reassessment, of the approaches that Governments and TNCs take to the links between environment and development.

Since this study focuses on TNCs with a high level of environmental sophistication, the answers are, predictably, optimistic. One can argue that the success stories are too few to allow for generalized conclusions. Be that as it may, taken together with a survey of transborder environmental management practices of TNCs conducted under a parallel project by UNCTAD and the Copenhagen Business

School, with financial support from the Danish International Development Agency (DANIDA), the stories do provide useful insights leading to some positive conclusions.

The "greening" of consumption and production is changing the way of life and the way of doing business not just in the industrialized countries, but increasingly in developing countries as well. Consumers are becoming more environmentally conscious. TNCs find considerable competitive advantages in being "green" and are increasingly concerned about their environmental image. Environmental policies and regulations of the command and control type give way to economically adjusted measures, such as "green" procurement.

There is an enormous potential for improving environmental performance along the supply chain, making full use of the purchasing power of consumers, businesses and the public sector – the latter often being the biggest, and sometimes the only, customer of TNCs. "Supply chain management" makes suppliers part of what can be called the "environmental footprint" of firms. In this case, it is not the ownership that matters, but the creation of "green" business and consumer networks across national borders.

"Greening" the supply chain is a matter of shared responsibility and cooperation. There are encouraging signs of TNCs offering their suppliers in developing countries training courses and supporting them in the implementation of environmental management systems. Expanding this practice could greatly improve the environmental impact of FDI. Cooperation between TNCs and their suppliers in the developing countries is also necessary, if only to ensure that introducing environment-related conditions for suppliers does not erect new barriers to trade or detract from the objectives of setting up environmental management systems.

The efficiency of markets depends on transparency, which is also crucial for environmental performance. Environmental reporting by TNCs – internal and external, voluntary and mandatory – can go a long way towards improving management practices and, in turn, environmental performance. In fact, reporting back to stakeholders creates a strong incentive to improve environmental performance. It also makes it easier for civil society to maintain a spotlight on environmental performance, for instance through awards and publicity, as opposed to more conventional regulatory approaches.

"Best practices" bring life to binding legal and administrative regimes. The examples provided in the study show that while there is a general trend towards managing corporate environmental responsibilities, including reporting, on an international scale, there is no single "best practice" describing how to do that. What constitutes "best practice" in one company or country is not necessarily the best, or even good, for another company with a different organizational make-up, or in a country with a different environmental profile and priorities.

Although most "best practices" tend to be rather specific, they do provide a point of reference for companies operating in a particular industry and country. They also constitute a good starting point for a dialogue between government, industry associations, companies, and civic and professional organizations, a dialogue that can do a lot for clarifying and sharing expectations concerning environmental performance in terms of guidelines, codes of conduct and standards. Such voluntary measures can be instrumental in ensuring that the operations of TNCs are in harmony with policies in the "home country", as well as in building mutual confidence between TNCs and "host countries".

Whether and under what conditions a particular measure or policy is justified depends on circumstances. The challenge is to find an appropriate policy mix capable of reducing environmental tensions without diminishing the opportunities FDI provides to countries to exploit their competitive advantage. Context-specific analysis is therefore required in each and every case to determine whether a response to environmental concerns will be welfare-enhancing or welfare-reducing. This study deals with the issues that need to be taken into account in this type of analysis.

Since some environmental issues defy economic and political geography, it is only natural that measures at the company level and policy action at the national level are accompanied or driven by international initiatives. The concept of cross-border environmental management has already found its way into international commitments. The best example is the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro. There is a vast and growing number of multilateral environmental agreements. Environmental chapters are becoming more and more common in bilateral investment agreements. On top of that, there are environmental guidelines adopted by international business associations.

Some of these initiatives may lead to partnerships that could give a practical meaning to the deliverables of the World Summit on Sustainable Development (WSSD) in Johannesburg. It is very encouraging that the study – and the project that made it possible – have prompted the "EcoChain Initiative", launched by the Sustainable Business Institute at the European Business School with the support of the German Federal Environmental Agency and the German Industry Association.

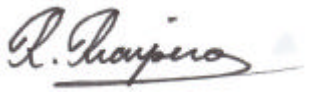
"Promoting sustainable development through investment" was one of the priorities for the Summit. Joint action by corporations, private sector associations, Governments, international organizations and other stakeholders are expected in the following five areas:

- Exploring ways to ensure that a larger number of developing countries and countries with economies in transition benefit from investment, in particular FDI;
- Promoting the use of environmental management systems in developing countries as well as the transfer of environmentally sound technologies to these countries;
- Encouraging companies to take responsibility for promoting sustainable development by applying best practices and promoting environmentally responsible corporate behaviour and information policies, especially those related to public disclosure procedures;
- Improving environmental performance along the supply chain and in waste management; and
- Exploring the potential role of voluntary guidelines for making investment more broadly supportive of sustainable development.

These recommendations provide a good framework for the EcoChain Initiative, which offers companies an opportunity to "showcase" their best practices and encourage others to take greater responsibility for sustainable development. With enough support from Governments, businesses, and civic and professional organizations, such an initiative could become a useful extension of the World Summit on Sustainable Development. I would welcome further cooperation with the SBI, other partners in Germany and other countries with a view to advancing this initiative and giving it a truly international character.

In one of his statements, the Secretary-General of the United Nations spoke of the "environment millennium", stressing that environmental issues must be fundamentally repositioned in the policy-making and business arenas, that corporations need to recognize that their choices can have significant consequences, and that Governments must not only create environmental agreements but enforce them. I find this study a practical and timely contribution to the ongoing debate on a new era of conservation and stewardship and am grateful to the Government of Germany, in particular the German Federal Environmental Agency, for supporting a project that has made this study possible.

The quality of the study is very much the result of the dedicated work of the SBI and its partners: the Center for Environmentally Sound Technology Transfer in China, the Administrative Staff College in India, the Indo-German Chamber of Commerce, ironmental Technologies in Malaysia. I view this partnership as a good foun search institutions promoting new and innovative approaches to technological and organizational solutions for the environment, corporate social responsibility and stakeholder relations.



Rubens Ricupero

Secretary-General of UNCTAD

Foreword

At the World Summit on Sustainable Development in Johannesburg in 2002 politicians, business representatives and delegates from civil society will be asked which of the objectives of the Agenda 21 have been achieved. Has there been any progress since the 1992 conference in Rio ?

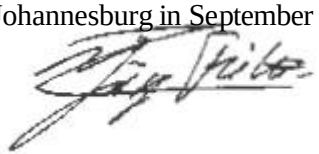
For many people, globalization is a key to reaching a high level of development and welfare for all the countries of the world. Yes, there are great opportunities connected with globalization, but there are also quite significant risks. Globalization supports the ability of investors and traders to locate their capital and to exchange goods and services wherever they choose. But there is a risk of environmental standards being lowered, e.g. to attract foreign investors. To avoid this, we have to strengthen our efforts to ensure a coherent global and ecologically responsive framework of environmental agreements and institutions, in order to guarantee that globalization will support sustainable development. The German Government believes that in framing the process of globalization we have to integrate ecological and social concerns.

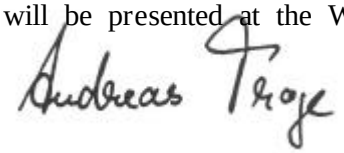
In the field of investment**,** Governments are very active in creating attractive framework conditions for business activities. Reducing tariffs and signing trade and investment facilitating agreements are good examples. In turn, we also see companies taking on greater responsibility towards supporting sustainable development in their foreign direct investment (FDI). We should call on multinational enterprises to contribute to sustainable development by transferring environmentally sound technologies, using environmental management schemes in all the countries in which they operate and by generally committing themselves to international codes of conduct such as the OECD Guidelines for Multinational Enterprises.

This study was commissioned by the Federal Ministry for the Environment and the Federal Environmental Agency in cooperation with UNCTAD in 1998. The Sustainable Business Institute at the European Business School was commissioned to undertake empirical research on the practice of environmental management in FDI. The study is based on four company level case studies which were carried out in cooperation with the companies *Adtranz*, *Bosch Siemens Hausgeräte*, *Aventis Pharma* and *Burgmann* regarding their FDI in China, Malaysia and India.

One of the main results of the study, and a very evident one, is that environmental requirements are no obstacle to FDI. On the contrary, environmental management can help develop advantages for frontrunners, to improve the transfer of environmentally sound technology, to 'green' the supply chain, to avoid environmental risks and to raise environmental awareness of consumers and business partners.

Building on this successful study, we initiated a national dialogue process for elaborating guidelines for the integration of environmental aspects into FDI. A working group of representatives from politics, business associations, enterprises, unions and civil society was established to develop operational and voluntary guidance for multinational enterprises in co-operation with UNCTAD and UNEP. The task is to make existing guidelines – such as the OECD Guidelines and the UN-initiatives Global Compact and Global Reporting Initiative - more specific by working out guidelines for applying best practice measures when carrying out foreign direct investment. These guidelines will be underpinned by best practice examples. The results will be presented at the World Summit in Johannesburg in September 2002.





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Abbreviations

ABB	Asea Brown Boveri AG
Adtranz	Adtranz-DaimlerChrysler Rail Systems GmbH
AHK	Außenhandelskammer (German Chamber of Commerce)
API	American Petroleum Institute
ASCI	Administrative Staff College India
ASEAN	Association of South-East Asian Nations
Aventis	Aventis Pharma AG
BDI	Bundesverband der Deutschen Industrie (Federal Association of German Industry and Trade)
BfAI	Bundesstelle für Außenhandelsinformationen (German Federal Bureau for information on foreign trade)
BHEL	Bharat Heavy Electrical Limited
BIT	bilateral investment treaties
BMU	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (German Federal Ministry for the Environment)
BMWi	Bundesministerium für Wirtschaft und Technologie (German Federal Ministry of Economics and Technology)
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (German Federal Ministry for Economic Co-operation and Development)
BOC	Bank of China
BSH	BSH Bosch und Siemens Hausgeräte GmbH
BSY	Anhui BSY Cooling Appliances Co., Ltd.
BUND	Bund für Umwelt und Naturschutz Deutschland (German section of 'Friends of the Earth')
CCPA	Canadian Chemical Producers Association
CEE	Central and Eastern Europe
CEFIC	Conseil Européen des Fédérations de l'Industrie Chimique (European Chemical Industry Council)
CER	Company Environmental Reporting
CERES	Coalition for Environmentally Responsible Economics
CESTT	Centre for Environmentally Sound Technology Transfer
CETEC	Centre for Environmental Technologies
CFCs	chlorofluorocarbons
CLW	Chittaranjan Locomotive Works
CNC	computer numerical control
CUTS	Consumer Unity & Trust Society
DEG	Deutsche Investitions- und Entwicklungsgesellschaft mbH (German Society for Investment and Development)

DFE	Design For Environment
DGB	Deutscher Gewerkschaftsbund (German Trade Union Federation)
DI&A	drug innovation & approval
DIHT	Deutscher Industrie- und Handelstag (Association of German Chambers of Commerce and Industry)
DM	deutsche mark (German Mark)
DOE	Department of the Environment
EAM	environmental area manager
ECR	efficient consumer response
EH&S	environment, health and safety
EMAS	Environmental Management and Audit Scheme
EMS	environmental management system
EPB	Environmental Protection Bureau
ESCAP	Economic and Social Commission for Asia and the Pacific
EU	European Union
EXIM	Export-Import Bank of India
FDI	foreign direct investment
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GDP	gross domestic product
GEF	Global Environment Facility
GNP	gross national product
GRI	Global Reporting Initiative
HC	hydrocarbons
HCFC	hydrochlorofluorocarbons
HFC	hydrofluorocarbons
HMR	Hoechst Marion Roussel
IBFG	Internationaler Bund Freier Gewerkschaften (International Confederation of Free Trade Unions)
ICC	International Chamber of Commerce
ICCA	International Council of Chemical Associations
ICICI	Industrial Credit and Investment Corporation of India
ICSID	World Bank's International Centre for the Settlement of Investment Disputes
IHK	Industrie- und Handelskammer (German Chamber of Industry and Commerce)
IISD	International Institute for Sustainable Development
ILO	International Labour Organisation
IMF	International Monetary Fund
IPR	intellectual property rights
IR	Indian Railways

ISO	International Organization for Standardization
ITUT	Internationales Transferzentrum für Umwelttechnik GmbH (Center for the International Transfer of Environmental Technologies)
IW	Institut der deutschen Wirtschaft (Cologne Institute for Business Research)
iwd	Informationsdienst des Institutes der deutschen Wirtschaft (Information service of the Cologne Institute for Business Research)
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
kWh	kilowatt hour
LCA	life cycle assessment
LCC	life cycle costing
LDC	least developed countries
LIC	low-income countries
MAI	Multilateral Agreement on Investment
MEA	multilateral environmental agreements
MIDA	Malaysian Industrial Development Authority
NGOs	non-governmental organizations
NTC	National Transportation Company
OECD	Organisation for Economic Co-operation and Development
RAL	Deutsches Institut für Gütesicherung und Kennzeichnung e.V. (German Institute for Quality Protection and Labelling)
R&D	research & development
RCP	Responsible Care Programme
SCC	safety checklist contractors
SME	small and medium-sized enterprise
SOE	spillover effects
TCE	trichloroethylene
TNC	transnational corporation
TRI	toxic release inventory
TRIMs	Agreement on Trade-related Investment Measures
TRIPS	Agreement on Trade-related Aspects of Intellectual Property Rights
TUAC	Trade Union Advisory Committee
TÜV	Technischer Überwachungsverein (German Certification Body)
UBA	Umwelt Bundes Amt (German Federal Environmental Agency)
UNCTAD	United Nations Conference on Trade and Development
UNCTC	United Nations Centre on Transnational Corporations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WEED	World Economy, Ecology and Development
WTO	World Trade Organization

Executive Summary

1. Background to the project

The German Federal Ministry for the Environment and the German Federal Environmental Agency, in cooperation with UNCTAD, commissioned the Sustainable Business Institute at the European Business School to undertake this research project in August 1998. The basic assumption of the project is that FDI can accelerate the diffusion of modern, eco-efficient management know-how, technologies and their spillovers, and thereby contribute to sustainable development. The objective of the study therefore is to identify starting points for an improved integration of environmental considerations into foreign direct investment (FDI) activities from the perspective of German companies investing in developing countries.

The study particularly aims to evaluate the critical success factors concerning practices of environmental management and communication as well as the transfer and diffusion of eco-efficient technologies and management practices. Based on these findings, it will provide recommendations for improved corporate environmental practices in FDI. To examine these questions, based on a review of previous theoretical and empirical work, four company-level case studies were carried out in cooperation with Adtranz-DaimlerChrysler Rail Systems GmbH (Adtranz), Aventis Pharma AG (Aventis), BSH Bosch and Siemens Hausgeräte GmbH (BSH) and Burgmann Dichtungswerke GmbH & Co. KG (Burgmann).

2. Theoretical, empirical and methodological foundations

A. Globalization and foreign direct investment

FDI is of special importance for developing countries. Although most of the worldwide FDI flows take place between OECD countries, they accounted for the largest share of capital flows to developing countries in the 1990s. Given that FDI flows, in particular to developing countries, are projected to increase further in the coming decades while official capital flows (especially aid) are set to fall, it is safe to assume that the nature of the FDI flowing to developing countries will play a significant role in shaping their economies. Since German firms are the third largest investors in developing countries, they have an enormous potential to influence the economic and ecological performance in those countries, not only directly by using modern and environmentally friendly technologies, but also indirectly by providing examples for others to follow.

B. The policy context

FDI takes place in an institutional context that influences its structure and effects. This context includes:

- International economic agreements and the discussions about a multilateral agreement on investment (MIA); the debate shows that worldwide standardization of the treatment of investments and further liberalization (of FDI) is a priority on the political agenda.

- International environmental agreements, especially the Montreal Protocol (1987), the Basel Convention (1989), the results of the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro (1992) and the Kyoto Protocol (1997).

- Initiatives on environmental reporting and transparency. Transparency concerning the activities of companies, particularly TNCs, has gained increasing importance. This trend is likely to accelerate in

the future. Greater transparency about the activities of companies, and their environmental impact in particular, can be seen as an opportunity for companies: by providing honest and complete information they can gain credibility and improve their dialogue with stakeholders and regulatory authorities. An increasing number of leading companies are already undertaking several voluntary initiatives aimed at greater transparency, which shows that they have recognized the importance of this trend.

- The environmental policy in the home countries of TNCs and the host countries of FDI. A strict environmental policy in the home countries of TNCs can influence the environmental standards such companies use in the host countries. Furthermore, it can give the host countries of FDI valuable information about the conduct of environmental policy: These countries often have fairly modern regulations, but in some cases lack the capacity to enforce them. An exchange of experiences between industrialized and developing countries might also help improve the environmental performance of FDI.

C. The strategies and behaviour of TNCs

TNCs' behaviour has the most direct influence on the structure and effects of FDI. In managing the environmental problems connected with their activities many corporations have introduced environmental management systems. Whether the introduction of those systems leads, a priori, to a better environmental performance also in the host countries of FDI is not certain; it depends crucially on whether the TNC uses different standards in different countries, or whether it uses an integrated cross-border environmental management policy with company-wide standards, regardless of the location of the plant. This decision of the TNC depends on numerous factors which may vary from case to case. However, a new empirical study shows that, according to the affiliates of TNCs, the policy of the parent company at headquarters and the local regulatory environment are very important factors in influencing the environmental performance of TNCs and their affiliates (HANSEN,1999a;b). Similar considerations apply to technology transfer, where many firms face a choice between modern (and more environmentally friendly) or older, and more pollution-intensive, technologies in the host countries.

D. The environmental impacts of FDI

The discussion about the environmental impacts of FDI has in the past focused mainly on the impact of host-country environmental standards on TNCs' investment decisions. In other words: Does the fact that countries compete internationally for FDI by trying to offer favourable conditions for companies lead to a competitive lowering of environmental standards (resulting in a "race to the bottom" or "pollution havens")?

Overall there is not much empirical evidence of "pollution havens" affecting either FDI or trade flows on a systematic basis. The evidence shows that most investment location decisions are not made on the basis of environmental criteria. Environmental costs are typically a small element in these decisions. If anything, the imposition of higher environmental standards seems more likely to generate a technological response, rather than leading to capital flights.

E. Purpose of the research project

There is little systematic evidence for the "race to the bottom" hypothesis, nor do empirical findings to date prove that FDI necessarily leads to a transfer and diffusion of modern "clean" technologies; the results of studies on this have been inconclusive.

Technology is spread to the host countries through FDI in diverse ways, depending on several factors that differ from company to company and from country to country. In order to draw valid conclusions about the critical factors influencing FDI and to determine how its environmental and technological effects are shaped, it was necessary to investigate several cases of FDI in detail. For this reason, a case-study approach was adopted that sought to take into account all possible effects of FDI. Using company-level case studies in selected industries and selected countries, the contribution of FDI to sustainable development was analysed. In addition, the hypothesis that FDI can accelerate the diffusion of modern eco-efficient management know-how, technologies and their spillovers, and thereby contribute to sustainable development was also evaluated.

3. Case study highlights

Four company-level case studies using a multi-stakeholder approach were carried out together with German TNCs and partner institutes in China, India and Malaysia.

BSH: Technology switch, from CFC to HC refrigerators

BSH recently switched from chlorofluorocarbon (CFC) to hydrocarbon (HC) refrigerators worldwide. The non-governmental organization (NGO), Greenpeace, was an important external driver of this change. BSH successfully launched the HC-technology in China in early 1999. In the wake of this development some of BSH's Chinese competitors changed some of their production, and now also offer the HC technology..

HMR: Concern for reputation as a driving factor behind EMS transfer

The reputation and success of pharmaceutical companies depend, among other things, on continuous improvements in health, safety and environment. Consequently, HMR has developed a worldwide environmental management system (EMS) to meet the highest expectations. In addition, in order to ensure adherence to good quality and environmental standards, HMR has specific suppliers for key products, whereas for other products the regulations of the pharmaceutical industry are stringent enough. The company also frequently audits its major suppliers.

Adtranz: Indian Railways push technology transfer with Adtranz

In order to facilitate the transfer and dissemination of a new eco-efficient railway-technology, Indian Railways (IR) negotiated a unique and unconventional transfer of technology with Adtranz. IR bought the technology and licensed several Indian companies to produce the new technology or components for this technology, and thereby installed a supply oligopoly. One of these Indian companies is Adtranz India.

Burgmann: High quality ensures environmental protection and technology transfer

Burgmann has implemented very strong quality standards in Germany and in the host countries. Furthermore, the company also expects its suppliers to implement these standards because the quality of the sealants depends also on the quality of the supplied goods. High quality sealants contribute not only to direct environmental protection, but also to a reduction of energy and resource consumption.

4. Key findings of the project

1. Globalization is a driver for standardization.
2. TNCs organize their corporate environmental responsibilities internationally.

3. Management commitment to environmental issues is essential; corporate values and training can greatly enhance this commitment.
4. Environmental supply-chain management is starting to take hold.
5. TNCs' concern for their reputation requires them to adhere to strict global standards.
6. Global environmental transparency requires integration of TNCs' foreign subsidiaries into environmental reporting.
7. Cost reduction is an important incentive for energy conservation.
8. Public purchasing can play an important role in improving technology transfer.
9. NGOs can initiate technology transfer.
10. TNCs can be subject to more stringent enforcement of regulations than local companies.

1. Globalization is a driver for standardization

Due to the TNCs' strategies to rationalize development and production and due to a further integration of markets, there is a tendency to increase standardization; that means TNCs standardize products and processes worldwide and adapt them to suit local needs.

However, this trend does not necessarily apply to "end-of-pipe technologies", as these are additional investments which are not automatically linked to the introduction of new processes and products.

All in all, this shows that globalization strategies and technology trends can support technology transfer through FDI. TNCs' overall technology strategies and product strategies, and the degree of innovation, especially with respect to integrated technologies, is critical to the relevance of this trend.

2. TNCs organize their corporate environmental responsibilities internationally

All TNCs involved in the case studies have organized their own international environmental management, defining responsibilities, management processes and standards, and reporting procedures worldwide. Through these international systems or networks, TNCs transfer management know-how to foreign subsidiaries.

The degree of international centralization relates to such aspects as management responsibilities for investments, technology decisions and compliance. The environmental standards differ in the scope of the aspects covered and the degree of specification. Some of the standards are pure management standards, while others are technical specifications including material selection or emission standards.

While it appears to be "best practice" to organize corporate environmental responsibilities and reporting systems internationally there is not one overall best practice on *how* international environmental management is to be organized.

The observed management practices show that TNCs increasingly work on international transparency within their companies and manage their environmental responsibilities globally. This helps to transfer good management practices and environmentally sound technologies through FDI.

3. Management's commitment to environmental issues is essential; corporate values and training can greatly enhance this commitment

Implementing environmental management procedures on an international level is not always a straightforward process. The successful implementation of EMS depends on its consistency with the overriding corporate values. In order to overcome conflicts of interest and the obstacles which occur during daily operations, top management's commitment in both host and home country is crucial.

4. Environmental supply-chain management: a recent trend

Traditionally, management requirements along the supply chain have been strongly related to quality issues. All TNCs have ongoing training and auditing processes for their suppliers. Especially in sectors where the final product is subject to high technical requirements, the quality of the supplied goods is extremely important.

TNCs have only recently started to work on supply-chain management, and they agree that environmental supply-chain management is an important trend, and a challenge that could have an enormous impact. A critical factor for the successful integration of environmental requirements into specifications for suppliers will be whether this will lead to cost reductions and/or whether the market will show its approval of the improved overall environmental efficiency.

5. TNCs' concern for their reputation requires them to operate to strict standards worldwide

TNCs are expected to operate to high environmental standards worldwide. They are subject to close scrutiny by the international public and NGOs and are permanently exposed to numerous challenges to their reputation. The magnitude of these challenges seems to be a driving factor for compliance with defined standards. Compliance with national standards of host countries is only the minimum requirement. In practice, operations will have to comply with the TNCs' global standards, which are generally stricter than the local regulations. Depending on the degree of specification, each TNC's standards will be interpreted by the subsidiaries and the management in charge to suit the specific local situation and requirements.

6. Global environmental transparency requires integration of TNCs' foreign subsidiaries into environmental reporting

In order to document their efforts, TNCs increasingly tend to integrate their foreign subsidiaries' environmental conditions and performance into their international corporate reporting.

7. Cost reduction is an important incentive for energy conservation

Due to high energy costs or unreliable supplies, energy conservation is one of the main environmental issues for companies operating in newly industrializing economies or developing countries. It also seems to be an important customer requirement. The transfer of energy-efficient technologies (both for capital goods and consumer goods) has therefore been particularly successful.

8. Public purchasing can play an important role in improving technology transfer

By setting environmental requirements, public authorities can use their purchasing power to reduce the transfer of environmentally sound technologies into their country. Even more so, they can encourage the diffusion of technologies by buying licences and/or intellectual property rights for environmentally sound technologies, thus making them accessible to local industry.

9. NGOs can initiate technology transfer

NGOs – especially international NGOs and those which have technological competence – can have a huge impact on technology transfer and diffusion. Due to NGO activities, corporations may change their technologies and implement advanced environmentally sound technologies.

10. TNCs can be subject to more stringent enforcement of regulations than local companies

It appears that in some cases, TNCs and their compliance with regulations are subject to very close scrutiny by the authorities. This could be due to the fact that TNCs are often comparatively large companies and they are foreign companies. Local environmental authorities seem to enforce TNCs' compliance with regulations more strictly than they do local, especially small, competitors.

Summary

These findings show that there are important drivers for eco-efficiency influencing the performance of FDI. Globalization can be a driver for eco-efficiency in the industrial sector. Additional external drivers are: market opportunities, stringent enforcement of environmental regulations, energy prices, and risks to reputation. Additional internal drivers are cost savings and a change of management attitudes, both at headquarters and in the host countries.

As important general best practices, the following measurements can be defined: international coordination of environmental responsibilities, definition of worldwide environmental (management) standards, external or internal audit, dissemination of up-to-date, eco-efficient technologies and good management practices along the supply chain, and integration of foreign activities into environmental reporting.

The diffusion of eco-efficient technologies to competitors in host countries can be an important side-effect of FDI.

5. Conclusions and recommendations of the project

The study does not offer an answer to the question of whether in general FDI is a lever for eco-efficiency or contributes to sustainable development. It is difficult to build recommendations on the basis of four company-level case studies, and further empirical research will be needed to corroborate the conclusions. Nevertheless, the case studies hint at two main starting points for the improved integration of environmental aspects into FDI: corporate environmental reporting and greening of the supply chain.

An improvement in global environmental transparency, especially through global environmental reporting of TNCs in the host countries, could lead to the dissemination of environmentally sound management practices and technologies in the host countries. Environmental transparency plays an important role in increasing access to technology and knowledge and improving both the companies' environmental performance and reputation. This could inspire other companies to follow their example. FDI can thereby have positive environmental impacts.

The incorporation of environmental standards and performance indicators into purchasing specifications can be an important driver for environmental improvements along the supply chain. A strong environmental policy contributes to a company's environmental credibility and can thus support the transfer of know-how as well as initiating technology transfer and dissemination. The enforcement of this driver certainly is a challenge for both TNCs and host countries. Therefore measures which could help such integration need to be designed and implemented bearing in mind different needs and interests.

6. Outlook: Rio-plus-10 and beyond

In 2002, governments and business were involved in discussions about which of the objectives of Agenda 21 had been achieved. TNCs and government representatives attending the World Summit on

Sustainable Development in Johannesburg were required to report on their measures and programmes to achieve these objectives.

In addition, there have been discussions about the extent to which FDI and trade liberalization contribute, or can contribute, to sustainable development, and the extent to which this contribution supports the implementation of multilateral environmental agreements. Furthermore, there are plans to create a network of institutes to carry out research on FDI, global supply-chain management, eco-efficiency and sustainable development.

This network of research institutes will, *inter alia*,

- Carry out further company- and sector-level case studies;
- Support dialogue between the participating countries and institutions;
- Encourage TNCs to improve the transparency of their global activities concerning their environmental performance and sustainability;
- Identify best practices and critical success factors;
- Increase transparency;
- Accelerate the transfer of technology and know-how along the supply chain; and
- Investigate the efficacy of specific best practice guidelines and develop them further.

Many international institutions (e.g. the World Trade Organization (WTO) and the European Commission) consider improvement of transparency, and such company- and sector-level case studies in particular, to be very important in order to continue the international dialogue on globalization and sustainability in a systematic and results-orientated way.

Introduction

I. Background

In August 1998, the German Federal Ministry for the Environment (BMU) and the German Federal Environmental Agency (UBA) commissioned the Sustainable Business Institute to undertake the research project on Globalization and Sustainable Development – Starting Points for an Improved Integration of Environmental Requirements into Foreign Direct Investment.

The objectives of the project were defined in collaboration with the United Nations Conference on Trade and Development (UNCTAD). Within the framework of its programme, Trade, Environment and Development, UNCTAD considers one of its main tasks to be "analytical work …in the field of competitiveness, market access, eco-labelling, multilateral environmental agreements, positive/supportive/enabling measures, and trade liberalization and sustainable development, and to disseminate the results". One of UNCTAD's technical assistance projects, Trade, Environment and Investment, explores measures for promoting sustainable development through foreign direct investment (FDI) and, more particularly, the project examines the role of transnational corporations (TNCs) in supporting the efforts of developing countries to implement and achieve the objectives of multilateral environmental agreements. The present report is an output of this UNCTAD project.

The work on this project was supported by a steering committee whose members include: BMU; UBA; the German Federal Ministry of Economy and Technology (BMWi); the German Federal Ministry for Economic Cooperation and Development (BMZ); the Federal Association of German Industry and Trade (BDI); World Economy, Ecology and Development (WEED); and UNCTAD.

II. Research objectives

Although most of the worldwide FDI flows are between the member countries of the Organisation for Economic Co-operation and Development (OECD), FDI accounted for the largest share of capital flows to developing countries in the 1990s. The pattern and structure of FDI will thus have a significant influence on the economies of developing countries in the years to come. Being the third largest group of investors in the developing world, German TNCs have great potential to contribute to the economic and ecological performance of developing countries.

Is FDI a lever for sustainable development or a threat? What is the impact of host country environmental standards on TNCs' investment decisions? In other words: Do developing countries have an incentive to create so-called "pollution havens" in order to attract FDI? Countries compete internationally for FDI and try to offer favourable conditions for companies. Does this lead to a competitive lowering of environmental standards (a "race to the bottom")? This study does not attempt to answer these questions, but these issues form the background.

The objective is not to determine whether and to what degree FDI may contribute to sustainable development in general. Rather, it is to identify starting points for an improved integration of environmental requirements into FDI from the perspective of German companies investing in developing countries.

The study aims mainly to:

(i) Evaluate the critical success factors concerning:

- ♦ best practices in environmental management and communication; and
- ♦ transfer and diffusion of eco-efficient technologies and management practices;

(ii) Provide recommendations for improved corporate environmental practices through FDI.

Besides these main objectives, the study aims to help find new or better ways of integrating environmental aspects into international agreements on investment and of implementing international environmental agreements.

While the project consists of case studies of German companies operating in China, India and Malaysia (i.e. a country in transition and developing countries), it nevertheless has implications for TNCs in general.

III. Research methodology and project phases

The research methodology involved desk-based reviews of:

- Recent related research to clarify and establish the connections between FDI and its technological and environmental impacts;
- The role of German FDI in influencing the global sustainable development agenda, and of German TNCs in influencing industry in general; and
- TNC practices to establish both the nature and legitimacy of a potential leadership role in catalysing improved environmental protection in host countries through their FDI.

The research survey on these issues has shown that the structure and effects of FDI depend on numerous economic and institutional factors. Concerning the environmental effects of FDI, previous research had mainly focused on the question of whether low environmental regulations in the host countries provide an incentive for FDI. For most companies and industries, (lower) environmental standards are not a relevant factor in the site-selection process. However, the empirical findings have *not* proved either that FDI necessarily leads to a diffusion of modern "clean" technologies; on this aspect, the results of the studies have been inconclusive.

Technology is spread in the host countries through FDI in diverse ways; it depends on several factors, which differ from company to company and from country to country. In order to draw valid conclusions about the critical factors influencing FDI and to give recommendations as to how its environmental and technological effects are shaped, it is necessary to investigate several FDI cases in detail. For this reason, research questions were addressed using a case study approach so that all possible effects of FDI might be taken into account. Specifically, a methodology based on company-level case studies with a multi-stakeholder perspective was designed.

In the case studies, the hypothesis was further tested that FDI can accelerate the diffusion of modern eco-efficient management know-how, technologies and their spillovers, and can therefore contribute to sustainable development.

The countries selected belong to the group of the most important host countries for German FDI among the developing countries: China, India, and Malaysia fulfil this criterion. And the selected companies come from industrial sectors important to the German economy.

The industrial partners that agreed to cooperate on the case studies were:

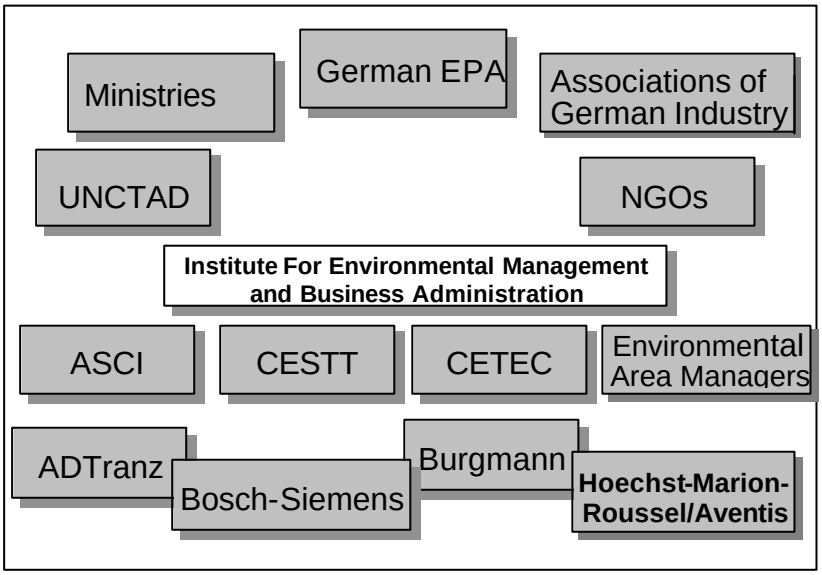
- China: BSH Bosch and Siemens Household Appliances (BSH) and Burgmann Sealing Technologies (Burgman);
- India: Aventis Pharma AG (Aventis), Adtranz DaimlerChrysler Rail Systems GmbH (Adtranz) and Burgmann;
- Malaysia: Burgmann.

The case studies were carried out in cooperation with the following institutions:

- China: Centre for Environmentally Sound Technology Transfer (CESTT);
- India: Administrative Staff College India (ASCI), Indo-German Chamber of Commerce;
- Malaysia: Centre for Environmental Technologies (CETEC).

The environmental area managers provided information on the host countries, such as national regulations, and supply of and demand for environmental technologies. Figure 1 presents an overview of the participating institutions and companies.

Figure 1: Participants in the project



The project consisted of three phases:

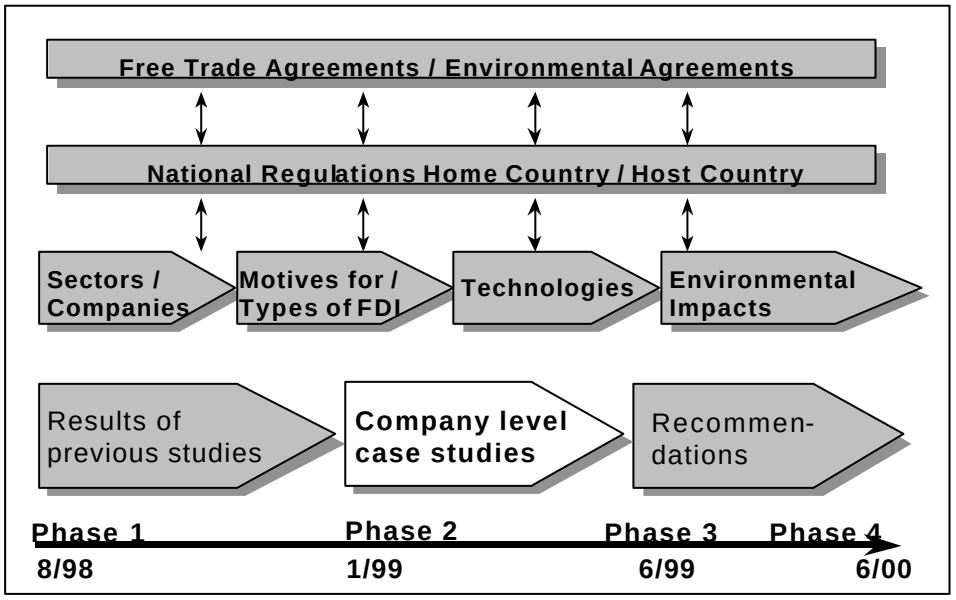
In *Phase I* (August 1998 to January 1999) the theoretical, empirical and methodological foundations of the project were established. The selection criteria for the companies and partner institutions were discussed at the first meeting of the steering committee in October 1998. A short questionnaire was developed on the basis of which the participating companies were selected.

The design of the project and the case studies were also discussed at the UNCTAD workshop on Strengthening Capacities for Trade and Environment Policy Integration in Jaipur, India (January 1999). The participants in this workshop were experts from companies, business associations, universities, research institutes, administrations, international organizations and stakeholder groups (NGOs), from India, Europe, China and Malaysia as well as some from other countries.

In *Phase II* (January 1999 to February 2000) the case study activities were carried out, partly within the Federal Republic of Germany by the Sustainable Business Institute, and partly within the host countries by the above-mentioned local institutions. In July 1999, a first draft of the results was discussed with the commissioners of the German Federal Ministry for the Environment and staff from UNCTAD at the second coordination meeting of the research project.

In *Phase III* (September 1999 to April 2000) the case studies were evaluated, and findings, critical success factors and recommendations for an improved integration of environmental requirements into FDI were derived. In November 1999, the preliminary results of the research project were presented and discussed at the pre-UNCTAD X Seminar, Making FDI Work for Sustainable Development in Geneva. In June 2000, the final results of the research project were presented and discussed at the UNCTAD Meeting on FDI and Sustainable Development: Final Project Meeting and Follow-Up Activities. Figure 2 presents an overview of the background and phases of the project.

Figure 2: Background and phases of the project



IV. Outline of this report

Part A includes the background to and objectives of the research project. Part B sets out the theoretical, empirical and methodological background of the project. This includes the economic and policy context, the strategies and behaviour of TNCs, and a review of the environmental impacts of FDI. Part C contains the reports of the case studies that were carried out in co-operation with four German TNCs, focusing on the management processes inside the companies and the external conditions the companies face. Part D draws conclusions from the case studies, with recommendations for both companies and policy makers for an improved integration of environmental requirements in FDI.

B. Theoretical, empirical and methodological foundations

Section B provides the context and basis for identifying starting points for an improved integration of environmental requirements into FDI and for designing the methodology of the case studies. These case studies enable some conclusions to be drawn on the possibilities for promoting sustainable development through FDI. In examining the potential for FDI in general, and German FDI in particular, to influence environmental performance in developing countries, it is necessary to explore the following issues:

(i) What is the nature of the relationship between FDI and the environment and what are the "levers" for ensuring sustainable development?

(ii) How can TNCs help to meet the environmental sustainability needs of China, India and Malaysia?

(iii) What is the potential of TNCs in general, and German companies in particular, to influence the debate on FDI and the environment, both at the international level and at the level of host countries?

In this section, some partial answers are given to these questions by considering the economic and political context in which FDI takes place and by surveying the scientific studies on the (environmental and technological) effects of FDI. This sets the background for the case studies.

Section B is thus structured as follows. Part I briefly describes the general context of sustainable development and globalization, highlighting the role of FDI in this process. Part II summarizes key economic data for Germany, the home country for the TNCs featured in the case studies, as well as of China, India and Malaysia, the three FDI host countries considered in this project. The policy context is described in part III, and includes economic and environmental international agreements as well as an overview of environmental policy in Germany and the FDI host countries; some important international environmental initiatives are also described, which highlight, especially, the role of corporate responsibility and transparency of corporate activities. In part IV the strategies of TNCs are considered, with special emphasis on recent trends in environmental management and technology transfer. Part V summarizes the results of earlier studies on the environmental impacts of FDI. Part VI draws some conclusions and implications for the design of the case study methodology.

I. General context

In order to identify possible starting-points for incorporating environmental considerations into FDI it is necessary to examine the general context of globalization and sustainable development. This section introduces the subject which will be examined in more detail in later sections.

1. Globalization and sustainable development

In the 1980s and 1990s, the world economy was defined by the accelerating pace of globalization, whilst the world's political leaders signed up to the objectives of sustainable development. Today, we face the dilemma of whether the two are or can be made compatible.

Globalization refers to an increased integration of markets for goods, services and capital. It is characterized by increasing volumes of international trade and capital flows, volatility of currency and equity markets, rapid technological change and homogenization of cultures. Globalization has arguably also had far-reaching consequences for existing models of political sovereignity, governance and business. It becomes more difficult for nation States to shape their economies and societies as they have to take into account the reactions of international (financial) markets.

The main drivers of globalization are technological as well as political. Modern information and communication technologies, along with low transport costs, have made trade easier. On the political side, during the past decade there has been a great wave of liberalization, especially in trade and financial markets. The General Agreement on Tariffs and Trade (GATT) and its successor, the World Trade Organization (WTO), have made considerable progress in abolishing (or at least diminishing) tariffs and quotas and other barriers to trade. This policy of liberalization was planned to be extended to foreign direct investment (FDI), as can be seen in the drafts of the proposed Multilateral Agreement on Investment (MAI). This proposed agreement, in particular, shows clearly the increased attention to FDI in the political arena; whereas in earlier times mainly goods (and services) were traded among nations, now the movement of the factors of production, especially capital, is equally important and is becoming the focus of public attention.

Sustainable development, on the other hand, refers to a development process that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. This general definition, which was coined in the Brundtland Report in 1987, was further defined in the Rio Declaration in 1992. It has three central requirements: productive economic growth, social justice and environmental sustainability. The precise criteria of sustainable development are still highly controversial, as there are many different interpretations of the vague definition of sustainability, ranging from "weak" to "strong" sustainability. "Weak" sustainability assumes a substitutability between natural capital and man-made capital. That is, a loss of natural capital can be made good by an increase in man-made capital, which delivers the same services as natural capital. "Strong" sustainibility assumes that natural capital and man-made capital are complements and cannot be substituted, or only to a very limited extent. Accordingly, advocates of strong sustainability emphasize the importance of maintaining the natural capital.[1]

Globalization and sustainable development can, at least in some instances, be interlinked. In some cases, the factors that drive globalization can be forces for sustainable development. Communication technologies, for example, accelerate the pace of change, making traditional control mechanisms less effective; but they can also bring transparency and the possibility of global governance. They can improve access to relevant and timely information, democratize knowledge and legitimize and facilitate a broad range of stakeholders to take appropriate actions. Trade liberalization policies that underpin globalization can help close the gap between the world's rich and poor by helping to increase the rate of economic growth.

[1] For an overview of the discussion on weak and strong sustainability, see, for example, Pearce and Turner (1990: 43-58).

The globalization debate among economic theorists mainly concentrates on the effects of trade liberalization. Krueger (1998) points to the benefits of improved resource allocation and the productivity enhancing (and therefore growth enhancing) effects of trade liberalization, especially through access to new technology. Ocampo and Taylor (1998) emphasize the regressive distributionary effects which are likely to result from liberalization policies. Greenway, Morgan and Wright (1998) assert that previous work on the effects of liberalization is inconclusive due to the complications associated with empirically measuring liberalization and the wide range of methodologies used. They estimate a new growth model for a large panel of developing countries using a range of alternative methodologies for capturing trade liberalization. The results suggest that liberalization does indeed have a favourable impact on growth, but not in an entirely straightforward way. In particular, there may by a "J-curve" type of adjustment at work. Taken together, the evidence shows that trade liberalization has positive effects on economic growth. This leads to the question as to whether these positive effects can be attributed also to FDI which is one of the key factors in the process of globalization.

2. Foreign direct investment, development and the environment

FDI refers to the flow of capital across national boundaries, as private sector companies invest in a foreign country in order to provide goods and services. The FDI flows have increased dramatically in recent years, outstripping the growth of international trade. Since the mid-1980s, FDI has grown at a rate four times higher than that of world GNP (Hansen, 1998: 16-17).

In 1998, world FDI outflows reached a record level of $649 billion, growing by 37 per cent that year, the highest growth rate attained since 1987. On average, virtually all of the increase in FDI in 1998 was concentrated in developed countries. FDI flows to and from developed countries reached new levels, of $460 billion and $595 billion respectively (representing increases over 1997 of 68 per cent and 46 per cent respectively). In developing countries, inward FDI flows decreased slightly, from $173 billion in 1997 to $166 billion in 1998, a decline of 4 per cent. Flows to the economies in transition of Central and Eastern Europe (CEE) remained almost stable, at close to $19 billion, although the Russian Federation saw a sharp decline. The 48 least developed countries (LDCs) continued to attract less than $3 billion, accounting for 1.8 per cent of flows to all developing countries and 0.5 per cent of world FDI flows (UNCTAD, 1999: 9-11). The leading sources and host countries of FDI are listed in tables 1 and 2.

The main share of FDI flows takes place between developed countries, but it is also an important factor for developing countries. The slight decrease in FDI flows into developing countries in 1998 should not conceal the fact that FDI is a part of overall financial flows to these economies and that it has become increasingly important in recent years. This becomes clear by looking at the financial flows to developing countries in the 1990s. Between 1991 and 1998 overall financial flows to developing countries increased from $120 billion to $275 billion. Besides FDI, these financial flows also included bank loans, portfolio investments and official aid. During the 1990s official aid decreased in both absolute and relative terms. Bank loans and portfolio investments increased until 1997, but decreased in 1998 – so did FDI, but the 1998 decrease in FDI was comparatively moderate. Altogether, the share of FDI in overall financial flows to developing countries increased from barely 27 per cent in 1991 to 56 per cent in 1998 (UNCTAD, 1999:10).

FDI is driven by market liberalization (in particular privatization programmes in developing countries), that enables TNCs to seek globally new outlets for their products and services and to exploit competitive advantages relating to production cost differentials, access to labour, technologies and natural resources. For many governments, especially in developing countries, the ability to attract

FDI is critical to economic growth and development strategies and to political success. Investment by TNCs brings not only foreign currency, but also employment growth, potential transfer of technologies and technical expertise, increased efficiency and competitiveness and managerial skills. Potentially, FDI can also introduce cleaner technologies, facilitating the technological "leapfrogging" that might contribute to sustainable development.

However, TNCs are driven primarily by the need to meet shareholder expectations, especially for investment returns. Their objective is to maximize their competitive advantage and the financial benefits of their investment incurring the least possible cost and business risk. This leads to a key concern: What kind of economic growth does FDI bring, especially in developing countries, and is it sustainable in the longer-term?

The debate on the environmental consequences of FDI is one of the central issues in the wider discussion about globalization and sustainable development and has been very heated. Some commentators are concerned that countries will lower environmental standards to attract FDI, creating so-called "pollution havens", and that a "race to the bottom" will ensue as countries compete with each other for FDI by continually reducing their environmental standards. Others argue that foreign investment brings more environmentally friendly technologies. In this view, FDI is the best way to disseminate new and cleaner technologies. Moreover, a slow but steady increase in environmental standards might result (Zarsky, 1999: 4-5). There is also the argument that poverty is the main cause of environmental degradation and that increased economic wealth will therefore enable countries to afford better environmental protection, and that with rising income levels consumer expectations for more environmentally friendly products will also grow (Panayotou, 1999: 238).

Table 1: FDI outflows 1998, by country (US$ million)

Rank	Country	Amount
1	United States	132 829
2	United Kingdom	114 195
3	Germany	86 591
4	France	40 587
5	Netherlands	38 310
6	Canada	26 577
7	Japan	24 152
8	Belgium-Luxembourg	23 111
9	Sweden	22 465
10	Finland	19 812
11	Hong Kong, China	18 762
12	Spain	18 387
13	Switzerland	17 416
14	Italy	12 076
15	Korea, Republic of	4 756
16	Denmark	4 008
17	Taiwan Province of China	3 794
18	Singapore	3 108
19	Austria	3 013
20	Cayman Islands	2 900
21	Chile	2 799
22	Brazil	2 609
23	Norway	2 544
24	Australia	2 533
25	Bermuda	2 365
...		
27	**Malaysia**	**1 921**
29	**China**	**1 600**
	India	**19**

Source: UNCTAD, 1999: 483-86

Table 2: FDI inflows by country, 1998 (US$ million)

Rank	Country	Amount
1	United States	193 375
2	United Kingdom	63 124
3	**China**	**45 460**
4	Netherlands	31 859
5	Brazil	28 718
6	France	28 039
7	Belgium-Luxembourg	20,889
8	Germany	19 877
9	Sweden	19 358
10	Canada	16 500
11	Spain	11 307
12	Finland	11 115
13	Mexico	10 238
14	Singapore	7 218
15	Thailand	6 969
16	Ireland	6 820
17	Denmark	6 623
18	Australia	6 568
19	Austria	5 915
20	Argentina	5 697
21	Korea, Republic of	5 143
22	Poland	5 129
23	Chile	4 792
24	Venezuela	3 737
25	**Malaysia**	**3 727**
...		
33	**India**	**2 258**

Source: UNCTAD, 1999: 477-480

II. The economic context

The economic structure, as well as the economic and environmental policies of investor and host country, influence the scale and nature of FDI, both directly and indirectly. To understand possible starting points for an improved integration of environmental concerns into FDI, it is useful to provide an overview of the German economy and the economies of the host countries of FDI investigated in this study, namely China, India and Malaysia.

1. Germany

1.1 Size and structure of the German economy

Germany is the third largest economy worldwide in terms of overall GDP, and the largest economy in Europe. Its economic structure is that of a highly developed, post-industrialized economy and is thus characterized by the dominance of the tertiary sector (e.g. financial services and transport), which accounts for about 64 per cent of GDP. Nevertheless, it still has a strong industrial base, in which high-technology activities are a critical component: they consitituted 13.8 per cent of German GNP, which is the highest proportion for any country (BMWi, 1998a: 117).

The German economy has many small and medium-sized enterprises (SMEs). In 1995, only 4.3 per cent of German companies had more than 500 employees, but they employed 44.9 per cent of the total labour force (Gaebe, 1998: 131) and they account for the largest proportion of the total output (IW, 2000, table 73).

Germany ranks fifth among the industrialized economies in terms of the number of large TNCs with investments abroad; German companies hold shares in about 20,000 affiliates abroad (BDI, 1999a). However, ranked according to UNCTAD's "transnationality index",[2] only one German TNC, Bayer, features among the world's top 20 TNCs (UNCTAD, 1999: 78-80). Table 3, which ranks the largest German TNCs, shows that the automotive and chemicals industries are particularly well represented.

[2] The transnationality index is calculated as the average of three ratios: foreign assets to total assets, foreign sales to total sales and foreign employment to total employment.

Table 3: Largest German TNCs

Ranking by foreign assets	Company	Type of industry	Ranking by UNCTAD's trans-nationality index	National ranking by output
1	Volkswagen Group	Automotive	5	2
2	Daimler-Benz AG[a]	Automotive	10	1
3	Hoechst AG[b]	Chemicals	2	11
4	Bayer AG	Chemicals	1	7
5	Siemens AG	Electronics	8	3
6	BMW AG	Automotive	3	5
7	Viag AG[c]	Diversified	7	10
8	BASF AG	Chemicals	4	8
9	Veba Group	Diversified	11	4
10	Robert Bosch GmbH	Automotive	6	9
11	Mannesmann AG[d]	Engineering/telecommunications	9	13

Sources: UNCTAD, 1999: 78-80; and IW, 2000: table 67.

[a] In 1998, Daimler-Benz merged with Chrysler and formed the DaimlerChrysler corporation.
[b] In 1999, Hoechst merged with Rhone-Poulenc and formed the Aventis corporation.
[c] In 2000, Viag AG merged with VEBA AG and formed the e-on corporation.
[d] In 2000, Mannesmann AG was taken over by Vodafone Airtouch.

1.2 Internationalization and German FDI

Germany has been a key member of the OECD since its foundation in 1960, it joined the General Agreement of Tariffs and Trade (GATT) in 1951 and was one of the six States to found the European Economic Community in 1957 (Schäfers, 1998: 116). It thus plays a major role in the international organizations that shape global and regional economic policies.

Since 1991, Germany has been the world's second largest economy in terms of exports and imports after the United States (Statistisches Bundesamt, 1999a:1). In 1995, German exports accounted for 18.6 per cent of worldwide automotive exports, 14.7 per cent of global chemical exports and 13.3 per cent of global exports of machinery and transport equipment (Schäfers,1998:66-67). In 1997, exports amounted to 27 per cent of total GNP (Statistisches Bundesamt, 1999d:1) and constituted the most important source of German economic growth (BMWi, 1998b: 4). For particular industries, such as the aircraft and space industries or the automobile industry, the share of exports amounted to 60 per cent of output (BMWi,1998b: 5).

Main trading partners

Germany's main trading partners are the member States of the European Union (EU), which accounted for more than 57 per cent of Germany's total exports in 1996. Its most important trading partner in 1997 was France, followed by the United States, the United Kingdom, the Netherlands and Italy (Statistisches Bundesamt, 1999b:1; and 1999c:1). With regard to Germany's trade relations, several studies confirm that its industries are beginning to show a greater outward orientation, especially towards Asian countries (Härtel et al., 1996:153-154; Schwaab, 1997: 23-30).

Trends in German FDI

German FDI has grown rapidly over the last 10 years. Between 1989 and 1995 it doubled from DM 28 to DM 55 billion and again nearly tripled to DM 152 million by 1998 (see table 4). Amongst the OECD countries, Germany was the third largest source of FDI after the United States and the United Kingdom (OECD, 2000: 17, table 1).The main hosts to German FDI were the EU (52 per cent), the North American Free Trade Area (NAFTA) (25 per cent) and other OECD countries (12 per cent), and only about 11 per cent was directed to non-OECD countries (OECD, 2000: 141).

Among the non-OECD countries, most of German FDI went to Latin America and the Caribbean (28.2 per cent), with Brazil being the largest recipient and Argentina the second; 20.5 per cent of German FDI went to Asian countries, of which China was the leading recipient, and Singapore and India second and third respectively. Less than 7.6 per cent went to Africa and about 2.8 per cent to the Near and Middle East (see tables 4 and 5).

Table 4: German FDI: outflows by country (DM million)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996[a]	1997	1998
OECD countries, of which:	16 052	20 751	27 400	37 738	36 380	29 115	22 677	22 832	45 778	68 139	55 903	140 935
France	1 098	1 043	2 578	2 316	5 272	3 081	1 887	2 091	4 890	3 303	5 639	16 394
Japan	169	268	358	677	523	326	69	651	513	2 589	-322[b]	257
Netherlands	664	1 036	1 742	3 752	2 256	2 370	4 009	1 777	8 211	2 889	-507	2 769
United Kingdom	1 105	1 649	5 261	6 040	3 063	3 765	1 852	3 948	10 624	19 747	4 714	9 121
United States	8 585	9 844	6 441	5 342	5 059	3 148	1 569	4 266	6 748	22 729	17 684	77 984
Africa	123	2	-105	-53	-124	427	358	-98	334	242	488	867
Latin America/ Caribbean[c]	730	-93	557	341	1 321	295	822	1 678	3 165	2 561	3 508	3 228
Near & Middle East	170	143	149	47	19	56	418	-394	417	376	227	326
Asian Countries	224	432	233	333	648	452	753	1 690	2 767	3 780	5 350	2 352
Unallocated	-4	-158	-75	-181	-510	1	-60	1 475	2 935	263	3 485	3 751
World	17 399	21 227	28 539	38 726	39 191	30 499	25 324	27 882	55 588	76 483	69 859	152 401

Source: OECD, 2000:139-140 (data for 1998 are provisional)

[a] Break in series as from 1996. Up to 1995 only long-term loans were included. Starting in 1996 short-term financial and trade credits are also included (OECD, 1999: 404).

[b] Negative numbers show disinvestment, withdrawal of capital or reimbursement of loans.

[c] Excluding Mexico.

Table 5: German FDI outflows to economies in Asia, Latin America and the Caribbean (DM million)

Country	1997	1998
Latin America and the Caribbean[a]	**3 508**	**3 228**
of which		
Argentina	565	305
Brazil	645	1,946
Colombia	71	66
Chile	102	199
Asian countries[a]	**5 350**	**2 352**
of which		
China	1 594	886
Taiwan Province of China	558	95
Hong Kong, China	236	17
India	381	440
Indonesia	185	162
Malaysia	496	-115[b]
Philippines	25	97
Singapore	1 077	575
Thailand	619	-24

Source: OECD, 2000:140 (data for 1998 are provisional)

[a] Excluding OECD member countries.
[b] Negative numbers show disinvestment, withdrawal of capital or reimbursement of loans.

The most important sectors for German FDI are manufacturing (55.5 per cent), real estate and business activities (19.5 per cent) and financial activities (18.2 per cent). Manufacturing mainly includes vehicles and other transport equipment (72.6 per cent) and petroleum, chemical, rubber and plastic products (15.2 per cent); financial activities mainly include those of financial institutions (34.0 per cent) and insurance and activities auxiliary to insurance (19.6 per cent) (see table 6).

Table 6: Evolution of German FDI: outflows by industrial sector (DM million)

Sector	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996[a]	1997	1998
Agriculture & fishing	7	3	2	-9	5	3	0	-1	4	-1 648[b]	-228	41
Mining & quarrying	685	359	220	224	1467	-78	-77	-362	-72	-13	25	-459
Manufacturing	6 016	9 599	9 055	16 420	15 331	12 422	9 590	10 549	20 055	16 500	27 899	84 529
Electricity, gas & water						241	882	113	1,353	561	734	233
Construction	83	55	110	289	160	77	447	269	206	51	704	222
Trade & repairs	163	409	973	842	715	1 326	1 398	515	1 963	2 485	3 350	1 634
Hotels & restaurants						-6	86	-7	18	60	-42	145
Transport & communication						399	930	518	1 813	2 782	-857	-2 777
Financial activities	2 348	3 741	10 445	13 427	12 925	5 242	5 346	6 822	11 208	26 020	15 957	27 752
Real estate & business activities						6 305	5 051	6 061	11 543	10 875	13 036	29 700
Other services	3849	3 890	640	768	919	1 090	760	2 150	3 507	2 940	2 823	3 454
Unallocated	1 250	1 370	6 420	6 765	7,669	3 478	911	1 255	4 344	15 870	6 458	7 927
Total	**14 401**	**19 426**	**28 284**	**38 726**	**39 191**	**30 499**	**25 324**	**27 882**	**55 962**	**76 483**	**69 859**	**152 401**

Source: OECD, 2000: 136 (data for 1998 are provisional).

[a] Break in series as from 1996. Up to 1995 only long-term loans were included. Starting in 1996 short-term financial and trade credits are also included (OECD, 1999: 404).
[b] Negative numbers indicate disinvestment, withdrawal of capital or reimbursement of loans.

2. The case study countries: key characteristics

Asia is one of the fastest growing economic regions in the world. In 1998, the countries in South, East and South-East Asia (among them China, India and Malaysia) received FDI inflows of $77.3 billion, that is 12 per cent of world inflows and 91 per cent of total inflows to Asia. The largest share of these ($45.5 billion) went to China (UNCTAD, 1999: 479). Table 7 shows German FDI flows to and from the case study countries.

Table 7: German FDI to and from the case study countries (DM million)

German FDI outflows by country												
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996[a]	1997	1998
China	22	80	17		115	233	112	483	630	1 522	1 594	886
India	18	29	28	9	6	11	108	149	297	153	381	440
Malaysia	-34[b]	25	29	82	62	102	46	144	55	629	496	-115
German FDI inflows by country												
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
China	2	3	22	-10		-1	17	-7	-6	40	14	36
India	1	-7			-3	3	4	-5	17	-26	10	63
Malaysia							167	-219		41	-23	-29

Source: OECD.

[a] Break in series as from 1996. Up to 1995 only long-term loans were included. Starting in 1996 short-term financial and trade credits are also included (OECD, 1999: 404).

[b] Negative numbers indicate disinvestment, withdrawal of capital or reimbursement of loans.

2.1 China

China is the largest country in the world in terms of population, and the third largest in terms of land area. Its population is 1,266.5 million people (The Economist, 1999: 96), and its GDP in 1997 was US$ 1,055 billion. Over the last 20 years China has pursued a policy of economic reform and opened up to external markets; this economic liberalization is expected to continue in the future, especially the privatization of most State-owned companies. Despite the rapid growth of the economy, unemployment remains a major problem. In UNDP's Human Development Index (HDI) of 1999, China ranked 98th, seven places higher than its ranking of the previous year.

Table 8: China's GDP and the share of different sectors (as % of GDP)

Country	**GDP 1997 (billion US$)**	**Agriculture**	**Industry**	**Services**
China[a]	1 055	18.7	49.2	32.1

Sources: Statistisches Bundesamt, 2000a; 2000b

[a]Excluding Hong Kong (China) and Taiwan Province of China

Since 1992, China has been one of the most important host countries for FDI among developing countries. This can be attributed partly to China's size, but also to economic factors such as low unit

labour costs, and high growth rates of more than 10 per cent per annum between 1990 and 1996. FDI flows to China increased from US$ 27,515 million in 1993 to US$ 45,460 million in 1998.

China's FDI policy divides FDI activities into four categories: encouraged, permitted, restricted and prohibited. Officially, this has a bearing on project approval. FDI in new agro-technology and agricultural development, energy, telecommunications and essential raw material industries is encouraged. FDI in products in which the domestic supply capacity is insufficient and in products which are export-oriented is also encouraged. The "prohibited" category covers activities that jeopardize national security, adversely affect social and public interests, and pollute the environment. The "restricted" category includes FDI in activities that lead to excess supply capacity in the domestic market, FDI in industries not fully liberalized, and FDI in the exploitation of rare mineral resources (Guoming et al., 1999: 6).

In recent years, China's FDI regime has liberalized gradually: sectors such as airlines, finance, insurance, foreign trade, and wholesale and retail activities have been partially opened up to FDI. Since January 1998, FDI projects in the "encouraged" category are exempt from tariffs and value-added tax on imported equipment that is intended for the investor's own use (Guoming et al., 1999: 6-7).

Most of the FDI inflows to China come from neighbouring Asian economies: Hong Kong (China) and Taiwan Province of China accounted for 62 per cent of total FDI stock in 1997. The share of total FDI flows to China from the EU increased from 2.4 per cent in 1993 to 9.6 per cent in 1997. German FDI was about 1 per cent of total FDI flows to China. Nine of the 10 largest manufacturing TNCs in Germany have started joint ventures in China and some have several affiliates. For example, Hoechst has more than 10 subsidiaries, and BASF and Bayer have more than five each (Guoming et al., 1999: 4). In spite of the low importance, overall, of German FDI in China relative to other foreign investors, Germany is among the most important investors in some specific sectors such as automotive, electronics and chemicals (OAV,1998: 132).

The largest proportion of FDI in China goes to the manufacturing sector, which, in 1997, accounted for 62 per cent in terms of stock, and real estate accounted for 25 per cent. The regional distribution of FDI in China is also quite unbalanced: 88 per cent of FDI (in terms of stock) was concentrated in the coastal areas in the eastern part of the country in 1997 (Guoming et al., 1999: 9).

Concerning environmental technologies, waste-water treatment technology and clean air devices are sectors which offer the most promising market opportunities for German industry. Its experience in tackling similar environmental problems in the eastern part of Germany represents an important competitive advantage (BfAI, 1998: 10).

2.2 India

With 1,002.4 million people, India is the second most populous country in the world. Its GDP in 1997 amounted to $357.4 billion. Until 1991, India was a planned economy with low levels of external trade and investment. Since then, it has opened up through a process of gradual liberalization. The remaining trade barrriers will probably continue to be reduced along with a further opening up of the country to FDI.

Table 9: India's GDP and the share of different sectors (as a % of GDP)

Country	GDP 1997 (US$ billion)	Agriculture	Industry	Services
India	357.4	25.3	30.1	44.6

Sources: Statistisches Bundesamt, 2000c; and 2000d

From 1973, India began imposing restrictions on the activities of TNCs with the Foreign Exchange Regulation Act (FERA) that set a ceiling of 40 per cent on foreign equity participation in India. As a result, many TNCs left the country and potential new entrants were deterred. But as a part of the New Industrial Policy (NIP) initiated in 1991, FDI was promoted; for example, licensing requirements for TNCs have been eased or lifted, TNCs are allowed a majority ownership in most industries and can now set up wholly-owned subsidiaries, and they can repatriate profits at the market rate of exchange. Additionally, several state governments offer incentives such as capital subsidies, sales tax exemptions, power subsidies, and land allotment on a priority basis (Jha, 1999: 3-4). However, there are weaknesses in India's infrastructure that can deter TNCs from investing. The Government has formulated policy initiatives to render the infrastructure sector attractive for FDI. These initiatives include, for example, market-driven pricing for infrastructural services that makes investment in this sector especially profitable, and fiscal incentives for investment in infrastructure (Jha, 1999: 5)

FDI flows to India grew from $550 million in 1993 to $3,351 million in 1997. In 1998, they fell to $2,258 million (UNCTAD, 1999:479). The sectoral distribution shows that infrastructural sectors, along with power and oil refineries and telecommunications, account for over 46 per cent of total FDI inflows. Engineering accounts for the biggest share in total FDI inflows, followed by chemicals and allied products, food and dairy products, finance, and electronics and electrical equipment. Regionally, the states of Delhi and Maharastra accounted for a little over 30 per cent of total FDI inflows in the 1990s (Jha, 1999: 7-8).

The United States, the United Kingdom and Germany are the three most important sources of FDI flows to India. Most German investments are in high technology products, computer software, electronics, heavy machinery, pharmaceuticals, chemicals and dyestuffs (Jha, 1999: 8 and 39). In the environmental sector joint ventures between Germany and India are most common in the fields of clean air devices; some firms also engage in the production of biological pesticides and environmentally friendly textile cleaning (BfAI, 1997: 7).

2.3 Malaysia

Malaysia has a population of 22.4 million (The Economist, 1999: 97); its GDP in 1997 was US$ 98.2 billion. Manufacturing is dominated by a few industries, especially the electrical and electronics industries. In 1995, exports of these industries constituted 66 per cent of total manufacturing exports and 52 per cent of total exports, making the economy vulnerable to changes in world demand for these products. Moreover, these industries are characterized by high input intensity and limited technology transfer; value added declined from 28 per cent of gross output in 1981 to 22 per cent in 1992 (UNCTAD, 1997: 90-91). Given this situation, an increase in FDI might improve the competitiveness of the country in the future through technology improvement and intensification and product diversification. FDI could also help the expansion of industries engaged in processing resources which are in abundant supply in Malaysia, and could thereby contribute to an increase in value added. Between 1990 and 1996, the Malaysian economy grew at 9 per cent per annum, on average. But this

growth slowed down in 1997, and in 1998 Malaysia recorded a negative growth rate of -6.7 per cent, mainly due to the Asian crisis (Rasiah, 1999: 8). Since then it has recovered to a certain degree: from the second quarter of 1999 to the second quarter of 2000, Malaysia's economy grew at 8.8 per cent (The Economist, 2 Sept. 2000: 106).

Table 10: Malaysia's GDP and the share of different sectors (as a % of GDP)

Country	GDP 1997 (US$ billion)	Agriculture	Industry	Services
Malaysia	98.2	12.1	47.3	40.6

Sources: Statistisches Bundesamt, 2000e; and 2000f.

FDI has played an important role in Malaysia; annual FDI inflows grew from US$ 2,387 million (annual average 1987-1992) to US$ 5,006 million in 1993. These declined in 1994 and 1995 but increased again to US$ 5,106 million in 1997 before declining once more in 1998 to US$ 3,727 million (UNCTAD, 1999: 479). In 1993, in the primary sector, FDI dominated in petroleum exploration and mining. In manufacturing, on average 50 per cent of fixed assets were in foreign ownership; in electrical and electronics industries, 91 per cent of fixed assets were owned by foreign companies. Beverage and tobacco, textiles and apparel, leather, rubber, fabricated metals, and machinery are also industries that have foreign ownership of more than 50 per cent (Rasiah, 1999: 8-9).

Despite increased environmental governance in the 1990s, the state of the environment is not satisfactory: air and water pollution levels worsened in the 1990s, and toxic and hazardous waste increased (Rasiah, 1999: 18-19). Environmental damage in some cases represents an obstacle to German FDI in Malaysia, but it can also be advantageous to German industry – given the high standard of its environmental technologies – as Malaysia's demand for environmental technology is likely to increase in the years to come.

3. Conclusions

During the past two decades, FDI has increased at much higher rates than other indicators of globalization. For developing countries, FDI has assumed special importance, becoming their most important source of capital inflows in the 1990s. The further increase of FDI and its structure will, to a large degree, shape the economies of developing countries in the future. Therefore it is important to investigate various features of FDI in developing countries to ensure that they pursue a development path which is sustainable in the long run and leads to economic as well as environmental and social improvements in the host countries.

German firms are the third largest investors in developing countries. Therefore they have an enormous potential to influence the economic and environmental performance of those countries – not only directly by using modern and environmentally friendly technologies, but also indirectly by providing examples that could be imitated by others or that could lead to better environmental regulations in the host countries of FDI. This potential for influencing the environmental performance of the host countries is reinforced by the fact that the FDI activities of German firms takes place mainly in industrial sectors which are of significance to development and which also have potentially high environmental impacts.

III. The policy context

International economic relations take place within an institutional environment that can have considerable influence on the structure and effects of FDI. This institutional environment has an economic and an environmental aspect. The economic component concerns international agreements on trade and investment, including national (in this case, German) policies for promoting and facilitating FDI. Regarding the environmental aspect, there are four components to consider: (i) international environmental agreements (IEAs); (ii) international and regional voluntary environmental initiatives; (iii) the environmental policy in the home countries of FDI (in this case, Germany); and (iv) the policy and market context in the host countries of FDI (in this case, India, China and Malaysia). These economic and environmental institutional factors are considered in the following subsections, 1 to 5; subsection 6 will draw some conclusions.

1. International economic agreements

1.1 Bilateral agreements and political support for FDI

There are about 1,600 bilateral agreements on investment (BITs) which aim, in particular, at the protection of investors' rights and reduction of investor uncertainty (Skarpelis-Sperk, 1998: 164). Since 1959, Germany has signed 120 BITs, the vast majority of which have been with developing countries (IÖW, 1998: 127) and which grant the investing companies comprehensive legal protection in developing countries and economies in transition (BMWi, 1999b). The investment treaties facilitate the opening up of new markets, especially for SMEs, and represent a necessary prerequisite to Federal guarantees for German capital invested abroad, as they protect against political risks (BMWi, 1999b).

The most important components of the BITs are:

- Definitions of the concepts of "capital investment", "yield on capital investment", and "party investing";
- National treatment and most-favoured-nation (MFN) treatment concerning investment;
- Freedom to transfer capital and profits;
- The right of ownership, including compensation, in terms of value, in case of expropriation, and possibility of legal recourse; and
- International arbitration in case of disputes between the home country and host country (BMWi, 1999b).

Additionally, there are numerous programmes and institutions that support the FDI activities of German companies. At the national level, there are two institutions in particular that offer grants to support FDI in developing countries, namely the German Society for Investment and Development (DEG) and the German Development Bank, KfW (BMWi, 1999a).

The DEG contributes to financing investment in developing countries and in economies in transition by participating with equity, granting long-term loans for which security is provided through the assets of the company in the host country, and by providing sovereign risk insurance. It also advises companies on the planning and realization of investment projects (BMWi, 1999a). The KfW promotes environmental investment projects, in particular for SMEs, through the provision of loans at interest below market rates (BMWi, 1999a; BMWi, 1998b: 84-85; and BMWi, 1997b:15). Besides these

institutions, numerous others offer advice and/or finance to companies willing to invest abroad (BMWi, 1997a:7-9; and BMWi, 1997b: 2-14).[3]

1.2 Multilateral agreements on trade and investment

The multilateral agreements under the aegis of the World Trade Organization (WTO) are the central agreements concerning trade and FDI. Rules for the international trade of goods were established under the General Agreement on Tariffs and Trade (GATT) that was established in 1947. Since the Second World War, multilateral tariff reductions have taken place under this umbrella framework. Furthermore, GATT rules forbid export subsidies and import quotas, except for certain specified products or circumstances. In January 1995, the GATT was replaced by the WTO, which is now the institution with worldwide responsibility for trade-related questions. FDI issues are (partially) treated in the following WTO agreements which were negotiated during the GATT Uruguay Round that stretched over the period 1986-1993.

- The *General Agreement on Trade in Services (GATS)*. This agreement contains rules for the international exchange of services, but parts of it are also relevant for FDI. Since direct contact with the customer is necessary in many services, the GATS protects all investments which are made in order to deliver services in other countries. The general principles of the GATT (national treatment and non-discrimination) apply also to these investments, although there are special arrangements for sectors such as financial services and telecommunications.
- The *Agreement on Trade-related Aspects of Intellectual Property Rights (TRIPS)*. TRIPS came into force with the WTO on 1 January 1995. It requires that any intellectual property rights granted to domestic innovators also be granted to foreign innovators (national treatment) and that no party should be favoured over others (non-discrimination). Developing country members and economies in transition have five years, and less developed countries 10 years, to introduce the required laws and meet the standards set in the TRIPS Agreement. This might be a challenge for countries that have no relevant legislation in place or have developed entire sectors based on imitations of innovations developed elsewhere (e.g. India's pharmaceutical industry) (Panayotou, 1999: 261-262).

According to Panayotou (1999: 262), complying with TRIPS will impose significant social and financial costs on countries through higher prices (due to payment of royalties and industry concentration). For example, small-scale seed and pharmaceutical companies in India and other developing countries are likely to go out of business, and prices will rise beyond the reach of many poor people.

TRIPS might also have adverse effects on the environment; for example a concentration of the seed market in the hands of a few major producers who specialize in a few strains may result in loss of biodiversity and impoverishment of the genetic pool. A narrow genetic base and extensive monocultures will be more vulnerable to epidemics of pests and blight.

[3] These institutions include: the German Chamber of Foreign Industry and Commerce (AHK), delegate offices and German industry's agencies abroad; the Federal Agency for Information on External Trade (BfAI), supported by the Federal Ministry of Economics (BMWi); German Centres (DIHZ) located abroad (supported by the Landeszentralbank, the main offices of the Bundesbank in the different Länder); C&L Deutsche Revision AG; Hermes Kreditversicherungs AG; Statistical Federal Office; Federal Office for Economics; Federal Export Office; Federal Administration Office; Federal Office for Finance; Federal Cartel Office; and the German Patent Office.

1.3 The OECD's proposed multilateral agreement on investment (MAI)

As described in section III.1.1 there exist about 1,600 bilateral investment treaties, which constitute, de facto, an international law on investment. This body of law is differentiated, but also very vast and contradictory, and can therefore be an important barrier to further FDI activities in countries outside the EU. It is too complex, especially for SMEs to handle, and although large TNCs can afford the necessary staff for managing such a complex area, it is, nevertheless, an important part of the cost of FDI. Furthermore, as was shown in the preceding section, the existing multilateral agreements regulate only some aspects of FDI. Thus both companies and governments recognize the need for standardized international rules on FDI. In response to this need, the OECD attempted to negotiate a multilateral agreement on investment (MAI) which would establish a set of rules for FDI. Although the negotiations on MAI have been suspended, the debate on this initiative highlights the problems and fears associated with it.

1.3.1 Content and provisions of the MAI

In order to standardize the multitude of rules for FDI that exist in different bilateral treaties, the OECD began negotiations in 1997 on a multilateral agreement on investment (MAI) between member countries as well as non-member countries willing to meet its conditions.

The objectives of MAI were to promote FDI by ensuring investor rights or needs through:

- Long-term stability of rules and procedures;
- Open markets and equal competitive opportunities with domestic investors;
- Protection of existing investments; and
- An international mechanism for settling disputes with national governments.

MAI was intended to include direct investments, portfolio investments, real estate investments and rights under contract. Its main provisions included (Panayotou, 1999: 258):

- Non-discrimination: foreign investors must be treated no less favourably than domestic investors (national treatment) and all investors should be accorded most-favoured-nation (MFN) treatment;
- Transparency of laws, regulations and procedures;
- Free transfer of funds to and from the host country;
- Expropriation only for public purpose and with full compensation; and
- Dispute resolution through binding arbitration.

General exceptions were to be allowed for national security, and for integrity and stability of the financial system; temporary safeguards were to be allowed in response to balance-of-payments crises; and country specific exceptions and regulations were to be permitted as negotiated among the parties. Exceptions for culture were also considered.

1.3.2 Environmental implications of the MAI

The MAI has been heavily criticized on a variety of fronts: from national sovereignty and cultural protection to public health and the environment. Environment-related criticisms include, among others (Panayotou, 1999: 258):

- Concerns that corporate challenges to environmental regulations will accelerate;
- The intellectual property rights provisions, giving patents full protection, might conflict with provisions of the Biodiversity Convention (see below);

- While MAI envisages protection of logging concessions, acquiring land for conservation is not protected;
- Governments are unduly constrained by provisions on rights from concessions, licences and permits in regulating corporations involved in developing natural resources in their jurisdictions. In effect, this could prevent an efficient natural resource conservation policy and stifle a nation's regulatory authority over both foreign and domestic corporations that do business within its boundaries.

MAI did not receive the necessary support from key parties so that the negotiations were suspended at the end of 1998. However, it is expected that there will be new efforts to negotiate a multilateral agreement on investment in the coming years. It will probably be negotiated within a transparent and participatory United Nations forum – a demand of the conservation NGO, World Wide Fund for Nature (WWF) – and include NGOs to ensure the appropriate integration of environmental and social concerns.

1.3.3 The debate on the MAI in Germany

The public debate in Germany over the proposed MAI was highly controversial. In the following subsections the positions of the different stakeholders are briefly sketched.

The German trade unions' standpoint

According to a statement on the MAI issued by the German Trade Union Federation (DGB) (DGB 1998), the Federation and its member trade unions supported the numerous efforts of the Trade Union Advisory Committee (TUAC) and the *Internationaler Bund Freier Gewerkschaften* (IBFG) for a qualitative amendment to the MAI draft and a provision for social and environmental standards.

The DGB acknowledged the great opportunity an international agreement on investment would offer for specifying binding social standards. Furthermore, the organization stressed the importance of internationally binding regulations by which governments are committed to force TNCs to apply the same standards in the host country as in the home country, given that the latter are stricter than the former.

Therefore, the DGB demanded, among other things, the integration of the OECD Guidelines for Multinational Corporations (see below) into the MAI; the creation of a national authority for supervision and arbitration, ensuring the observance of the OECD Guidelines and the social and environmental standards which are to be integrated into the MAI and international control through the International Labour Organization (ILO) and the OECD; and a binding clause prohibiting governments from offering lower – or abolishing – labour, social and environmental standards as an investment incentive.

German industry's standpoint

The Federal Association of German Industry (BDI) had a positive attitude towards the liberalization of FDI and towards the proposed MAI. German industry had a special interest in the success of the negotiations due to the importance of FDI (BDI, 1997). Among the positive effects of a MAI, the BDI appreciated the greater legal certainty for investors, the high level of investment protection, equal treatment of national and foreign investors, and the introduction of new measures in favour of greater liberalization.

German NGOs' standpoint

In an open letter, numerous German NGOs (for example the German section of Friends of the Earth, the BUND, and WWF-Germany) addressed the federal Government as well as the *Bundestag and Bundesrat,* criticizing the general orientation of the MAI, and, in particular, the lack of binding regulations on social and environmental standards. In this letter, the federal Government was asked to put a stop to the MAI for the time being so that probable effects could be thoroughly analysed and discussed in public. The letter disapproved of the exclusion of less developed countries and the *Bundesrat* and *Bundestag* were called upon not to ratify the MAI in its draft version (IÖW, 1998: 91-92).

German NGOs in general fear that the environmental consequences of trade and investment liberalization will result in further overexploitation of natural resources, that higher environmental standards will be impeded by the so-called standstill principle (which precludes the passing of laws that are not in conformity with the MAI), and that environmental laws will be thrown overboard if an agreement such as the MAI is passed (WEED, 1998: 22).

2. International environmental agreements

Multilateral environmental agreements (MEAs) are based on the political recognition that global action must be taken on transboundary or global environmental problems that cannot be tackled adequately solely through national actions. Such issues include biodiversity loss, desertification, climate change, ozone layer depletion and acid rain.

MEAs are negotiated under the umbrella of the United Nations and, once ratified, are legally binding on signatory countries. They frequently include measures which affect trade, either in the form of trade restrictions or through the provison of financial and other support to help compliance by developing countries. Such measures take account of the principle of "common but differentated responsibilities" granted to developing countries in international negotiations. This includes differentiated timescales for implementation by developing and developed countries and the provision of support for technology transfer by the latter for developing economies. MEAs thus have the potential to influence the structure of FDI, as demonstrated by the brief review of selected key MEAs set out below in chronological order.

2.1 The Montreal Protocol (1987)

The Montreal Protocol sets targets for the phasing out of the use of many ozone-depleting substances including chlorofluorocarbons (CFCs) and halons. It has more than 165 signatory countries. Rules include the following: CFCs and halons must not be imported by the signatory States; there are restrictions on the possibility of signatory countries relocating production of CFCs and halons abroad; industrialized countries are to phase out CFCs by 1995; developing countries have a 10-year grace period. An international fund has also been set up to help developing countries fulfil their obligations.

The agreement has an impact on the trade of goods and services and on FDI, since the provisions of the Protocol restrict the possibility to relocate abroad those production processes that contribute to stratospheric ozone depletion. The Protocol is therefore characterized by trade barriers against the non-signatories as well as by financial transfers from the industrialized countries to the developing countries in support of the application of environmentally friendly substances (Stewart, 1993: 2101).

2.2 The Basel Convention (1989)

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, which came into force in 1992, has been signed by more than 100 member States. Signatories are obliged to ensure environmentally sound management of hazardous wastes, including their disposal. At the 1998 Kuala Lumpur Meeting of the Parties, a ban on exports of hazardous waste to developing countries was agreed.

The provisions on cross-border movements of hazardous wastes gave rise to deliberations on the compatibility of the MEA with international free trade agreements under GATT/WTO. The two have conflicting objectives: while the Basel Convention aims at restricting the international transfer of certain substances for environmental reasons, the objective of the GATT/WTO is to ensure international free trade (Mehta/Chatterji, 1996).

This agreement is relevant for the FDI activities of TNCs because under it, foreign affiliates are no longer allowed to transfer hazardous waste to developing countries with less stringent standards.

2.3 The United Nations Conference on Environment and Development, Rio de Janeiro (1992)

The United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro (1992), also known as the Earth Summit was attended by representatives of 176 countries, including more than 100 Heads of State. A number of key agreements were signed which have directed subsequent environmental policies of governments, industry and other stakeholders. They include:

- The *Rio Declaration*, which recognizes the Earth as an integral and interactive system, in accordance with the first global conference on the environment (the 1972 United Nations Conference on the Human Environment in Stockholm). Economic development and environmental protection are considered two objectives that have to be attained simultaneously in order to comply with the objective of sustainability (BMZ, 1992: 11-12). The Declaration is not legally binding, but as it has been signed by a large number of countries, it is of immense political importance. Positive effects on the environment are likely to have occurred as a result of the appeal in the Declaration not to relocate abroad activities or materials that are detrimental to the environment or to health (Principle 14). In addition, the Declaration recommends the negotiation of multilateral agreements. This might bring about a reduction of so-called "tariff-jumping FDI" and help stop FDI that attempts to circumvent high environmental standards in the home country.

Furthermore the Declaration emphasizes the necessity of international cooperation to achieve sustainable development and to strengthen endogenous capacity-building (Principles 7, 9, 12). The importance of a precautionary approach is especially highlighted in order to prevent environmental damage from the outset (Principle 15). Regarding environmental policy, the use of economic instruments according to the "polluter-pays principle" is encouraged (Principle 16). Finally, effective access for each citizen to information concerning the environment, including information on hazardous materials and activities in their communities, is seen as vital for encouraging public awareness (Principle 10).

- *Agenda 21*, a global action plan for the 21st century which aims at achieving sustainable development, contains detailed instructions for all stakeholders on environmental and development policy. Agenda 21 is not legally binding but has, nevertheless, led to the implementation of Agenda 21 programmes in both developed and developing countries.

With regard to international trade and FDI, Agenda 21 demands that environmental aspects be considered in FDI and that barriers to trade which can be ascribed to environmental protection be based on international consent (BMZ, 1992: 15-16). Moreover, with a view to environmental protection, Agenda 21 provides for the transfer of both know-how and technology from the industrialized to the developing countries. The possibility that FDI can accelerate technology transfer, infrastructure projects, the training of experts and the conveying of environmental management practices is explicitly indicated.

With regard to corporate environmental performance, consideration of environmental, safety and health aspects is required at all levels of corporate planning and decision-making. Agenda 21 makes 31 demands of TNCs. Among them, the following are of special interest for the present study (UNCTAD, 1999: 460-461). TNCs, along with other industrial actors, should:

a) be encouraged to establish worldwide corporate policies on sustainable development (chapter 30.22);[4]
b) have a special role and interest in promoting cooperation in technology transfer and in building a trained human resource pool and infrastructure in host countries (chapter 34.27);
c) share their environmental management experiences with the local authorities, national governments, and international organizations (chapter 30.22);
d) report annually on their environmental record as well as on their use of energy and natural resources (chapter 30.10 (a));
e) arrange for environmentally sound technologies to be available to affiliates in developing countries (chapter 30.22);
f) provide data (for substances produced) that are needed specifically for the assessment of potential risks to human health and the environment (chapter 19.16);
g) apply a "responsible care" approach to chemical products, taking into account the total life cycle of such products (chapters 19.5 1 (b) and 20.18 (d));
h) adopt, on a voluntary basis, community right-to-know programmes, based on international guidelines, including sharing information on the causes of accidental releases or potential releases and the means to prevent them (chapter 19.5 1 (e));
i) make available to governments the information necessary to maintain inventories of hazardous wastes, treatment/disposal sites, contaminated sites that require rehabilitation, and information on exposure and risks (chapter 20.23 (a)).

- The *United Nations Framework Convention on Climate Change (UNFCCC)* aims at the stabilization of greenhouse gas (GHG) emissions to an acceptable level. As of 1997, 165 countries had signed this Convention and most of them had ratified it. Under the Convention industrialized countries and economies in transition have agreed on a voluntary target to reduce their GHG emissions to 1990 levels by 2000. There are also various reporting requirements on all signatories and measures to assure developing countries of financial and technological support to address climate change issues.
- The *Convention on Biological Diversity (CBD)* aims at the protection of species and has been signed by about 150 countries. Once again, the connection with FDI is based on intended cooperation with regard to financial and technological problems. Positive effects on the environment can be achieved by technology transfer, but also by easier access to patents and licences (BMZ, 1992: 8-9).

[4] Bracketed references are to the original Agenda 21 chapters.

- The *Global Environment Facility (GEF)*, attributed to a Franco-German initiative, was created in order to finance poor countries' efforts to contribute to global environmental protection.[5] The fund is administrated by the World Bank, the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP). The GEF aims at avoiding the application of old polluting technologies. Therefore, the idea of the fund is to bear the additional costs incurred for installing environmentally friendly technologies.

2.4 The Kyoto Protocol (1997)

The Kyoto Protocol was adopted in 1997 under the aegis of the UNFCCC. It establishes legally binding, quantified GHG emission reduction targets for developed countries Parties to the Agreement (so-called Annex One countries). The overall target set is a 5.2 per cent reduction of carbon dioxide (CO_2) equivalent emissions below 1990 levels by 2008-2012. The targets cover six GHGs (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perflourocarbons and sulphur hexafloride).

The Kyoto Protocol includes a number of implementation options aimed at ensuring that emission reduction targets are met cost-effectively. One of these measures is the Clean Development Mechanism (CDM), which explicitly promotes sustainable development. It allows Parties with emission reduction obligations to meet them by investing in appropriate projects in a developing country or through purchasing a "right" to certified emission reductions (CERs)[6] generated by such projects. The CDM thus aims to exploit the differentials in the marginal costs of climate change mitigation measures between projects in developing and developed countries. Properly functioning, it could bring new capital and transfer environmentally friendly technologies and practices to developing countries and finance the technological "leapfrogging" required for sustainable development.

The scale of capital flows involved in the CDM is potentially significant, although estimates vary widely. One study calculates that in 2010, 21–58 per cent of total emission reductions required under the Kyoto Protocol will be met through the CDM. This will represent a value of between $0.5 billion and $4.5 billion, with 60 per cent and 16 per cent of total CDM flows going to China and India respectively (Zhang, 1999). The World Bank's Prototype Carbon Fund places a higher figure on the potential size of the CDM market; it estimates a trade volume of $10–20 billion per year during the commitment period 2008–2012. At a project level, income generated by CERs could also be significant and could make the difference between a project being commercially viable or not.

However, there are various conditions that must be met for projects to qualify as CDMs.[7] Moreover, the detailed rules for implementation of the CDM have not yet been decided, while the Kyoto Protocol itself has so far only been ratified by a limited number of States.

[5] At present, Germany provides about 10 per cent of GEF's resources (BMZ, 1999c: 1).

[6] CDM projects will generate certified emission reductions which are the units of emission reductions. Whilst they can refer to all the gases covered by the Kyoto Protocol they are likely to be expressed as CO_2 equivalents.

[7] A key condition stipulated under the Kyoto Protocol for CDM projects is that of "additionality": the reductions in emissions must be additional to any that would have occurred otherwise, had the project concerned not been implemented. Other conditions relate to voluntary participation by each party concerned (for instance, the project cannot be in response to regulation) and the ability to demonstrate real, measurable and long-term benefits related to the mitigation of climate change. The projects must also have host country endorsement and promote sustainable development.

3. International initiatives on environmental reporting and management, and the importance of transparency

The content of the international environmental agreements surveyed in the last section, especially Agenda 21, shows an important trend in environmental policy. Apart from specific (reduction) targets for certain environmental problems, companies are required to deliver information about the environmental consequences of their activities.

This trend aims at securing greater transparency in general about the activites of companies, especially TNCs, and an increased reliance on their corporate responsibility. It is driven by several actors and groups. Market participants demand greater transparency about companies' activities in order to make more informed judgements about their economic decisions (e.g. whether to buy products from a certain company); in this regard, greater transparency can be an important factor for market success. Stakeholders such as environmental groups or other NGOs demand greater transparency from the companies, particularly with regard to the environmental impact of their activities. As these stakeholders might become more important in the course of globalization (as a result of an increase in international networks), companies have to come to terms with this challenge. Finally, the requirement by the State for greater transparency, such as information about the environmental impacts of companies' activities, might be used to complement – or even substitute – other, more specific, regulations imposed on firms.

Various initiatives concerning environmental management and reporting of companies and TNCs in particular have been launched during the past few decades in order to cope with the growing demand for greater transparency. These initiatives take the form of voluntary guidelines developed by industry associations or single industrial sectors, or they are standardized by public regulations. Section III.3.1 describes some of the most important aspects of these initiatives, which consitute companies' response to demands coming from the market or from stakeholders in civil society. Additionally, there is empirical evidence from the United States that requirements concerning the disclosure of firms' environmental records can be an effective policy tool. This will be taken up in section III.3.2.

3.1 Environmental management and sustainability reporting initiatives

Environmental Management and Audit Scheme – EMAS

This scheme was passed by the EU in 1993. A revised version will come into force during the first half of 2001. Its objective is to promote the continuous improvement of environmental performance of companies through the introduction of efficient and transparent environmental management processes. This requires the setting of goals and targets, the establishment of monitoring and review systems (environmental management systems – EMS), assignment of responsibilities, and awareness-raising and training programmes for employees. Apart from compliance with all environmental regulations, companies are required to continuously improve their environmental performance. Performance results are externally audited at least every three years.

EMAS also promotes environmental transparency through its provision that company environmental policy statements have to be published and made publically available (the audit statement itself is not published).

As it is an EU regulation, EMAS is limited to EU member States. Furthermore, its application is limited to single sites of companies and refers only to the production industry. But these latter two problems will be tackled in the revised version of EMAS: the scope of EMAS will be extended to all

sectors of economic activity and all sites of a company shall be audited, and not only some of the sites selected by management.

ISO 14001

In 1996, the International Organization for Standardization (ISO) passed the norm ISO 14001 within the ISO 14000 series. The main objectives of this norm are the continuous improvement of a company's environmental management system and avoidance of damage to the environment. Environmental management systems are certified according to ISO 14001 at least every three years in order to maintain ongoing verification that they are being implemented and maintained properly. The following are the main criticisms of ISO 14001:

- It is system-oriented, which means that it only requires improvement of the EMS itself and not improvement of environmental performance;
- There is no requirement for external auditing or the publication of environmental policy statements and other information; and
- Compliance with national environmental regulations is a minimum requirement for certification. Thus in countries where regulatory and enforcement capacity is weak, it might be much easier to obtain certification. ISO contains no requirement for using best available technologies.

It is planned to introduce a norm on environmental reporting within the ISO 14000 series. This norm will resemble the German norm on environmental reporting: DIN 33922.

Voluntary codes of conduct for TNCs

As early as 1976 the OECD passed basic guidelines for multinational enterprises. These are the recommendations of the Governments of the OECD countries to the companies that do business within their boundaries. These basic principles contain recommendations and codes of conduct for the multinational enterprises and they aim to bring business activities – particularly FDI – in line with the government requirements of the host countries. They also provide advice for companies that wish to draw up internal corporate guidelines and codes of conduct. The multinational companies are not responsible for ensuring their suppliers' compliance with the OECD guidelines, and their own observance of the recommendations and the codes of conduct is voluntary, and therefore not legally binding. On 27 June 2000, a new and updated set of guidelines was adopted by the Governments of the 29 member States of the OECD and of Argentina, Brazil, Chile and Slovakia.

Concerning transparency and environmental performance of the multinational companies, the following two principles are of particular importance:

a) Enterprises should ensure that timely, regular, reliable and relevant information is disclosed regarding their activities, structure, financial situation and performance. Furthermore, enterprises should also disclose material information on company objectives, major share ownership and voting rights, members of the board and key executives and their remuneration, material foreseeable risk factors, material issues regarding employees and other stakeholders, and governance structures and policies.

b) Enterprises should establish and maintain an EMS to minimize environmental, health and safety risks. This includes: collection and evaluation of adequate and timely information regarding the environmental, health, and safety impacts of their activities; establishment of measurable objectives and, where appropriate, targets for improved environmental

performance, including periodically reviewing the continuing relevance of these objectives; and regular monitoring and verification of progress toward environmental, health and safety objectives or targets. Furthermore, a company should provide the public and employees with adequate and timely information on the potential environmental, health and safety impacts of the activities of the enterprise, which could include reporting on progress in improving environmental performance; it should also engage in adequate and timely communication and consultation with the communities directly affected by the environmental, health and safety policies of the enterprise and by their implementation.

International Chamber of Commerce

In 1990, the International Chamber of Commerce (ICC) drew up the Business Charter for Sustainable Development. This charter includes 16 principles in the field of environmental management, and represents a company code of conduct that is in accordance with national and international guidelines and standards. Observance of the charter is voluntary, but its application by companies is becoming more common. So far, more than 2,300 companies have signed the charter (ICC, 2000). Signatories commit to applying home country environmental requirements internationally (i.e. in the host countries of FDI). Furthermore, all firms along the supply chain, as well as the public, should be informed about or trained on the safe use, transportation, storage and disposal of products. The environmental performance of the suppliers should be adapted to the company's level (e.g. by supporting improvements in the suppliers' environmental management through the application of the Charter's principles).

Responsible Care

Responsible Care began as a framework for improvement for the Canadian Chemical Producers Association (CCPA) in 1985. To date, it represents the chemical industry's commitment to continual improvement in all aspects of health, safety and environmental performance and to openness about its activities, achievements, plans and targets. At present, it is implemented in 42 countries, covering 87 per cent of global chemicals production (ICCA, 1998: 2).

In November 1998, the European Chemical Industry Council (CEFIC) presented a new set of reporting guidelines containing 16 "core parameters" and their definitions. By 2002, all member federations of the CEFIC are to report data on these core parameters. The parameters include: number of fatalities, lost-time injuries frequency rate, occupational illness frequency rate, hazardous waste for disposal, non-hazardous waste for disposal, emissions of sulphur dioxide (SO_2), nitrogen oxide (NO_X), carbon dioxide (CO_2) and other global warming gases, emissions of volatile organic compounds (VOC), aquatic release of phosphorus compounds, aquatic release of nitrogen compounds, chemical oxygen demand (COD), aquatic release of heavy metals and their compounds, other substances that potentially affect human health or the environment, energy consumption and energy efficiency, and distribution incidents.

Social Accountability 8000 Standard - SA 8000

In 1997, the Council on Economic Priorities Accreditation Agency (CEPAA) developed the Social Accountability 8000 Standard (SA 8000). This is a voluntary standard for auditing workplace conditions and a system for independently verifying factories' compliance with the standard. Issues covered include child labour, forced labour, health and safety, freedom of association, and right to collective bargaining.

CERES Reporting Initiative

In late 1997, the Coalition for Environmentally Responsible Economics (CERES) established the Global Reporting Initiative (GRI), with the aim of designing globally applicable guidelines for preparing enterprise-level sustainability reports covering economic, environmental and social issues (GRI, 1999). The objectives of the GRI are:

a) To elevate sustainability reporting practices worldwide to a level equivalent to, and as routine as, financial reporting in terms of comparability, auditability, and generally accepted practices; and

b) To design, disseminate, and promote standardized reporting, core measurements applicable to all enterprises, and customized, sector-specific measurements, all reflecting the environmental, economic and social dimensions of sustainability.

The GRI guidelines were developed through consultation with a broad range of stakeholders in an effort to harmonize disparate reporting initiatives worldwide. They are also to be in accordance both with existing norms and regulations, such as EMAS and the ISO 14000 series, and international guidelines and national laws. Indicators are currently under development for economic, environmental and social performance (GRI, 2000).

3.2 Environmental transparency as a political device

The previous subsection already emphasized the increasing importance of transparency. Corporations publish environmental reports to create goodwill and to deliver information on their environmental activities. Recent research has shown that information and transparency can be important tools for improving conditions – tools that can be used by governments and by companies.

In environmental policy, a new instrument requiring that information be made public creates transparency about the environmental impacts of companies. Such a requirement can have significant positive environmental effects, as experience in the United States has shown. In that country, firms are required by law to provide certain data about the environmental impacts of their activities to the Environmental Protection Agency. This is done within the framework of the so-called "Toxic Release Inventory" (TRI). One example of the kind of data firms have to deliver is the amount of solid toxic waste and the way they handle it (such as recycling or other forms of disposal). These data are available to the public. Analyses of the stock market reactions to the publication of the data (Konar/Cohen, 1997; Khanna,Quimio and Bojilova, 1998) have shown that this is followed by significant reactions in the stock market price of a firm. These stock market reactions can induce firms to take action to improve their environmental performance and, consequently, can lead to an improvement in their financial performance as measured by their stock market price.

That means that on the one hand enhanced ecological transparency can be an effective measure of environmental policy in order to improve the environmental performance of companies. On the other hand, this increased transparency can create a competitive edge for companies that use this instrument proactively. By providing transparent environmental reports, firms can create a higher level of credibility in the eyes of the relevant stakeholders. Furthermore, established corporate environmental reporting might uncover new possibilities, not only for improving environmental performance, but also for saving resources and costs.

4. The environmental policy context in Germany

Germany is widely regarded as a country with a stringent environmental policy, a policy that heavily influences the technology and standards used by German companies when doing business in Germany. But German environmental policy can also be important for the structure and effects of FDI for two reasons: first, it can influence the technology and the environmental standards used by TNCs in the host countries of FDI; secondly, in some cases, other countries (might) learn from the experience of Germany to develop their own policy mix. German environmental policy is therefore briefly surveyed in this section.

4.1 Environmental policies and regulations

German environmental policy seeks to comply with commitments made at the Earth Summit in Rio de Janeiro that emphasized the principles of sustainable development. It aims to ensure that options for the development of future generations and the diversity of wildlife species and ecosystems are kept open and enlarged (Storm, 1998: XXI). The protection of natural living conditions has become a national objective set out in the German Constitution.

Environmental regulation in Germany has three objectives, which were stated for the first time in the environmental programme of the federal Government in 1971 (Storm, 1998: XI):

- To ensure that conditions are fit for human beings and are not detrimental to their health;
- To protect soil, air and water as well as flora and fauna against harm from human action; and
- To reduce and eliminate existing environmental damage.

At the national level, there are some 30 laws relating to the environment (Storm, 1998: XV). Due to the German federal structure, legislative competence is divided between the federal Government and the governments of the states (Länder), which can also pass acts on the environment. German environmental regulation is fragmented but discussions are under way on consolidation within one Environmental Statute Book.

In general, Germany's economy is considered to be one of the most regulated economies among the OECD countries. This applies also to the environmental arena, and German industry has often criticized this situation, which, it claims, leads to high compliance costs and consequent competitive disadvantage. A member of the board of Viag AG (a large German group mainly concerned with energy, telecommunications, aluminium, packaging and chemicals) [8] recently pointed out that there are more than 10,000 different laws, regulations and administrative stipulations in Germany. This often leads to inefficiency and to problems for SMEs in coping with the legal aspects of environmental protection (Schürmann, 1998: 30). The air pollution laws, in particular have entailed high costs for German industry. This has led to concerns that German industry might seek to avoid those standards by relocating industrial plants to countries with less stringent environmental laws.

The counter-argument, however, is that tough environmental standards result, in the longer-term, in technical innovation and competitive advantage, which also opens up opportunities for the sale of environmental technologies. This is borne out by the fact that sales of goods for environmental protection amounted to DM 72 billion in 1998, that is 4 per cent of industrial production; clean air devices accounted for 35 per cent of these products, 29 per cent comprised equipment for measuring

[8] In 2000, Viag AG merged with VEBA AG to form the e-on corporation.

and control purposes, 27 per cent relate to waste-water treatment, and 9 per cent concerned the treatment of solid waste. (NIW, 2000: 3).

In 1997, German exports of products for environmental protection amounted to DM 41 billion, that is 5 per cent of total industrial exports. Germany's share in international trade in those products was 16.5 per cent, making it the second largest exporter of those goods after the United States and ahead of Japan. In Germany's exports, water and waste-water technologies as well as measuring and control technologies took first place equally, with nearly DM 16 billion each. Prevention of air pollution amounted to DM 8 billion and waste treatment technologies to DM 5.5 billion (NIW, 2000: 5).

These products mainly concern "end-of-pipe" solutions for environmental problems. In addition, German industry has begun to develop integrated solutions for environmental problems. That means that companies adopt a "cradle-to-grave" philosophy towards their products, which implies that environmental and resource concerns are integrated into all phases of a product's life cycle through all levels of production. Such questions as recyclability are considered from the beginning at the planning and designing phase of a product.

This shift of emphasis has its counterpart in the change of focus of German environmental policy. In the past, environmental policy consisted mainly of pure command-and-control and end-of-pipe measures. But recently, it has moved to more cost-effective means of achieving environmental objectives which also emphasize prevention instead of end-of-pipe measures. Apart from the importance of integrated solutions in industry this shift can also be attributed to the problems connected with overly detailed regulations that are also taken seriously. One example of this new kind of regulation is the German Waste Management Act.

Additionally, German policy makes increasing use of voluntary agreements by industry, which can complement or substitute state regulations and acts. German industry has made nearly 100 environmental commitments, from the reduction of CO_2 emissions to the disclosure of environmental data and information. The chemical industry alone has made some 30 commitments. The evidence on the outcomes of this instrument of environmental policy shows mixed results and depends on various factors (Rennings, et al., 1995; Knebel,Wicke and Michael, 1999), but it seems most likely to continue to spread.

Economic instruments have been used only moderately in Germany (e.g. the waste-water tax act (*Abwasserabgabengesetz*). However, as a result of the recent introduction of an ecological tax reform, the use of energy is now taxed (although there are many exceptions) while social security contributions have been reduced. This should promote the substitution of labour-intensive production processes for resource-intensive ones. There is also likely to be a greater use of market-based instruments (e.g. tradable permits which might come into force during the implementation process of the Kyoto Protocol).

One of the most important environmental acts of the last few years is the German Waste Management Act; its implememtation will influence the life-cycle management of many products and sectors.

The German Waste Management Act

The German Waste Management Act (*Kreislaufwirtschafts- und Abfallgesetz* – KrW/AbfG) of 1994 shows that policy is focusing increasingly on prevention and the polluter-pays principle. It aims to save natural resources and to avoid waste of products and materials. The underlying concept of waste

extends to all movables which the respective owner – or is obliged to – dispose of. Its main features are:

- *Prevention*. The new act explicitly states the precedence of prevention over recycling and disposal. Exceptions are possible when dictated by considerations of technical feasibility, environmental protection and economic efficiency. Recycled waste and secondary resources shall be given priority as input factors in the production of goods.
- *Recycling*. The concept of recycling is not restricted to physical recycling, but also includes waste incineration with energy recovery.
- *Extension of the product liability of producers.* They are obliged to produce reusable, long-lasting goods which can be disposed of in an environmentally friendly manner.
- *Labelling.* Products containing contaminants have to be labelled in order to ensure their proper disposal. Additionally, this leads to greater transparency for consumers who can make better-informed purchasing decisions.

After the KrW/AbfG had been passed, several product-related regulations came into force in order to implement the Act. In some cases, voluntary commitments or agreements of the respective industry have been used instead of regulations.

4.2 German commitment to international environmental approaches and MEAs

Germany actively supports international approaches to dealing with global environmental problems (BMZ, 1997a: 15-16). For example, it has signed and ratified the declarations agreed at the Earth Summit and the MEAs listed in section III.2 above. It has also provided technical assistance to developing countries to implement the conventions (BMZ, 1995: 39). Up to 1995 this assistance amounted to DM 5 million (BMZ, 1995: 42), and recently Germany also provided DM 10 million on a voluntary basis for the implementation of the UNFCCC in developing countries (BMZ, 1995: 41). Germany also played a leading role in the establishment of the GEF and its restructuring in 1994 (BMZ, 1995: 39), and it provides about 10 per cent of the GEF's resources (BMZ, 1999c: 1) amounting to DM 64.4 million.

Germany advocates the integration of the environmental dimension into the different policy areas and, in particular, the counteracting of global environmental risks by means of development policy (BMZ, 1997a: 5-6). The German Ministry for Development, BMZ (the *Bundesministerium für wirtschaftliche Zusammenarbeit*) regards the protection of the natural basis for life in accordance with Agenda 21 as being just as important as economic efficiency, and provides financial support to developing countries to protect and improve the environment. All German development assistance projects are subject to an environmental impact assessment (BMZ ,1998b: 45). The following table shows the German development assistance commitments and the share allocated to environmental objectives.

Table 11: German development assistance commitments

	1996 (actual value)		**1997** (target value)		**1998** (target value)	
	DM million	(per cent)	DM million	(per cent)	DM million	(per cent)
Total assistance commitments	3 910.8	100.00	3 965.0	100.0	3 445.0	100.0
Share allocated for environmental objectives in general	1 023.5	26.2	1 094.5	27.6	819.9	23.8

Share allocated for rainforest protection in particular	222.9	5.7	261.5	6.6	261.3	7.6

Source: BMZ, 1998a: 222.

The number of projects dealing with biodiversity has risen considerably since the Earth Summit in Rio: there were more than 150 in 1997 for which the BMZ allocated about DM 1.5 billion (BMZ 1997a: 44). Projects to combat desertification have been subsidized by German development assistance since the mid-1980s. In 1997, the volume of funds spent on such projects by the BMZ amounted to almost DM 2.3 billion (BMZ 1997a: 56). The Ministry also funds projects which aim at integrating environmental aspects into agriculture, water and energy supply and distribution, and sustainable urban development (BMZ 1997a: 60-83).

4.3 Implementation of key environmental voluntary initiatives by German industry

German industry actively participates in several of the voluntary international initiatives described in section III.3, and is therefore suited for playing a leading role in the transfer of environmentally sound technology to developing countries.

Responsible Care

The German Chemical Industry adopted the principles of responsible care in 1991. Since 1996 the German Chemical Association, VCI (*Verband der Chemischen Industrie*) has been publishing its Responsible Care Report with data concerning air emissions, waste generation, water discharges, water and energy consumption, environmental protection costs, product stewardship, occupational illnesses, occupational accidents, process safety, distribution safety, implementation of EMS, and environmental reports and statements. In 1999, 800 member companies (of a total of 1,700) participated in the Responsible Care Survey, representing about 82 per cent of employment and more than 80 per cent of the total output of the chemical industry. Member companies issue environmental reports (or environmental statements in line with EMAS). VCI's "Forum Future" events provide a platform for dialogue with external stakeholders, and there are conventions and seminars for science teachers, plus company "open door" days. Based on regular meetings and other forms of help, VCI published a Responsible Care Implementation Pack for all 1,700 of its member companies in 1998, including a self-assessment questionnaire, best practice examples, and basic presentations with slides (VCI, 1999: 19; ICCA, 1998: 51).

EMAS

The involvement of business in environmental protection can also be illustrated by the number of EMAS validations. German companies have the largest number of such validations: three out of every four companies that have participated in this voluntary scheme are located in Germany. In the EU, more than 3,100 facilities have been certified so far, 2,300 of which are located in Germany.

ISO 14001

There are over 1,800 companies located in Germany that are certified according to ISO 14001. Worldwide, 13,000 companies are certified. Thus Germany takes second place after Japan, where 2,700 companies are certified (*ISO World* 2000).

4.4 German environmental technology transfer initiative

In additon to measures to implement international environmental agreements, Germany launched an initiative in 1996 to promote the transfer of German environmental technologies to several developing countries.[9] In partnership with the private sector, it established The Center for the International Transfer of Environmental Technologies, ITUT (*Internationales Transferzentrum für Umwelttechnik*). ITUT is sponsored by several partners: five federal ministries, the federal states (*Bundesländer*), the Association of German Chambers of Commerce and Industry (DIHT), business promotional institutions and business federations (DIHT 1997: 6). It acts as a source of information, contact point and consulting office for German companies exporting environmental technologies. It especially seeks to support SMEs and provides consulting both with regard to market-entry strategies and continuous and specific support during the phase of implementation.

The German Chamber of Industry and Commerce (IHK) also promotes trade in environmental technologies, through a network of Environmental Area Managers (EAMs). The main area of interest in developing countries is the fast growing Asian economies (ITUT, 1999: 6). The EAMs provide business/marketing consultancy services, partner search activities, market information regarding demand for environmental technologies in specific countries, commercial support and promotional activites for German environmental technologies (DIHT, 1997: 4-5)

5. Environmental policy and the application of environmental technologies in host countries

It goes without saying that the situation in the host countries is a crucial determinant of the structural and environmental effects of FDI. This refers to two important aspects: first, the host country's environmental policy has to be taken into account; its aims and means are important for the activites of companies and especially for TNCs. Second, the market potential for environmental technologies also has to be evaluated if the effects of technology transfer are to be adequately measured. Therefore, these two problems were also investigated during the research project, mostly with the help of environmental area managers (EAMs).[10]

5.1 Regional overview of environmental issues

Asia ocupies only 23 per cent of the world's surface, but about 58 per cent of the world's population lives there. The region is characterized by a rapidly growing population and increasing urbanization and industrialization. These are accompanied by growing air and water pollution and waste management problems, loss of natural habitats and biodiversity, desertification and erosion of fertile land. Natural disasters also occur regularly in the region, including floods, drought, forest fires, earthquakes, landslides and gales. The economic impact of these environmental problems is high. In China it is estimated that productivity losses caused by soil erosion, deforestation and land degradation, water shortage and destruction of wetlands amount to an annual cost of US$ 14 to 26.5

[9] Mexico, Brazil, Poland, the Czech Republic, Hungary, India, China, Malaysia, Indonesia, Thailand, and South Africa.

[10] A survey of the relevant issues was conducted by providing each of the EAMs in China, India and Malaysia with a questionnaire asking for detailed information about the supply and demand of environmental technology, the contribution of FDI to its transfer, and the political and social circumstances in their respective countries. The main conclusions of these questionnaires are provided in the following subsections. Some important findings from other studies are also mentioned.

billions (nearly 4–7 per cent of GDP); In India the costs of urban air pollution, water degradation, soil erosion, land degradation and deforestation in 1992 amounted to 4.5–6 per cent of GDP (UNDP, *Human Development Report 1998*).

Since the 1992 Earth Summit in Rio, environmental issues have drawn greater attention in the region and various international initiatives have been taken to improve the transfer of clean technology for, and the financing of, environmental infrastructure development. Over the past few years, environmental policy has gained importance in all three case study countries, although in general there is still low environmental awareness and low regulation and enforcement relating to environmental issues.

The demand for environmental technologies is growing, due to both increased living standards that raise demands for environmental improvements and the availability of improved technical processes. But throughout the region barriers to the application of environmental technology persist. The main impediment to the dissemination of environmental technologies seems to be an insufficient transfer of know-how of existing technologies and services, and intangible assets (such as implementation support). A lack of knowledge of host countries' languages and cultural differences is also an important reason for the insufficiencies. EAMs try to minimize these knowledge gaps by gathering and distributing the information from both sides, thereby acting as an information channel. Unfortunately, the EAMs get little feedback from both sides, but during the past few years they have contributed, among other things, to the slow but steady increase in both demand for and application of environmental technologies.

Promoting the use of environmental technologies could be greatly enhanced by implementing a better transfer system of information and know-how between the supplying and demanding bodies/companies. Monitoring the implementation of existing environmental regulations could also contribute to this improvement. This would mean a greater number of employees working for the environmental authorities and offices and it would require specific environmental training. This does not necessarily imply more stringent environmental regulations; but it does imply that existing intellectual property rights regimes should be strengthened, as deficiencies in this area are an impediment to the introduction of new technologies. In addition, public pressure through international agreements or NGOs could also contribute to greater use of environmental technologies.

Concerning international agreements, the Basel Convention on the Movement of Wastes and their Disposal and the Montreal Protocol on Substances that Deplete the Ozone Layer encourage the use of and demand for environmental technologies.

5.2 China

Environmental policy and the regulatory framework

Despite the existence of environmental laws and regulations the environmental situation in China is serious. It was found that air pollution levels in most Chinese cities exceed the official limits. The four major pollutants are sulfur dioxide, nitrogen oxide, granules and dust, resulting in acid rain and drinking water contamination in some urban regions (Xian/Zhang, 2000: 7).

China's regulatory framework for environmental protection is based on the Environmental Protection Law of the People's Republic of China, while the National Environmental Protection Administration (NEPA) is responsible for its overall supervision and management. Its main tasks include: setting

national environmental standards; establishing a nationwide environmental monitoring system; and evaluating the effectiveness of pollution prevention measures. Additionally, there are several local environmental protection authorities which set local standards, screen investment projects for their possible environmental impacts and coordinate their acitivities with other relevant administrations. At present, there are about 30 national laws and regulations relating to environmental protection and 364 environmental standards; in addition, local authorities have issued over 600 rules and regulations (Guoming et al., 1999: 10-14).

China's current environmental policy has four important components (Guoming et al., 1999: 11-12):

- *Environmental impact reporting system*. Each project has to go through an environmental impact review process if it is perceived as having possible negative environmental effects. The environmental administrative authorities analyse and screen these effects and determine appropriate preventive measures.
- *The principle of the "three simultaneous steps"*. A pollution-preventing facility has to be designed, constructed and operated simultaneously with the design, construction and operation of the main production line of the project. The environmental authorities check the project design, monitor the construction and give their approval before the project can start operation.
- *Registation and licensing system for the discharge of pollutants*. Emitters of polluting substances have to register and file reports in accordance with the stipulations of the environmental protection authorities.

System of effluent charges. Firms emitting polluting substances above the prescribed limits are charged an excess effluent fee. In addition to the charges, the firms are obliged to reduce their emissions to the prescribed limits at their own cost. If they do not reach the standards after three years, the charges are increased at the rate of 5 per cent annually.

These four components apply equally to TNCs and domestic firms; thus, in principle, the procedures for regulating the environmental aspects of FDI are similar to those applied to domestic firms. But nevertheless, there are problems with enforcement of the environmental law and regulations. This is due to a lack of resources and infrastructure; furthermore, there is an insufficient awareness of the need for environmental protection in certain regions (Xian/Zhang, 2000: 19).

Regarding the MEAs described in section III.2, China has ratified the Convention on Climate Change, the Basel Convention and the Convention on Biological Diversity. It has also signed the Montreal Protocol and the Kyoto Protocol.

The demand for and application of environmental technologies[11]

Compared with industrialized countries, environmental technologies in general are not widely used in China. Noise reduction (sound absorbers, vibration absorbers) is given priority, since the Chinese population deems noise to be the greatest problem; this puts great pressure on the Environmental Protection Bureaus (EPB) to act, and Chinese environmental technologies in this area are highly developed. Next in importance are water/waste-water treatment (flocculators, filter presses, suction filters) and emission controls (mass craft precipitators, electrostatical precipitators). Solid-waste management (incinerators, utilization of coal, steel and iron) and prevention of soil contamination are seen as less important. The demand for environmental technologies has increased very slowly. Although the number of environmental projects has grown, the corresponding budget hardly expands. However, demand will probably increase with growing environmental problems. For example, only

[11] This section is mainly based on information provided by EAM.

about 20 per cent of all cities have sewage plants, and out of these only 70 per cent use mechanical and biological waste- water treatment.

The Chinese Government does not favour the importing of (environmental) technologies as it prefers to promote the development of local industries. In addition, both the high price of German environmental technologies and the fact that intangible assets, such as planning and consulting, are still not considered worth paying for, hinder the transfer of environmental technologies. Due to the size of the country and the nature of existing information flows, there is a large gap between the specific demands of Chinese companies and the capabilities of the technologies supplied by German companies.

According to the EAM, adherence to existing regulations and the implementation of patents and royalties could contribute to the application of environmental technologies. Pressure through international agreements could also increase the implementation of advanced environmental technologies. In addition, both the supply of the technologies themselves and the provision of consulting and mediation services accompanying this technology transfer could be facilitated, for example through the EAM. In particular, a systems approach could be instrumental in the dissemination of environmental technologies.

5.3 India

Environmental policy and regulatory framework

The basic umbrella legislation of Indian environmental policy is the Environment Protection Act of 1986. This act sets the maximum allowable limits of concentration of various environmental pollutants, the procedures and safeguards for the handling of hazardous substances and related restrictions regarding the location of industry, as well as the procedures and safeguards for the prevention of industrial accidents which may cause environmental pollution. The Central Pollution Control Board (CPCB) has the power to set standards of quality of air, water and soil for specified areas and for specified purposes. Furthermore, the CPCB advises the Government, coordinates the activities of several state pollution control boards (SPCBs) and provides them with technical assistance. These SPCBs plan and execute programmes of pollution prevention and inspect factories to ensure that they comply with the Act. The SPCBs can also set more stringent standards in respect of a specified category of industries within their jurisdiction (Jha, 1999: 18-19).

Since 1994, industrial activities in 29 different categories (such as petroleum, chemicals, mining, themal power plants, river valley projects, ports, harbours and airports, communications, atomic energy, transport and tourism) require an environmental impact assessment (EIA). This is especially relevant for FDI, as over 80 per cent of FDI approved since 1991 falls in one of these categories. The EIA report is evaluated by the Impact Assessment Agency before the Ministry of Environment and Forests (MOEF) of the central Government gives final environmental clearance (Jha, 1999: 21-22).

India's formal environmental legislation seems to be quite advanced and similar to the average environmental legislation in Europe. But the administrative resources to enforce these regulations and to strengthen environmental governance remain limited. Furthermore, regulatory capacity to handle current environmental problems is becoming increasingly inadequate as resource-intensive and pollution-intensive growth is stimulated by economic policy. But a – at least partially – counterbalancing trend towards greater enforcement of environmental regulations is set by increased judicial activism. Plants not complying with existing regulations are identified and court rulings may

require them to take appropriate measures to ensure compliance within certain time limits (RUUD, 2000: 26).

Regarding the MEAs described in section III.2, India has ratified the Convention on Climate Change, the Basel Convention and the Convention on Biological Diversity. It has also signed the Montreal Protocol and the Kyoto Protocol.

The demand for and application of environmental technologies[12]

Water/waste-water treatment (almost all types of plants and methods ranging from primary to tertiary treatment of water and waste water), solid waste management (almost all types of physico-chemical and biological methods) and cleaner production technologies (almost all state-of-the-art technologies) are the fields where environmental technologies are most frequently applied. These are followed by emission controls (scrubbers, incineration and electrostatic precipitators). However, treatment of soil contamination is of little interest.

During the past few years there has been a steady increase in the demand for environmental technologies. The integration of environmental aspects into international agreements, either on investment or environment, could strengthen public awareness and the subsequent public pressure could contribute to a further rise in demand.

The main impediment to the use of environmental technologies is the communication gap between suppliers and potential purchasers. This gap includes a lack of understanding of each other's needs and requirements, the different levels of knowledge, and the different modes of business transactions due to different business ethics and cultural backgrounds. EAMs or other institutions could bridge this gap between suppliers and purchasers of environmental technologies through an analysis of supply and demand, the presentation of the capabilities of particular technologies at fairs, and the mediation of contact between suppliers and purchasers.

5.4 Malaysia

Environmental policy and regulatory framework

In Malaysia, the Environmental Quality Act (EQA) of 1974 constitutes the framework for most environment-related regulations. This act addresses air, noise, land, inland waters, oil (or mixtures containing oil) and discharge of waste into waters. Under this act, licences are required for: the use or occupation of prescribed premises; the discharge of emissions exceeding acceptable levels into the atmosphere; noise pollution; polluting, or causing to pollute, any soil or surface of any land; emitting, discharging or depositing any wastes or oil into inland waters or into Malaysian waters that exceed acceptable levels (Rasiah, 1999: 12).

In the 1970s and 1980s, environmental standards were not strictly enforced, as the Government wanted to create an attractive environment for FDI. But in the 1990s, after a massive inflow of FDI, rapid growth and a sharp decline in poverty levels, greater attention was paid to environmental problems. Thus environmental regulation has improved in the last decade due to better economic conditions (Rasiah, 1999: 21). In 1996 there were several amendments to the EQA, focusing on four areas: management and more stringent control of hazardous wastes and products considered to be

[12] This section is mainly based on information given by the EAM.

environmentally unfriendly, including provision for "prescribed substances" and "prescribed conveyance" (as for "prescribed premises" in the earlier regulations); environmental audit; research and development; and higher penalties for non-compliance. Furthermore, the Government announced the introduction of environmental impact assessments (EIAs) to assist the enforcement of higher environmental standards. Finally, a committee on environmental standards was formed with the main objective of ensuring the widespread use of ISO 14000 (see subsection 3.1; and Rasiah, 1999: 16-17).

Furthermore, to reduce sewage, the Government uses such incentives as capital allowances for companies providing facilities for storing, treating and disposing their dangerous toxic wastes; rebates on import duties of environmental technologies; tax exemption and special financing arrangements for environmental investment (Pedersen, 2000: 10; Rasiah, 1999: 17).

According to the Department of the Environment (DOE), there have been three stages of Malaysian environmental policy since the passing of the EQA in 1974 (Pedersen, 2000: 9–10). The first stage emphasized pollution control, and concentrated on industrial effluents and waste. At this stage, Malaysia introduced legislation directly targeting major pollution problems in the oil palm and rubber industries. The second stage gave priority to pollution prevention and planning. Instead of trying to control pollution through monitoring and enforcement, regulation was aimed at setting environmental standards and limiting the use and depletion of resources through planning of investment and the requirement of manufacturing licences and EIAs. The third stage can be termed "self-regulation". Realizing that the enforcement of environmental standards is difficult, the Government wants to see industries take the lead through self-regulation and voluntary action. For this purpose, industry representatives take part in various committees where environmental standards and certification are discussed. This emphasis on self-regulation reflects the fact that the sources of pollution are no longer easily discernible, and that the main environmental problems come from growth sectors like chemicals, food processing, textiles and electronics where the different dimensions of environmental challenges are less clear-cut.

Regarding the MEAs described in section III.2, Malaysia has ratified the Convention on Climate Change, the Basel Convention and the Convention on Biological Diversity. It has also signed the Montreal Protocol and the Kyoto Protocol.

The demand for and application of environmental technologies[13]

Generally, the application of environmental technologies has risen over the past few years, but it still remains at a low level. Water/waste-water treatment, solid waste management (waste disposal sites, recycling of paper and synthetics), monitoring of water quality and warm water preparation seem to be fields of application that are of medium importance. Emission controls (scrubbers, electrostatic precipitators), and prevention and treatment of soil contamination appear to be of minor interest.

The demand for environmental technologies depends mainly on two aspects. First, the market power of TNCs that are either export-orientated or certified under ISO 14001 is crucial. Secondly, increasing industrialization in Malaysia, which has led to higher living standards as well as superior technical processes and thus to higher demand for environmental technologies.

But environmental awareness is still low for several reasons. First, there are only a few government programmes that promote the use of environmental technologies. Secondly, the existing regulations are not very stringent and are not closely checked due to the lack of trained staff, including the staff in

[13] This section is mainly based on information given by the EAM.

local SMEs. The improvement of regulations on patents and royalties seems to be of minor importance.

According to the EAMs, the Government should promote the use of environmental technologies through grants and loans, train the employees working in environmental authorities and offices, employ more staff to work in environmental authorities and offices, and promote public environmental awareness. Local SMEs should also improve environmental awareness and train their employees on environmental aspects of production.

6. Conclusions

The previous sections have shown the many facets of the institutional environment in which FDI takes place and that shapes the effects and structures of FDI in the host countries.

The international economic agreements surveyed in section III.1 and plans for a multilateral agreement on investment (MAI) show that further liberalization is a top priority. To ensure sustainable development, it is therefore necessary to shape this process by introducing measures that take sufficient account of environmental concerns. Some important measures are the international environmental agreements that were surveyed in section III.2 and the activities demanded by these agreements. Moreover, it will be necessary to strengthen the abilities of developing countries to implement these agreements. This will have direct or indirect implications for FDI activities in these countries.

In particular, the review of the agreements has shown that transparency about the activities of companies – especially TNCs – and their environmental impacts in particular has gained increasing importance. This trend is likely to accelerate in the future and should be viewed as an opportunity for companies: by providing honest and complete information they can gain credibility and improve their dialogue with stakeholders and regulatory authorities. It might also lead to an improvement in their economic performance through increased sales on the one hand and diminished regulation by State authorities on the other. This can be all the more important for TNCs as they are often under greater scrutiny than other firms. The different voluntary initiatives aimed at greater transparency, which were introduced in section III.3, show that several business organizations have recognized this connection; an increasing number of companies are already acting according to one or more of these initiatives. Countries and regulatory authorities on the other hand, can also gain through increased transparency: they can gain access to environmental know-how and can make more reasonable judgements about the appropriate measures for controlling and regulating environmental performance. Moreover, demanding information from companies can itself be an aspect of environmental policy, as pointed out in the example of the United States mentioned in section III.3.2.

Environmental policy in the home countries of TNCs and the host countries of FDI can also influence the structure and effects of FDI. The relatively strict environmental policy of Germany is one of the reasons why this country has a competitive advantage in environmental technologies. Therefore, German firms are in a position to influence positively the environmental impacts of FDI. A second, indirect, influence of German environmental policy might be that German TNCs apply equally strict environmental standards in the host countries where they are implanted, which also leads to an improvement in the environmental conditions in these countries. Finally, the environmental policy itself and measures for its implementation can be an area for transferring experiences to the developing countries. The survey of German environmental policy in section IV.4 has shown that Germany not only helps developing countries in implementing international environmental agreements, but also that it is moving away from command and control measures in environmental

policy towards a more flexible approach. This could mean better access to information for environmental policy makers in the host countries of FDI. The survey of host-countries' environmental policy in section IV.5 has shown that they often have quite modern regulations but lack the capacity to enforce them. An exchange of experiences between industrialized and developing countries might also help improve the environmental performance of FDI.

But apart from the improvement of the institutional environment in which FDI takes place it is important to consider the strategies of TNCs in conducting their activities, and of FDI in particular. Since their behaviour has the most direct influence on the structure and effects of FDI, the trends in their strategies is considered in the next section.

IV. The strategies and behaviour of TNCs

TNCs are the most important "players" when investigating the structure and effects of FDI. The institutional environment described in sections II and III consists of important factors influencing TNCs' activities. But in addition to these, the strategies of TNCs themselves need to be investigated. Section IV.1 gives a general overview of how globalization changes the strategies of companies in general. It shows that companies are more and more inclined to split up their value chain over different countries (and cultures), which means that FDI is likely to increase further in the future. In dealing with environmental problems, many firms have introduced environmental management systems (EMSs). Different types of such systems are surveyed in section IV.2. In connection with FDI, the relevant question is whether these EMSs lead to high environmental standards company-wide causing environmental performance in the host country to improve. Section IV.2.2 surveys the central arguments concerning EMSs and section IV.2.3 summarizes the findings of a new case study. But apart from the establishment of an EMS, TNCs' decisions concerning technology transfer to the host countries are of at least equal importance. Section IV.3 summarizes the key arguments concerning this issue.

1. An overview of the impact of globalization on business strategies, structures and processes[14]

In the course of globalization, TNCs have adopted new business strategies, structures and processes. By the mid-1980s international business activities were regularly controlled from group head offices in the home country. Exports represented the dominant form of internationalization. Direct investments were undertaken first and foremost to make use internationally of the knowledge generated domestically, and when geographical distance, cultural factors or administrative trade barriers rendered it difficult to conduct business in foreign markets from the home country. Some FDI was motivated by the aim of securing access to raw materials. These are still valid reasons for much of FDI today (Dunning, 1993b: 129-284).

However, the traditional export strategies are no longer equal to dealing with the increased pressure for efficiency brought about by more acute competition. As a result, since the mid-1980s, companies have begun to reorganize their entire value-added chain globally. At the same time, business has tended to focus on core competencies, divesting low-yielding (product) sectors and reducing the vertical range of manufacture through outsourcing.

[14] In this section we mainly build on the results of the research project, *Understanding and Shaping Globalization*, of the Gottlieb Daimler and Karl Benz Foundation. These results are published in Steger, 1998 (see in particular pp. 35-45).

Such responses are in part the result of the homogenization of the world market that is taking place with globalization. Fragmented national markets have been replaced, at least to a certain degree and in certain segments, by homogeneous world markets. They are characterized by relatively homogeneous demand, mainly for capital goods and semi-finished industrial products, as well as for particular "global brands" of consumer goods. This is leading to more intense competition, with companies entering into more immediate conflict with each other (Engelhard, 1996: V-VI).

However, there is a counter-trend to worldwide standardization, wherein customer requests are becoming increasingly differentiated and specific. Product adaptation, additional services, after-sales service, distribution and marketing are increasingly becoming a critical success factor.

The following are some of the key challenges of globalization and responses by TNCs:

a. Managing geographic diversification

- To cover the global market, local presence and local adaption of technologies, products and sevices is needed. Numerous joint ventures or strategic alliances are thus frequently formed along with agreed joint R&D activities and compatibility and product standards. The chance of influencing the business activities of foreign enterprises is clearly greatest with wholly-owned subsidiaries. However, there are notable risks (e.g. political factors) and problems (e.g. ignorance of national characteristics). Hence direct investments abroad often occur in joint ventures.

- An extreme response is the emergence of the so-called "virtual company". This involves a form of organization in which legally and economically independent professionals with core skills work together for a limited period. The "company" is not integrated; rather it is a loose amalgamation of independent units, which create an integrated whole along the value-added chain (Sydow/Winand, 1998: 17-23).

- Traditional hierarchical organizational strutures, focusing on a central, controlling head office and large-scale coordination between functions, are "de-layered" to avoid delays in response time and inefficient burdens of bureacuracy that result from managing complex interactions (see also Managing culture in subsection d below). In the course of globalization, the head office assumes the role of providing a structural framework with regard to the general aims of the company, such as growth targets, and is less concerned with carrying out the regular functions of business.

b. Managing vertical integration

- The value-added chain is divided up globally and operations or processing stages transferred to where conditions are the most favourable with regard to costs of production and access to critical resources, including raw materials, labour skills and technologies (Hill, 1997: 478-484). The yardstick for this is the company-defined minimum return, derived from capital market requirements (Boutellier, Gassmann, and von Zedtwitz, 1999: 35-39).
- Managing a complex value-added chain requires both large-scale logistic processes and "dense" and interactive processes of coordination and agreement. With the distributed value-added chain, organizational structures based on a controlling head office are dysfunctional. Consequently, internal hierarchical boundaries are removed to decentralize and speed up decision-making processes and to open up communication channels. External company boundaries also become blurred, and supplier arrangements are transformed into development

partnerships, where the supplier is partly responsible for (product) development, provides additional services (e.g. modular pre-assembly) and commits itself to harmonized, inter-company, quality process and management standards (Boutellier, Gassmann, von Zedtwitz, 1999: 20-21).

c. Managing knowledge and technologies

- Effective knowledge transfer is a key competitive factor in a globalized economy. Given that this is often person-based, certain managers and specialists need to be mobile. In many companies an ethnocentric cultural transfer strategy is successfully practiced, whereby key management positions are occupied by managers of the home-country nationality. However, the trend is towards filling all positions overseas with local personnel. This saves on the high costs of expatriates, but the main benefit is that it harnesses local skills. Company knowledge transfer is then effected by means of specific in-service training schemes, job rotation or international project groups, which facilitates the intrinsic control necessary today (Scholz, 1996: 228-231).
- The pace of innovation has been speeded up in today's globalized economy. In order to ensure competitive advantage, innovations can no longer be introduced sequentially as in the past (i.e. first on the domestic market, then gradually on secondary user markets), but must be introduced simultaneously. Only in this way can high R&D expenditure be recovered, within ever-shorter product life cycles and pay-back periods (Boutellier, Gassmann, von Zedtwitz, 1999: 3–8). Companies are thus obliged to fully exploit technology advantages and manufacture in all locations using the most advanced technologies.

d. Managing culture

- Globalization means more than just decentralization, which affects traditional hierarchical organizational strucures and decision-making processes. It also involves putting in place management processes and systems that ensure the rapid global distribution of knowledge and technology, "best practices", the use of economies of scale and scope (e.g. by means of joint procurement) (Dunning, 1993a: 210-233), and, possibly, dividing the company's headquarters over several regions.
- The greater the company units' opportunity for self-determination, the greater is the imperative to replace more traditional hierarchical command and control stuctures by heterarchical forms of coordination. To function efficiently, this requires a strong sense of common aims and values and shared basic assumptions and behaviour patterns – the so-called "corporate culture". An inevitable consequence is that direct control over detailed reporting and licensing functions is replaced by a culture of trust, which relies more on the sense of responsibility and motivation of the managers and staff in the company's divisions (Hedlund, 1993: 226; Ghoshaland Bartlett, 1993: 94–95).

e. Managing visibility and stakeholder expectations

- Due to the progress in information technologies – especially the Internet – it is possible to gather and spread information about corporate actions more easily. Therefore, these actions and their consequences are increasingly visible to the public. As a result, corporations – and TNCs in particular – must deal with the fact that their actions are publicly observed and discussed more intensely than in the past.
- This development gives corporations' stakeholders – that is, all the people and groups that can affect or are affected by the actions of corporations – a more important role. Stakeholders expect increased corporate social and environmental responsibility along with greater transparency of the firms' operations. In this respect their expectations of TNCs in developing countries are higher than they are of national firms.

- Corporations, and TNCs in particular, who are not able to react adequately to this challenge risk being criticized by stakeholder groups publicly and losing their reputation which can also lead to financial losses due to lower sales and adverse impacts on share price. Therefore, the corporations need management systems which allow them to handle this challenge. In this respect it is most important for the corporations to be accountable and transparent to the stakeholders.

2. Trends in TNCs' environmental management

In the course of globalization, environmental issues have become not just a focus for cost reductions, competitor differentiation and new market opportunity; they are also one of the key areas where a TNC is exposed to risks to its reputation. It has already been said that this can lead to financial losses due to reduced sales or to negative reactions reflected in the share price.

The response of TNCs has been a wider implementation of environmental management systems (EMSs) for coping with environmental problems.

2.1 General developments

In 1993, UNCTAD completed a survey which examined the international environmental conduct and policies of TNCs. According to the survey, to which 169 TNCs responded, existing corporate EMSs can be subdivided into four types (UNCTAD, 1993: 167–177):

(i) *Compliance-oriented EMS*. This EMS adopts a reactive approach primarily oriented towards compliance with existing regulations. It involves the company's implementation of such activities as monitoring, control procedures and regular compliance reports. The applied technologies for reducing environmental impacts are mainly end-of-pipe solutions.

(ii) *Preventive EMS*. Companies with this kind of EMS seek to anticipate and prevent short-term costs and liabilities through environment, health and safety (EH&S) management procedures, or through new production processes and products. Many corporations refer to "product stewardship" and "precautionary and preventive management" in their policy statements, and have EH&S programmes in areas such as waste reduction, energy conservation and accident prevention. Preventive EH&S management relies on keeping management well informed about the state of EH&S issues in the corporation in order to prevent major accidents and liabilities. This is done through procedures such as auditing or assessments of risks and hazards.

(iii) *Strategic EMS*. Companies with a strategic EMS commit themselves to the integration of EH&S objectives in all aspects of the corporation's activities. They adopt a "cradle-to-grave" philosophy, which implies that environmental and resource concerns are integrated into all phases of a product's life cycle through all levels of production. These companies also engage in dialogue with stakeholders and regulators to build up a good reputation. Through this dialogue, and through the implementation of progressive and innovative EH&S procedures, these companies take pre-emptive action in anticipation of future regulations.

(iv) *Sustainable development EMS*. This EMS implies giving special consideration to the particular conditions of developing countries in corporate environmental conduct, and the establishment of worldwide policies on sustainable development – both of which are recommended in Agenda 21 (section III.2.3). Furthermore such an EMS requires transparency on the part corporations dealing with global environmental problems such as pollution of the oceans and the atmosphere or the destruction of rainforests. Corporations using this form of EMS undertake activities such as those related to renewable energy sources or afforestation programmes.

According to the UNCTAD survey, most of the companies surveyed had a rather reactive approach to environmental problems – that is, they have a compliance-oriented EMS – especially regarding their operations in developing countries. On the other hand, about 40 per cent of the companies had company-wide environmental policies, and some had adopted an explicit policy of implementing home-country standards in international operations. Sixty per cent of the companies conducted company-wide EH&S audits and some were involved in innovative environmental practices in developing countries, such as supporting local environmental groups, devising reforestation programmes, protecting wildlife habitats and developing local infrastructure.

Since the UNCTAD survey, little research has been done on the environmental policies of TNCs. Chang Xing (1995), studying 19 TNC affiliates in pollution-intensive sectors in China, found that these companies were not aware of the existence of European management standards, and none of the affiliates surveyed implemented European environmental management standards. Hansen (1998) investigated 112 Danish TNCs and found that only around 12 per cent of the respondents aimed at meeting Danish environmental standards when operating in Eastern Europe and developing countries; furthermore, only 17 per cent had formal environmental control and reporting procedures between headquarters and foreign affiliates. This low degree of formalization might be due to the fact that many of the investigated TNCs were relatively small.

Apart from the *type* of EMS, it is important to distinguish the *manner of implementation* of an EMS. This is especially relevant for TNCs that act in different countries with different (regulatory) environments. International implementation of EMS by TNCs may be realized according to one of two principles:

(i) *Standardization,* where standards are applied uniformly in all areas of operation (i.e. they are integrated across borders); and

(ii) *Differentiation,* which is characterized by local adaptation, so that environmental management by the company is fragmented across borders.

The reasons for choosing one or the other of these implementation strategies are manifold. Hansen (1999a) has developed a framework for structuring these reasons; he distinguishes four forces that influence the decision: regulatory forces, market forces, industry forces and company-specific forces.

Regulatory forces

Environmental management is driven by regulation. Regulations in the host country are crucial to a company's decision on whether to adopt company-wide or differentiated EMS standards, as there are no, or only very few, international and extra-territorial binding regulations requiring a particular conduct on the part of TNCs in host countries. If implementation of existing standards in developing countries is weak (due to a lack of financial resources, trained personnel and equipment or insufficient environmental infrastructures, or because of coordination problems beween different jurisdictions in the country), TNCs are tempted to exploit this weakness.

On the other hand there can be factors that induce TNCs to observe higher environmental standards or to choose a company-wide standard. First, TNCs are often subject to tougher enforcement than is local industry. Sometimes they operate in environmentally sensitive industries, or are perceived to possess the necessary means to improve environmental performance, or they become subject to controversy in debates over environmental degradation as they are the most visible foreign presence in the country.

Market forces

Market forces are perceived to encourage a "race to the bottom" as the firms with the lowest environmental costs can charge competitive prices and thus gain an increasing market share. Accordingly, companies will choose different standards for different markets and countries. This can indeed be the case in highly competitive markets, in markets with weak environmental screening by other market agents (for example, due to information restrictions) and in markets where low priority is given to quality (as a focus on quality and that on environmental improvements are often two closely related objectives). In these cases, companies might indeed opt for different environmental standards in different countries.

On the other hand, there are also market forces that can lead companies to choose high standards company-wide. First of all, the fear of a worldwide consumer boycott after an environmental scandal might encourage companies to choose high environmental standards, regardless of their location. Secondly, environmental screening of a company's products by large and powerful customers that are in a position to evaluate the environmental quality of products and production processes can also encourage high standards. These large customers can be large retail chains, large corporate customers or governments. A similar case can be made for institutional investors that screen their investments based on environmental criteria. Thirdly, a high quality orientation in a market often means the use of high environmental standards. Fourthly, a company producing goods for an environmentally sensitive leading export-market is likely to choose the adoption of high company-wide standards.

Industry forces

The level of concentration and collaboration in an industry can also affect the environmental performance of firms and the choice of environmental standards. Generally, in very competitive industries it will be difficult for companies to make environmental investments and set high company-wide standards. On the contrary, companies might reduce their environmental standards competitively, thereby initiating a "race to the bottom".

On the other hand, in oligopolistic industries, firms have a higher degree of market control so that they are able to implement high standards worldwide leading to a harmonization of regulations at a relatively high level. It has to be borne in mind that this can lead to higher prices for consumers or present a significant barrier to entry for new firms.

Company-specific forces

Apart from the first three forces which are exogenous to TNCs, there are also some company-specific forces that influence the choice of whether to maintain high company standards worldwide or to lower the standards in developing countries.

Five such factors can be identified:

(i) If the company uses a production technology with high risks and/or large potential environmental impacts, it is inclined to have high worldwide environmental standards.

(ii) If a company has (in its home country) high fixed costs and has invested in the development of cleaner technology and management practices, it is more likely to apply these technologies and standards in all of its locations.

(iii) The UNCTAD study found a strong correlation between the size of a TNC and the scope and content of cross-border environmental management practices. Hansen (1998) found that the international orientation of a TNC is an even better explanatory factor: a company with a presence in many different locations can obtain scale advantages by devising a uniform management system and adopting standards worldwide that meet the highest requirements internationally. Hadlock (1994) argued that it would be impractical to design different risk-reduction initiatives or standard environmental procedures for operations in distinct plants or countries. Murphy/Oye (1998) argued that companies having huge assets embedded in international operations – and this is typically true for TNCs with many affiliates or large foreign sales – would be more vulnerable to disruptions of production in foreign locations and therefore more inclined to seek harmonization of environmental standards across borders.

(iv) TNCs with a highly integrated international structure, where most functions are managed mainly from headquarters, are also more likely to have a closely integrated environmental management system. Conversely, companies pursuing a stand-alone strategy will be more likely to have a locally adapted environmental management system with few cross-border links.

(v) The ownership structure is of importance for the choice of standards. In the case of an affiliate which is wholly owned by the TNC or where the TNC is a majority owner, it is more likely that the TNC can influence the environmental performance and will choose company-wide standards. In the case of non-equity arrangements (e.g. strategic alliances, licensing or subcontracting) or of minority ownership, it is improbable that the TNC will have a major influence on environmental decisions.

These different forces influencing decisions about the kind of EMS to implement show that there is no clear-cut decision for one strategy or the other; only empirical investigations can show how this decision has been made in most cases. From this point of view an empirical study that has investigated the environmental management of affiliates of TNCs in China, India and Malaysia is interesting.

2.2 Environmental management by TNCs in China, India and Malaysia

Hansen (1999b) investigated the environmental management practices of 154 TNC affiliates in China, India and Malaysia. This study was closely connected to the present research project and was also an important part of the UNCTAD programme on Trade, Environment and Investment mentioned in section A.I; its results are described below.

In the study, a questionnaire was sent to about 250 affiliates in each of the three TNC host countries. About 50 companies from each country responded. The parent companies of the affiliates were from several OECD countries: 68 per cent from Europe (11 per cent from Denmark, 21 per cent from Germany, 14 per cent from the United Kingdom and 21 per cent from the rest of Europe), 11 per cent from the United States and 22 per cent from Asia. This sample of parent countries made the study particularly interesting, as previous research on TNC environmental management practices covered mainly United States companies. The study focused on four categories of questions:

(i) What is the scope and content of environmental management at Asian TNC affiliates?

(ii) To what extent do TNC affiliates extend their environmental management practices beyond the factory gate, to include suppliers, subcontractors or local communities?

(iii) What is the effect of foreign ownership on environmental management practices at Asian affiliates? and

(iv) What factors constrain and facilitate improved environmental management practice at TNC affiliates in Asia?

The following were some of the main results of this survey:

- Concerning the scope and content of environmental management, more than 70 per cent of the respondents had a written environmental policy in place. Two thirds of those were formulated by the headquarters of the TNC. Forty-four per cent of the respondents reported that they subscribed to a national or international environmental guideline; these guidelines include the chemical industry's Responsible Care Programme, environmental management standards (e.g. ISO 14000 series or EMAs) and the World Health Organization's (WHO's) Good Manufacturing Practice Guidelines. Although only 14 per cent responded that they were certified according to an environmental management standard, 50 per cent were considering obtaining certification in the future. Thirty-six per cent reported that their headquarter set specific environmental performance standards for their affiliates. This number varied in different industries: more than 50 per cent of the respondents in the chemical industry, in general, and 70 per cent in the pharmaceutical sector, in particular, stated that their headquarters set specific environmental targets for affiliates. Moreover, 31 per cent of the respondents in Malaysia reported that the parent company had an explicit policy of operating with uniform environmental standards regardless of location.
- About one third of the respondents had established environmental procedures related to suppliers and subcontractors, but these procedures were seldom formalized and referred mainly to environmental aspects of product quality. Concerning the relationship between TNCs' affiliates and the local authorities, 58 per cent found the relationship to be "good" and 24 per cent found it to be "very good"; only 10 per cent (but in India alone 20 per cent) stated that the relationship was problematic. Nevertheless, 46 per cent stated that, as they had foreign equity, they were subject to significantly stricter enforcement than were local companies (in China 64 per cent felt that way as compared to 33 per cent in Malaysia).
- Concerning the difference in environmental performance due to foreign ownership, 50 per cent reported that they performed better than comparable local companies, another 30 per cent reported that their performance was equal to that of the home country of the TNC, and only 20 per cent stated that their performance was equal to comparable local companies. The answers varied between the three host countries: only little more than half the Malaysian affiliates reported performing better than local companies or similar to the home country, but more than 90 per cent of the Indian and Chinese affiliates answered that way. This probably reflects that the Malaysian environmental regulation is closer to that of the TNC home countries than are those of India and China.
- Concerning the major barriers to improved environmental performance 40 per cent of the respondents cited economic and financial constraints as the most important barrier. Other major barriers were associated with the local regulatory set up: inefficient enforcement of regulations, lack of environmental infrastructure in the host country and weak or non-existent regulations. Asked for the factors that could motivate an improved environmental performance, 40 per cent cited headquarters' policies and standards. Thus the influence of the company headquarters is considered even more important than that of current and anticipated regulatory pressures (30 per cent), local management leadership (10 per cent), pressures from NGOs and the media, consumer pressure or fear of accident (each less than 5 per cent).

This study indicated that the level of cross-border integration of environmental management is relatively high: 40–50 per cent of the respondents had extensive cross-border environmental procedures in place. Thus many TNC headquarters in the OECD countries seem to care about the environmental management of their affiliates. It is debatable whether this leads to improved environmental performance of the affiliate, but at least it is clear the the headquarter's policy (together with the local regulatory regime) is often decisive for the environmental management strategy; it seems to be much more important than market factors such as consumer pressure.

3. Trends in TNC technology management and transfer

To what extent intended environmental improvements of such EMS actually lead to the implementation of modern eco-efficient technologies is a different question which cannot be answered through an analysis of EMS alone. Rather, it depends on the integration of environmental management into business processes, especially into technical development, production and buying decisions.

As for environmental management, there are two different strategies concerning the transfer of technology: standardization (using the same technology at each location), and differentiation (using different technologies for locations in different countries).

Several studies conclude that FDI undertaken by TNCs will result in some standardization of technologies across countries (Pearson, 1985; Birdsall and Wheeler, 1993; Levy, 1995; Warhurst and Isnor, 1996). Birdsall and Wheeler (1993) have cited examples where companies from the pulp and paper industry with FDI in Chile strove to comply with high OECD standards because the products were destined to be exported to OECD countries, and therefore needed appropriate quality standards. Schmidheiny (1992) has cited examples where the international standardization of production processes resulted in these processes becoming more efficient and – at the same time – less environmentally damaging.

On the other hand, the differentiation of technologies may have advantages for the investing TNCs. Application of specific technologies and standards may not be possible due to implementation problems in the host countries (Hansen, 1998: 101). In that case, differentiation of technologies is due to adaptation to conditions in the host country.

If low environmental standards prevail in developing and newly industrializing countries this may result in TNCs applying relatively more damaging technologies. For example, if "pollution havens" exist, it is possible that capital could flow towards those regions with the weakest environmental regulations. This could provide an incentive to use cheaper – and perhaps, more environmentally damaging – technologies in particular countries or sectors (see section V.2 below).

There are a few isolated examples of companies actually dismantling outdated production facilities in industrialized countries and moving them to developing countries (Esty and Gentry, 1997). It is suggested that some host companies purchase obsolete – which in most cases means environmentally harmful – production facilities from industrialized countries. They accept outdated equipment because they are undercapitalized and because this equipment is cheap. The worst examples of this type of "technology dumping" appear to involve investors from non-OECD countries (Esty and Mendelsohn, 1995). However, most of these cases actually involve sales of technology, rather than FDI itself.

But even if TNCs use different technologies in their home and host countries, the differentiation does not necessarily mean an orientation towards the – commonly lower – environmental standards of the host country, but generally that the standards still comply with a higher level than the host country average (Zarsky, 1999, 54).

Apart from these direct effects of technology transfer of TNCs, the presence of these firms can also have positive spillover effects on the technological characteristics of national firms. Local firms may try to imitate TNCs' technological practices ("reverse engineering"), depending on the stringency of the intellectual property rights regime (Jaffe et al., 1994; Coe and Helpman, 1995; Coe, Helpman and Hoffmaister, 1995; Blömstrom and Kokko, 1996). Spillovers also arise when local firms employ staff previously employed by the TNCs, thereby gaining access to expertise which may not be readily available or applied locally, particularly if the TNCs have strong training programmes for their staff.

Spillovers concerning technology use by host-country companies are of particular importance if these local companies are part of the TNCs' value or supply chain. Thus in general it is necessary to support the transfer of management systems and modern technologies into the host countries in order to ensure appropriate quality standards along the whole supply chain. Some studies indicate that TNCs' supply-chain management pushes the use of modern technologies onto the local suppliers. By demanding particular quality standards, and then providing the technical assistance needed to meet those standards, TNCs can help upstream industries improve their technological efficiency (Blomström and Wolf, 1994; Blomström and Kokko, 1996). However, this trend is more obvious in terms of quality requirements than environmental requirements.

Finally, FDI can also promote the diffusion of environmentally friendly technologies through the expansion of the environmental goods and services industry. Worldwide sales of pollution- abatement equipment and related services are estimated to total some US$ 200 billion, with 90 per cent of total output accounted for by OECD countries (Duchin, Lange and Kell,1995).

4. Conclusions

The review of the impacts of globalization on business strategies in section IV.1 has shown the new challenges connected with this process. Generally, meeting the challenges of globalization will require a company's presence in many different markets, which means that FDI will remain an important (and increasing) element of companies' strategies as well as a central feature of the economic landscape.

In managing the environmental problems connected with their activities, many corporations have introduced environmental management systems (EMSs). However, it cannot be assumed that the introduction of those systems in the host countries of FDI necessarily leads to a better environmental performance; this depends on the crucial question whether or to what degree the TNC uses different standards in different countries or company-wide standards, regardless of the location of the plant and the standards of the host country. As section IV.2.1 has shown, such a decision of the TNC depends on several factors, which may vary from case to case. However, the empirical study described in section IV.2.2 shows that, according to the affiliates of TNCs, the policy of the company headquarter and the local regulatory environment are very important factors in influencing the environmental performance of TNCs and their affiliates.

Similar considerations apply to the problem concerning technology transfer to developing countries by TNCs. TNCs can choose whether they transfer modern (and environmentally friendly) technologies to the host countries or whether they use older (and more polluting) technologies. Although there is much to be said for using modern technologies, in the absence of a sufficient number of empirical studies, it is not possible to draw a definite conclusion on this question. Moreover, many studies do not seem to take sufficient account of the special circumstances of FDI. Therefore, it becomes necessary to investigate some FDI cases in detail, as is done in part C of this report. But before doing so it is useful to review the available research on the environmental effects of FDI to provide a context for these case studies.

V. Review of the environmental impacts of FDI

1. FDI, growth and the environment

Much of the discussion on the environmental impacts of FDI is closely linked to the problems relating to trade and the environment: Does growth that is promoted through liberalized trade have harmful or

beneficial effects on the environment? Many of the results of this research can be applied to the environmental effects of FDI.

There are six trade-related environmental effects, which can be either positive or negative: (Panayotou, 1999: 237-241):

(i) Effects of a change in scale of economic activity. These effects are negative when increased trade leads to more pollution without compensating product, technology or policy developments; they are positive when increased trade induces better environmental protection through economic growth and policy development that stimulates product composition and technology shifts which cause less pollution per unit of output.

(ii) Effects of income growth. These effects are positive, as growth-induced trade brings about a greater willingness to pay for a better environment with increased personal income. Furthermore, increased budgetary resources are allocated to environmental protection, both in absolute and relative terms.

(iii) Effects of changes in structure of economic activity. These are changes in the patterns of economic activity or microeconomic production, consumption or investment, or geographic effects from increased trade. They either exert positive environmental effects (e.g. by reducing the production of crops that rely on chemical-intensive methods in favour of more extensive agriculture) or have negative consequences (e.g. encouraging the drainage of wetlands to satisfy new trade demands).

(iv) Effects of changes in product consumption. These effects are either positive, when trade increases in goods that are environmentally beneficial (e.g. biodegradable containers), or negative, when trade increases in environmentally damaging products (e.g. hazardous wastes).

(v) Effects of technology diffusion. These can be positive when reducing pollution per unit of output (e.g. precision farming that reduces excessive use of fertilizer), or negative when they lead to the spread of "dirty" technologies (e.g. highly toxic and persistent pesticides);

(vi) Effects of trade-induced regulations. These can be positive through improved environmental policies in response to economic growth from enhanced trade or through measures included in trade agreements, or negative when existing environmental policies are relaxed because of specific trade pressures or restrictions on environmental policy by trade agreements.

Concerning FDI in particular, so far the discussion has focused on the last point, relating to regulatory effects; it considers the following interrelated key questions, which can be addressed in tandem:

- What is the impact of host-country environmental standards on TNCs' investment decisions? In other words: Do developing countries have an incentive to create so-called "pollution havens" in order to attract FDI?
- Countries compete internationally for FDI and try to deliver favourable conditions for companies. Does this lead to a competitive lowering of environmental standards (a "race to the bottom")? Or, put differently, are national environmental standards of any relevance for the allocation of FDI from the perspective of TNCs, which might induce developing countries to create so-called "pollution havens"?

In the following subsections, the theoretical and empirical literature on these questions is briefly surveyed in order to develop the focus of the case studies.

2. Relationship between environmental regulations and competition among sites

Often sites and countries compete internationally for mobile investment capital and for industrial settlement, on the assumption that investment flows exert a positive influence on employment, income and technological development. The adjustment of site-based factors with a view to attracting capital therefore represents an essential aspect of a country's growth-oriented strategy. Apart from considerations of legal certainty, market volume, infrastructure, availability of resources and factor costs, site-based factors include costs for environmental protection. Site-based competiton resulting in a reduction of environmental factors can set off a process of repeated mutual undercutting of standards (commonly known as a "race to the bottom") and so lead to a deterioration of the environment.

To assess the environmental impact of site-based competition, it is necessary to analyse whether TNCs are actually influenced by environmental standards in their choice of location, and whether this has led to a competitive deterioration of environmental standards. Empirical literature has examined the environmental dimensions of international site-based competition repeatedly since the mid-1970s.[15]

There is some evidence that in industries with higher-than-average pollution-control costs, production may indeed seem to migrate to areas with lower environmental standards. Which types of firm are most likely to do this? To answer this question, it is useful to distinguish between three basic types of FDI (Esty and Gentry, 1997):

- *Market-seeking FDI.* Many foreign investors seeking opportunities to sell in overseas markets are likely to be attracted by the potential for sales in the domestic markets of the countries in which they are investing. Markets that are large and growing will therefore be the most attractive (e.g. China). FDI that is seeking new access to local markets is not likely to be especially sensitive to higher environmental costs.
- *Production-platform-seeking FDI.* Some investors set up overseas facilities specifically to serve regional export markets as a platform for production and sales. For example, Japanese automobile factories in the United Kingdom and Mexico provide platforms for sales in the European and North American markets. This type of FDI will probably not be very sensitive to higher environmental costs either.
- *Resource-seeking FDI*. Some investors' overseas activities are aimed at obtaining access to critical resources not available in their own markets. In other cases, although the materials might be available at home, investors are driven by the prospect of lower prices in setting up a facility abroad. Low-priced natural resources continue to attract a significant number of foreign investors of this type. For many investments in this category, outputs are relatively undifferentiated, thus small price differences can translate into large changes in market share. Investment flows towards these industries may therefore be particularly susceptible to differences in environmental costs.

There are two types of research to investigate this:

- At a microeconomic level, surveys of companies' activities have been conducted to investigate motives for direct investment.
- At a macroeconomic level, data on trade relations and FDI patterns are analysed to determine whether they show any significant correlation with a change in environmental regulations.

[15] For a survey of the literature, see Schwaab and Busch, 1998; Esty and Gentry, 1997; Adams, 1997; Levinson, 1996a; Jaffe et al., 1995; Dean, 1992.

2.1 Surveys of companies' activities[16]

Most surveys indicate that environmental protection costs are only a minor factor in companies' location decisions:

- In a 1997 World Economic Forum survey, 3,000 business executives from 53 countries were asked to rank environmental regulations and 26 non-environmental factors – ranging from government tax and investment policies to the quality of the workforce and infrastructure – according to their role in their investment location decisions. Stringency of environmental regulations ranked 22nd.
- A report from the World Bank (Dasgupta, Mody and Sinha, 1995), found that the quality of local labour, rather than its cost, was the decisive factor in the choice of investment location for Japanese companies. This study was based on a survey by Japan's Ministry of International Trade and Industry (MITI) of FDI motivations for 173 Japanese companies. It showed that, although companies often complained of high production costs at home, this seldom drove decisions to invest overseas. Meeting overseas demands and following competitors to new markets were much more important factors. The study also showed that low-cost production sites was a more important factor, and that this factor was more important for small companies than for large ones. Environmental factors were not mentioned at all in the report.
- Research on German industry has shown that the bulk of its FDI is of the market-seeking kind. The leading motives for German industry's global activities are to open new markets, to target potential markets and to maintain current ones (Iwd, 1996: 5). Nevertheless, relocations can also be linked to cost burdens, but this refers more to labour costs and the companies' tax burden than to ecological aspects (Iwd, 1995; 1996: 5). Moreover, according to Knödgen's surveys (1979 and 1982), most companies assume that differences in environmental regulations between countries will decrease with time and that they cannot therefore constitute a decisive factor for long-term location decisions.
- Another study, by Zamparutti and Klavens (1993), suggests that low environmental standards can actually discourage investment. This survey of 1,000 large corporations based in OECD countries found that environmental issues were an important concern of Western investors, and could block or impede direct industrial investments in Central and Eastern Europe. However, the environmental issue of most concern was the fear of inheriting liability arising from past practices, such as the costs of bringing host country facilities into compliance with environmental standards. Concerns about liability for future environmental practices, including uncertainty about how the rules for this liability would be established, were also of concern.
- Nearly 70 per cent of respondents claimed to follow relatively strict internal corporate environmental standards, where these were more stringent than the host country's requirements. Since the bulk of international investment is undertaken by large TNCs, which frequently operate at a corporate standard of environmental performance worldwide rather than taking advantage of relatively lax local standards, this practice may explain much of the reason why instances of capital flight and/or "pollution havens" generally are not found in the literature.
- In resource-seeking industries, where products are relatively undifferentiated and small cost differences can translate into large market-share gains and losses (i.e. where demand is relatively elastic), foreign investors can sometimes exert considerable pressure on recipient countries. In such industries, companies claim, quite correctly, that small differences in cost will dramatically affect their competitiveness, and they may successfully argue for relief from "high" domestic environmental standards.
- However, competitive pressures can also operate in the opposite direction. In some markets, overseas investors push for higher environmental standards. Foreign investors in Costa Rican banana production have been known to insist upon environmental care, perceiving that their European customers want an environmentally sound product (Gentry et al., 1996). A number of

[16] This section is taken mainly from OECD, 1998e which provides an excellent survey of the literature.

Asian lumber products are similarly geared to the European market, where consumer sensitivity often demands that the product meet certain minimum environmental conditions.

- Gentry et al. (1996) have suggested that, overall, countries which operate straightforward, transparent, efficient environmental programmes experience no resulting loss of FDI, and may in fact attract some industries which are looking for reliable overseas bases of operation. For example, although the Mexican Government has significantly increased its environmental enforcement efforts over the past few years, FDI in the area around Mexico City has expanded rapidly – and air quality has actually improved. Reflecting a similar spirit, a recent survey of multinational investors in Mexico found that most companies believed that reduced subsidies for power and water, along with more consistent enforcement of existing pollution-control requirements, were the most effective steps the Mexican Government could take to influence industry's environmental performance (Gentry and Fernandez, 1996).
- A study of 30 chemical and engineering companies using clean-production techniques (Christie and Rolfe, 1995) found several important reasons for investment in environmentally beneficial systems: compliance with regulations, cost savings associated with greater process efficiency, increased competitiveness, commitment to corporate responsibility, pressure from customers, and an anticipation of new regulations. More companies reported benefits from cleaner production than problems.

2.2 Macroeconomic studies[17]

An analysis of trade and FDI patterns corroborates the conclusion that the fear of a "race to the bottom" is probably not as great as it seems.

- Repetto (1995) analysed 1992 data for United States FDI by sector and by regional destination. He noted that, although developing and transitional economies received 45 per cent of total FDI from the United States in 1992, a much smaller proportion of that FDI went into environmentally sensitive industries (petroleum and gas, chemicals and related industries, and primary or fabricated metals) than that to the developed countries with relatively tight environmental standards. Twenty-four per cent of United States FDI into the advanced countries went into pollution-intensive sectors, but only 5 per cent went into those sectors in the less developed economies. Thus, to the extent that the advanced countries export their "dirty" industries, they seem to be sending them to each other, not to the less developed economies. Where data was available for individual economies, this conclusion was corroborated: in Nigeria, Hong Kong (China), the Republic of Korea, Malaysia, the Philippines, Singapore, Taiwan Province of China, Thailand, Argentina, Brazil, Colombia and Venezuela together, and in each one individually, except Venezuela, the stock of inward FDI in the pollution-intensive industries represents a smaller share of total FDI now than in the 1960s or 1970s, despite the fact that environmental regulations have tightened in the countries making the foreign investments.
- These overall trends are confirmed by Olewiler (1994); he summarized and updated the work of Leonard (1988), who had assessed trade and investment data with respect to pollution-intensive industries in the United States and concluded that there was no pattern of investment in LDC "pollution havens". Even for the mineral processing sector, FDI was much higher, on average, in developed countries than in developing countries, and no correlation was found with the stringency of environmental policy.
- Xing and Kolstad (1996) took a different approach to measure the effects of stricter environmental regulations, and arrived at somewhat different results. They examined FDI between 1985 and 1990 in 22 countries (7 developing and 15 developed) by the United States' chemical industry, electrical machinery industry, and the non-electrical machinery industry. Their analysis showed that more lax environmental regulations in a host country were significantly correlated with FDI by the United States chemical industry, but not with other industries which pollute less than the chemical

[17] This section is taken mainly from OECD, 1998[e], which provides an excellent survey of the literature.

industry. Furthermore, their results indicated that the more "relaxed" the environmental regulations in the host country, the more likely that country was to attract investment capital from United States industry.

- More ambiguous results were obtained by Bouman (1996) for Germany. This study found a significant, but small, negative effect of German compliance costs on capital outflows, although some of the regressions also found the reverse situation (increased compliance costs and reduced outward foreign investment). Also, the results varied according to whether the compliance-cost measure concerned capital expenditures or current expenditures, raising some questions about the robustness of the results.
- Birdsall and Wheeler (1993) investigated whether greater openness in trade and foreign investment was associated with pollution-intensive development. Their hypothesis was that if trade encouraged the existence of pollution-havens, the more open developing economies should experience relatively higher pollution-intensive development. The evidence (from Latin American countries) showed, however, that over the 1970s and 1980s, the more open economies actually ended up with cleaner industrial sectors. Although pollution intensity did grow more rapidly in Latin America as a whole after environmental regulations in OECD countries became stricter, anecdotal evidence suggested that openness to foreign technology and capital gave rise to pressure for more stringent environmental standards. The authors concluded that pollution havens could be found, but not where they had generally been sought. Instead, they were in protectionist countries.
- Similar conclusions were reached by Lucas, Wheeler and Hettige (1992). Focusing on production, rather than on investment flows, they examined changes in the relative output of various industrial sectors over the period 1960–1988, using time series estimates of the pollution intensity of manufacturing for a large sample of developed and developing countries. The results indicated that pollution intensity in developing countries had indeed grown strongly. In addition, pollution intensity had grown most rapidly in developing countries that were relatively closed to global market forces. Relatively closed, fast-growing economies experienced very rapid structural transitions towards greater toxic intensity. The opposite seems to have been true, however, for more open economies. Restrictive trade policies imposed by the developing countries themselves may even have been the main stimulus to toxic industrial migration, rather than regulatory cost differences between the North and South.
- Walter (1982) examined the significance of the increasing mobility of companies for industrial development in developing countries in the 1970s by comparing the respective intensities of FDI.[18] Neither for industry in general nor for lines which are particularly harmful to the environment was there a significant change in the ratio of investments in developing countries to investments in industrialized countries. It can therefore be concluded that the effect of environmental regulation on location choice is relatively small.
- Blazejczak (1993) and Blazejczak et al. (1993) investigated German FDI inflows and outflows from the beginning of the 1980s. They examined Germany's attractiveness as a site for industrial production. The influence that environment-related site factors exert on the choice of industrial location was considered to be relatively small. Their findings reveal that Germany was not at a disadvantage as a site, but even had a comparative advantage with regard to the production of goods used in environmental protection.
- Some studies have also approached the "pollution haven" hypothesis from the perspective of revealed comparative advantage (RCA). These studies have examined the question of whether or not individual countries (especially the developing ones) are becoming more specialized in the production of environmentally sensitive products over time. SORSA (1994) found that industrial countries had basically maintained their 1970 share of world exports in environmentally sensitive products (at about 73 per cent) in 1990. Major structural changes were seen specifically in trade in manufactures, where industrial countries' share of world manufactured exports fell (from 91 per

[18] The intensity of FDI is measured by the ratio of FDI to total (real) investment effected within a country.

cent to 81 per cent), but environmental compliance costs were not found to be the cause of this change. For example, Finland and Austria both maintained high environmental standards and a high share of environmentally sensitive goods in their export composition during the study period.

- At a more disaggregated level, industrial countries both gained and lost comparative advantage in different environmentally sensitive products, again suggesting that non-environmental factors were more important in explaining changing comparative advantage. For example, Germany maintained its comparative advantage in the chemical and metal industries, which have the highest compliance costs within the manufacturing sector, yet their RCA declined in other products.
- Low and Yeats (1992) analysed trade flows in environmentally sensitive industries along the same lines as Sorsa, using data from 1965 to 1988. They found that the share of pollution-intensive industries in total world trade had fallen and, while the industrial countries continued to supply around three quarters of the exports of pollution-intensive industries, these industries represented smaller shares of the industrial countries' total exports than previously.
- Work at the World Bank has extended this research, using international data on industrial production, trade and environmental regulation for the period 1960–1995. So far this research (Mani and Wheeler, 1997) has found that, although pollution-intensive output did seem to be falling in the developed countries and rising in the developing ones, "pollution haven" effects have not had much influence on these shifts.

3. Conclusions

The evidence shows that most decisions on investment location are not made on the basis of environmental criteria. Environmental costs are typically a small element in these decisions. Most pollution-intensive FDI originating in industrialized countries is going to other developed countries, rather than to developing ones. Even in the developing countries, the amount of inward investment in pollution-intensive industries was a smaller proportion of total FDI receipts in 1992 than in 1972.

There is not much evidence of countries explicitly lowering their environmental standards in order to attract new FDI. Even where countries do react in this way, it is not obvious that they are being very successful. On the contrary, countries which operate transparent and efficient environmental programmes are often quite successful in attracting new FDI. Countries with high environmental standards are still the major producers and exporters of most environmentally sensitive goods, and still have the highest living standards.

Overall, therefore, there is not much empirical evidence of "pollution havens" influencing either FDI or trade flows on a systematic basis. In fact "pollution havens" seem to be more often associated with protectionist economies than with environmentally tolerant ones. If anything, the imposition of higher environmental standards seems more likely to generate a technological response, rather than leading to capital flight.

VI. Conclusions of the research project

1. Summary of the findings and implications for the objectives of the project

The structural and environmental effects of FDI on a host country, especially regarding the transfer of environmental technology, are determined by a range of factors including:

- Economic and development priorities of the host country, its environmental policies and regulations, existing local skills and technology supply;
- The environmental policies of the TNCs;
- The environmental policy of the home country of the TNC;
- Expectations and pressures of stakeholders, including consumer organizations, environmental pressure groups and other NGOs; and
- International regulations through environmental agreements.

Within developing countries, as host countries of FDI, there seems to be scope for improving environmental policies and regulations. They need to find cost-effective means for promoting the goals of sustainable development. The studies surveyed above have shown that for most companies and industries (lower) environmental standards are not a relevant factor in the site-selection process. Although the empirical findings do not prove that FDI necessarily leads to a diffusion of modern technologies with lower environmental impacts there is a clear potential for sustainable development through FDI if it is aligned with the corporate policies of many TNCs.

The objective of the studies was therefore to find levers for maximizing the positive effects of FDI so as to promote sustainable development. These potentially include:

- Reduction in pollution intensity;
- Reduction in intensity of resource use;
- Transfer of "best practices" across industry, especially along the supply chain; and
- Shifts in consumer expectations towards "greener" products.

The activities of TNCs are of special interest as they are the most important "players" in this process. On the demand side, pressure by regulators, customers, shareholders and the community can drive firms to supply environmentally friendly technology, such as "cleaner" production technology and pollution-abatement equipment. While regulatory and community pressures usually aim at process characteristics, customer pressure is directed towards product characteristics. On the supply side, environment-related technological change is driven by abatement costs, the ability of innovating firms to benefit from mitigation of environmental damage (which in turn depends on the regulatory regime), and to appropriate the benefits of innovation with wider application.

Many earlier studies concentrated on the industrial-flight hypothesis or on an analysis of "dirty migration". They therefore focused on the question of whether low environmental regulations in the host countries provide an incentive for FDI. As noted earlier, one important conclusion that can be drawn from these studies is that for most companies and industries (lower) environmental standards are not a relevant factor in the site-selection process. Fears that competition among sites to attract FDI leads to a "race to the bottom" or a general lowering of environmental standards in the FDI host countries is not supported by the empirical studies. However, as was also noted earlier, the empirical findings have *not* proved either that FDI necessarily leads to the diffusion of modern "clean" technologies. In this regard, the results of the studies were inconclusive.

Part of the reason why previous studies have delivered inconclusive results lies in their methodology. Working within general models they have tried to support their conclusions with statistical analyses which must necessarily detract from the special circumstances of each case. The ways in which technology is spread in the host countries through FDI are diverse, and depend on several factors which differ from company to company and from country to country. In order to draw valid conclusions about the critical factors influencing FDI and to give recommendations as to how its environmental and technological effects are shaped, it is necessary to investigate several cases of FDI in detail. For this reason, the present study adopted the approach of company-level case studies in

selected industries and selected countries so that all possible effects of FDI might be taken into account in order to analyse the contribution of FDI to sustainable development.

2. Underlying assumptions and critical factors

Taking into account the results discussed above, it was decided to base the project on the following assumptions, which provide a general summary of the interconnections between investment and the environment:

(i) International agreements on trade and investment serve liberalization and non-discrimination in the international flow of goods and factors.

(ii) Provisions in international trade and environmental agreements exert an indirect influence on FDI, assuming they are implemented through national regulations.

(iii) The main motives for FDI are the opening up and extension of new markets.

(iv) Differences in environmental regulations between home and host countries are a contributory factor in companies' site-selection process only in a few industries.

(v) FDI which is motivated by an expansion strategy increases production capacities in the host country and thereby aids the economic development process. This normally implies an increase in resource consumption and environmental pollution.

(vi) Economic growth and increasing per capita income in the host countries brings about growing interest in environmental protection and environmentally sound production technologies as well as a rise in demand for environmentally friendly products.

(vii) FDI can accelerate the diffusion of modern eco-efficient management know-how, technologies and their spillover, and can thereby contribute to sustainable development.

Some of these assumptions are debatable in the general discussion on globalization while others are seldom disputed. The steering committee of the project agreed on these assumptions in October 1998 and they were discussed at the UNCTAD workshop on Strengthening Capacities for Trade and Environment Policy Integration in Jaipur, India, where they were accepted as general contextual assumptions. The project focused on a further evaluation of assumption (vii) through the case studies.

On the basis of previous studies on environmental management as well as interviews with TNC headquarters, critical factors contributing to an improved integration of environmental requirements into business in general, and particularly into FDI, were identified and defined. These factors can be subdivided into external and internal factors. They were used to structure the fieldwork of the case studies (see table 12).

Table 12: Critical factors contributing to an improved integration of environmental requirements into FDI

External factors	Internal factors
Customer expectations	Products & services
Social values	Corporate policy and commitment
Competitor capabilities	• Corporate values
Pressure group activities	• Management commitment
Media	• Corporate policy
Regulation	Management systems
Enforcement	• Environmental management systems
Property rights	• Environmental audit systems
Supplier capabilities	• Environmental management programmes
Business association activities	Competencies
Prices	• Technical know-how
Natural resources	• Skills of employees
	• Resources
	Site
	Costs

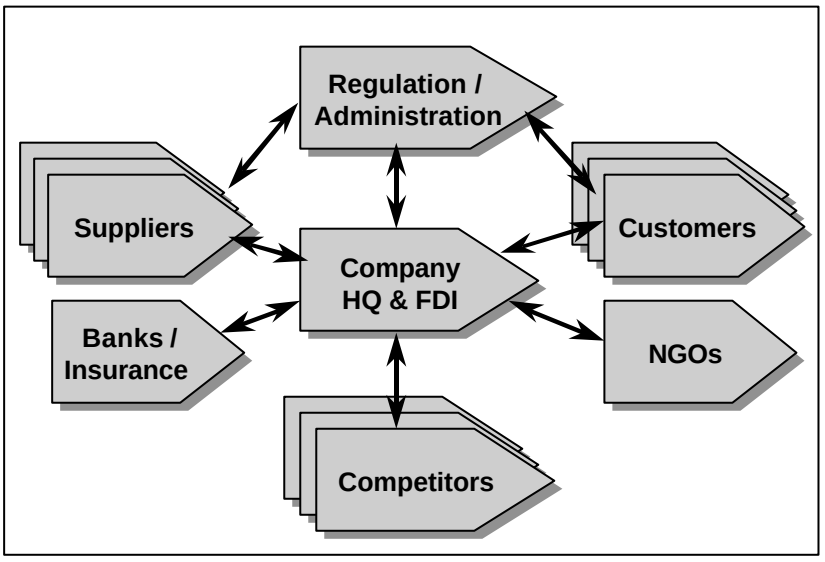
Using company-level case studies in selected industries and selected countries, the contribution of FDI to sustainable development was analysed based on the factors listed above.

C. Case studies

I. Introduction

The case studies provide an insight into international strategies, technology choices and environmental management practices of four TNCs. It is important to bear in mind that the companies willing to participate in such a project normally represent "best practice", so that the results obtained in these case studies cannot be generalized. However, generalization is not an objective of the research project. Also, interviews with the companies concerned are likely to offer more detailed insight into management practice than an analysis of macroeconomic data. The contribution of FDI to sustainable development is therefore identified at all levels of a product's value chain. Since the views of important stakeholders such as suppliers, customers, NGOs, banks and insurance companies as well as government representatives were covered by the survey, the approach chosen also helps elucidate the impact of stakeholder influences on companies' environmental strategies. See figure 3 for an overview of the stakeholders influencing the companies included in the case study.

Figure 3: Stakeholders influencing the case study companies



The examination of best practice in TNC behaviour with regard to the dissemination of environmental technology and management practices gives valuable clues as to how to improve the contribution of FDI to sustainable development from an environmental point of view. Furthermore, the experience of the "best-practice" TNCs might be helpful for assessing the impact of FDI on environmental policy in the host countries and the contribution FDI can make to the implementation of multilateral environmental agreements.

The countries selected are the most important host countries for German FDI among the developing countries: China, India and Malaysia.

The selected companies come from the industrial sectors that are important to the German economy.

1. Case study selection process

On the basis of the above-mentioned assumptions, criteria were defined to choose companies for the case study. The following selection criteria were used:

- German companies with subsidiaries in China, India or Malaysia;
- Sectors of international importance;
- Sectors with high technological requirements;
- Best practice at company or sector level;
- Environmentally relevant business activities;
- Globally active large or medium-sized corporations; and
- Subsidiaries with relevant local supplier relations

A short, seven-page questionnaire was developed for evaluating the companies' general level of interest in this subject. In August 1998, the Institute sent 106 short questionnaires to German companies that undertook FDI in China, India and Malaysia. Of these 16 corporations responded and the following are the findings of particular interest based on their responses:

- Nearly 40 per cent of the companies belonged to the chemical sector and nearly 25 per cent to the electronic sector;
- About 75 per cent of the companies have implemented a worldwide standardized environmental policy;
- The "ICC environmental guidelines" and the "Responsible Care Programme" were of particular interest, among the international guidelines that the corporations used when choosing the location for their FDI;
- "Market volume/market proximity" and "legal certainty" were of particular interest, whereas "capital costs", "costs of transportation", and "environmental legislation and standards in the host country" were considered to be of little importance.

On the basis of the responses to the short questionnaires and additional interviews, Adtranz, Aventis, BSH, and Burgmann were selected as partners for the detailed case studies.

2. Case study design and research methodology

The case study design aimed to explore critical success factors in order to improve the integration of environmental requirements into FDI. Therefore, not only environmental managers, but also line managers, product managers and external stakeholders (such as suppliers, customers, NGOs, banks and insurance companies) along with governments and authorities were involved. The purpose of this multi-stakeholder approach was to obtain valid results about the dynamics and impact of the management process and their external effects.

Chinese, Indian and Malaysian research institutes were asked to participate in the case studies in order to minimize language and cultural barriers and thereby ensure good relationships between the research institutes and the local affiliates/subsidiaries as well as the local authorities and competitors. In cooperation with UNCTAD and the steering committee, a set of selection criteria was defined for determining the partner institutes in the host countries, the most important of which were that they should be national research institutes, non-governmental institutions having good relationships with the government, should have adequate staff and equipment, business and environmental competence, experience in international cooperation, experience with previous research activities and publications, and financial independence.

A long questionnaire[19] was then developed to structure and facilitate the evaluation of the case studies. The interviews for the case studies were carried out by the Sustainable Business Institute and its partner institutes. While the Institute for Environmental Management and Business Administration met with the German headquarters and managers in the home countries of the above-mentioned corporations as well as with some of their relevant stakeholders, the partner institutes met with the managers in the host countries and with local stakeholders. Upon completion of the case studies, the partner institutes organized workshops with the subsidiaries and all relevant stakeholders, and presented the results.

The long questionnaire was divided into two parts. The first part concerned the companies and sought to obtain general information about the company headquarters and its subsidiaries and about environmental aspects such as policy, management processes and effects. The second part was concerned with the perspective, significance and influence of different stakeholders regarding the environmental performance of the subsidiaries.

The methodology was discussed at a steering committee meeting in Bonn (October 1998) and at the UNCTAD workshop on Strengthening Capacities for Trade and Environment Policy Integration in Jaipur, India (January 1999).[20] Besides some issues specific to the Indian situation, more general aspects were also discussed. The following aspects were identified as being of general interest for the case studies (CUTS, 1999):

- Comparing the environmental performance of TNCs with that of local companies or State-owned enterprises;
- Finding out how win-win situations could be achieved both for the developing countries and for the TNCs investing in the host countries (for example, striving for sustainable development and achieving business-oriented goals);
- Analysing to what extent the supplementary pollution (due to scale effects in production) of large TNCs could be compensated for by efficient environmentally sound technologies;
- Examining the relationship between the TNCs and their suppliers and customers in the host countries in order to determine whether these companies are making efforts to create the necessary environmental awareness and know-how amongst their suppliers and consumers;
- Finding out benchmarks and best practices in TNCs' environmental performance; and
- Evaluating incentives for TNCs not only to offer the product as embodied technology or the entire technology as a black box, but also to enable the host countries or companies to gain know-how from the transferred technology.

Some but not all of these aspects were covered in the case studies.

II. BSH Bosch and Siemens Hausgeräte GmbH (BSH)

Technology switch: From CFC to HC refrigerators

Starting in 1993, while in the process of globalizing their business, BSH Bosch and Siemens Hausgeräte GmbH (BSH) switched from chlorofluorocarbons (CFC) to hydrocarbons (HC) in their refrigerators. The NGO, Greenpeace, was an important external driver of this change as it sought to

[19] See the appendix for the long questionnaire.

[20] For more details, see the report of the Consumer Unity & Trust Society (CUTS) on the seminar on Strengthening Trade and Environment Policy Integration, organized under the Trade, Environment and Investment Project, Jaipur, India, January 13-15, 1999.

promote HC-technology internationally. The use of HC-technology first succeeded in Germany and then in other countries of Europe, but in the rest of the world, manufacturers still supply hydrochlorofluorocarbon (HCFC) and hydrofluorocarbon (HFC) refrigerators. The developing countries remain the main "battlefield" for the competing technologies. The importance of the markets in these countries is due to both the number of households and to the fact that most of these households simply do not yet have a refrigerator.

The case study focuses on BSH's investment in China, analysing critical factors for successful technology transfer. It is based on interviews with managers in Germany and China, the responsible environmental managers at BSH, Siemens and Bosch, the director for cooling systems at BSH and the management and the employees at Anhui BSY Cooling Appliances Co., Ltd. (BSY) in China, local suppliers, representatives of the administration, Greenpeace and other stakeholders. The interviews were carried out between December 1998 and August 1999 in cooperation with the Centre for Environmentally Sound Technology Transfer (CESTT) in China.

1. About BSH

BSH was founded in 1967 as a joint venture between Robert Bosch GmbH and Siemens AG. As each company owns a 50 per cent equity, BSH was able to develop as an independent company. In 1998, BSH reported revenues of DM 10.3 billion and over 34,000 employees. It is one of the world's leading manufacturers of electrical home appliances, producing a wide range of products including washing machines, dishwashers, ovens, cooling appliances and many other small home appliances.

In the late 1970s and early 1980s, BSH started to expand into the European market with acquisitions in Greece and Spain, but it has only recently entered the global market, with investments in China and Brazil. Concerning its activities abroad, it can be observed that BSH favours joint ventures and acquisitions of regional companies so as to benefit from the marketing and service experience of its local partners. In order to implement new technologies, BSH converts the manufacturing facilities of its local partners from the start. It has also pursued this strategy with its other foreign subsidiaries in countries such as Brazil, Mexico and Peru. For marketing purposes, BSH uses different brand names in the various regions.

About the BSH Group in Chuzhou (China)

Foreign companies intending to enter the Chinese market are required to form joint ventures with Chinese companies. An earlier planned joint venture with the Chinese market leader, Kelon, failed. Therefore BSY was founded in March 1996 as a joint venture between BSH and China Yangzi Group to manufacture refrigerators. The site is located in Chuzhou in the eastern part of China and the total investment amounted to DM 200 million, with 962 employees assembling 300,000 refrigerators a year; the goal is to produce 500,000 in the near future. One of the most decisive factors when looking for a joint venture partner was the excellent infrastructure of Yangzi's manufacturing site. Chuzhou is well connected by road, rail and air transport.

In addition, BSW Household Appliances Co. Ltd. (BSW) was founded as a joint venture between BSH and Wuxi Little Swan Co. to manufacture washing machines and tumble dryers. BSH China is the exclusive vendor of all products manufactured by BSY and BSW.

2. Management processes

a. Product and technology strategy

Following the concept "think globally, act locally", BSH products are manufactured worldwide using the same advanced technologies. They are developed at the technology centre in Germany and adapted to local or regional consumer needs and local production circumstances. All BSH products are manufactured to the same high technological international standards and their low water consumption and energy efficiency are fundamental characteristics. The United States' Environmental Protection Agency (EPA) awarded the Stratosphere Ozone Protection Award to the engineer responsible at BSH for efforts to eliminate CFCs.

b. Environmental management

In 1991 BSH appointed an international environmental manager, and in 1994 it issued an international environmental policy, setting up an international network and various information channels. In addition, BSH's environmental management has close contacts with the environmental management departments at Siemens and Bosch and can use their competencies and resources whenever needed. BSH's environmental management focuses on products as well as on production. The implementation of the environmental management standard and compliance with relevant regulations are responsibilities of the local joint venture. All sites and foreign subsidiaries report to headquarters. In addition to the internal reporting system, a public environmental report has been produced annually since 1993. Some information from the foreign subsidiaries is included in this report.

Products. A life-cycle oriented optimization of products is the underlying philosophy and programme of the company's environmental management. It encompasses concrete goals for improvement in the further development of products. Using environmental indicators, BSH aims to continuously improve its products' environmental performance. This is particularly important when one considers that the utilization phase of the life cycle of the home appliances accounts for approximately 90 per cent of their environmental impacts. Besides energy efficiency, there are other environmental design criteria such as recyclability, water efficiency and the reduction of packaging material. The centralizing of BSH's environmental affairs and its R&D departments creates opportunities for the departments concerned to work together throughout the life cycle of the products.

Until 1993, only the CFCs R12 and R11 were used for cooling and in the insulating foam of refrigerators. BSH was the first manufacturer to reduce the amount of CFCs used in the insulating foam by half in 1988, one year after the Montreal Protocol. The company has now phased out CFCs worldwide, starting in Europe in 1993, and it uses HFCs as an intermediate technology. Since 1994, none of BSH's European locations have used CFCs. The HC-technology has been implemented since 1994, starting in Germany. In China, BSY completely substituted CFCs with HFCs in January 1998, and a year later it became the first manufacturer in China to adopt HC refrigeration technology. The substitution of HFCs was set to be completed in the year 2000 and BSH publicized that goal worldwide.

Production. It is BSH's policy to use synergies between environmental, quality- and safety-management, and to integrate the management processes whenever feasible. Environmental management standards (EMS) will be implemented in all sites worldwide. In addition to this internal management standard, all sites in Germany participate in the EU's Environmental Management and Audit Scheme (EMAS), and additional ISO 14001 certifications are planned. All sites in Europe either

participate in EMAS or are ISO 14001 certified. So far no certifications have been planned for facilities in non-European countries.

The paintshop is a significant environmental aspect of BSH's appliance production. The company has therefore switched to powder coating or "coil-coating" in its new factories, thus reducing water and energy consumption as well as emissions and waste.

In Chuzhou the entire plant has been completely refurbished, including renewal of the drinking water supply, the network for compressed air, the heating system and the energy supply, as some of the environmentally significant installations. Waste-water treatment is continuously being improved and a basin to collect runoff is planned.

Although the reputation of BSY's competitors in China benefited from their ISO 14001 certification, the company does not plan such certification there. As the public does not compare the quality and performance of the internal EMS implemented at BSY to the certified EMS of the Chinese companies, BSY gives low priority to improving its reputation based on this.

c. Supply-chain management

The quality of BSH products is one of their main marketing strengths. Suppliers of materials and components therefore have to fulfil strict requirements. BSH organizes international training courses and workshops for both their own experts and supplier representatives. The company also requires that its suppliers operate according to the same environmental guidelines as it does. In Europe, BSH has begun to evaluate the environmental management of its most important suppliers in order to optimize the environmental life-cycle performance of its products.

Some of the basic components of BSH refrigerators are designed and delivered by suppliers. However, BSH still has sufficient in-house competencies regarding these outsourced components to write specifications and to evaluate the quality of these components in its laboratories.

Furthermore, BSH China audits the local suppliers and their manufacturing processes according to an inspection/audit plan. The main objective of these audits is to ensure that the suppliers meet BSY quality requirements and are able to produce goods of the required quality at a competitive price.

Besides the environmental advantages of HC, it is a natural gas in plentiful supply worldwide. That means BSH has no problems obtaining the gas and it is not dependent on the chemical industry. In addition to this, the intermediate technology using HFCs is significantly more difficult to manufacture than the HC-technology, as it requires an extremely clean and dry production environment. The main technical challenge for the change from CFC or HFC to HC as a refrigerant is that more powerful compressors are required. In 1992, there was no supplier for these compressors. After a short period of negotiations, therefore, one supplier agreed to produce the necessary volume of the desired compressors. These were tested and approved by BSH, which then bought 80 per cent of the production capacity.

d. Staff management

Communicating its environmental philosophy represents a challenge for BSH. Getting employees to identify themselves with its philosophy and act accordingly is particularly difficult in China due to a general lack of awareness of environmental issues and problems. Language barriers and differences in culture are further obstacles to the implementation of environmentally sound technologies and management systems.

BSH China organizes internal training programmes for its sales promoters and agents to provide them with basic product knowledge and unique selling points. Part of the programme informs them about the issues concerning CFCs and their environmental impacts.

3. External conditions for BSH in China

There are different external factors that have had, and still have, an influence on the transfer and diffusion of the company's technology and on its environmental performance in general.

a. Social values and media

Environmental problems and global climate change were very important publicly debated topics in the late 1980s and early 1990s, both in Germany and in the rest of Europe. CFCs were one of the priority issues at that time. In Germany, in particular, the media reported both on companies that attempted to avoid CFCs and on the success of the Greenpeace campaign and of companies like BSH. In China the CFC issue has had less public resonance in the media. Language and cultural barriers are considered to be a significant obstacle to cooperation between BSY and the local authorities as well as the joint-venture partner. According to the Chinese authorities, BSY gives too little consideration to the Chinese culture and to local needs and has little regular communication with the local authorities and newspapers – BSY seldom features in the media.

b. Politics and local authorities

The 1987 Montreal Protocol has been signed by 140 countries. According to the Protocol, total CFC production was to be phased out by the year 1996 in industrialized countries and by the year 2010 in developing countries.

In Europe home appliances must carry a label indicating their expected energy and water consumption. The EU introduced these energy labels for home appliances in order to make their performance more transparent for consumers. BSH placed most of its products in the more favourable labelling categories and thus managed to position itself well in the market.

The Chinese authorities have implemented a labelling system for 14 categories of energy-intensive products and equipment, which involves certification of the products. The first phase of the certification programme focuses on three groups of products, one of which is home appliances. This could mean marketing advantages for BSY refrigerators which are particularly energy efficient. In addition, the Chinese authorities have issued 29 technical standards in their environmental labelling programme. It is worth mentioning that BSY has played an active role in the development of the energy labelling certificate in China, with respect to both standards and procedures.

The leading environmental problem in Chuzhou City is water pollution. Due to a relatively underdeveloped local economy, there is no municipal waste-water treatment plant in Chuzhou. The local Environmental Protection Bureau (EPB) has increased its environmental enforcement efforts over the past few years. As a result, 52 small-scale polluting enterprises have been shut down in order to reduce waste-water discharge into the Huanhe River. The local EPB has not encountered any major difficulties in dealing with BSY in the field of environmental protection.

The protection of intellectual property rights (IPRs) is limited, both with respect to establishing the regulatory framework and to its enforcement. The few existing laws appear not to be considered

binding as the copying of state-of-the-art technologies is fairly common. However, Chinese authorities are improving the legal framework and enhancing enforcement of regulations.

c. Customers and customer-relations management

The achievements of environmentally sound technologies are relevant for communication and marketing in all markets:

In Germany "CFC-free" has been an important feature in the refrigerator market and in some other markets as well. Energy efficiency is another important product feature for the German market and for other European markets where BSH has been very successful with its new refrigerators.

In order to facilitate specialized dismantling and optimize recycling, BSH Germany has offered to take back old appliances since 1994. Furthermore, the service team provides concrete tips on how to save energy and water.

In China there is little incentive for HC-technology from the customer side. For Chinese customers purchasing a refrigerator, energy efficiency is the most relevant environmental aspect and an important selection criteria; it is much more important than the use of HC-technology. Electric power costs, on average, over US$ 0.07 per kWh, which is very expensive considering the average monthly income of urban residents (less than US$100 per month). Most buyers are less concerned about CFCs than abouts saving energey. Therefore, "energy saving" rather than "CFC-free" has been used as the primary sales argument for BSY-manufactured refrigerators in China.

For those buying their first refrigerator, the most important selection criteria are price and energy consumption. On average, for most people, the price of a refrigertor is equivalent to at least three months' income. They are also concerned about the noise level and the appearance of the refrigerator. Many Chinese families regard the refrigerator not only as a cooling appliance, but also as an important piece of furniture which is placed in the (usually small) living room. Those families who bought their first refrigerators in the late 1980s and early 1990s and are now upgrading them pay more attention to high quality, superior functioning (keeping food fresh), large capacity and design.

BSH China has launched a customer education campaign, which aims to advise customers on how best to select a refrigerator. This has resulted in a substantial increase in sales of BSY's products, including refrigerators which are more energy efficient and use the environmentally friendly HC-technology.

d. Competitors

In Germany, the other manufacturers phased out CFCs during the same period as BSH. Yet it was BSH that managed to increase its market share from 14 per cent to 20 per cent when it launched its HC refrigerator.

The market for refrigerators in China is highly competitive. There is no opportunity to enter the market with a low-tech product. BSY competes on the refrigerator market with Chinese companies such as Haier, Kelon, Xinfei, Meilin and Changling. The Chinese refrigerator manufacturers hold the lion's share of the home appliances market and have all attained ISO 14001 certification. Especially in the south, companies became interested in substituting HFCs because of the high humidity levels and associated quality problems. Through contacts between Kelon and BSH during their (failed) joint venture negotiations, and through direct contacts with Greenpeace, Kelon was familiar with the HC-technology. Today, Kelon (Rong Shen) has shifted a significant proportion of its production to HC-technology as has Qingdao Haier, with technology for this provided by the German manufacturer

Liebherr. Some of these companies have larger production capacities than BSY. There are also some SMEs which manufacture refrigerators with CFC- and HFC-technologies. Nevertheless, BSY offers its hydrocarbon refrigerators at the same price as its competitors.

e. NGOs and neighbourhoods

In Germany, Greenpeace was the main promoter of the HC-technology, and in 1992 it supported the former East German manufacturer, Foron, in presenting the first HC refrigerator. However, Greenpeace continued campaigning, as BSH and others were still using HFCs instead of HCs. Following negotiations, it was agreed that BSH would change its technology. BSH and other manufacturers of cooling appliances agree that it was Greenpeace's initiative which forced them to change to HC-technologies.

Greenpeace also played an active role in pushing the HC-technology internationally. In 1993 and 1994 this NGO promoted the technology in China. As there are no Chinese NGOs, BSY met with Greenpeace representatives in Hong Kong (China) to discuss the phasing out of CFCs and HFCs in China.

As the largest foreign company investing in Chuzhou, BSY is under close public scrutiny, especially in the local neighborhood. Since international NGOs are not particularly active in this region, their overall importance and influence is very small. However, in the past few years, some NGOs have been formed and play an important role in the shaping of environmental awareness. They include: China Population and Environment Society (CPES), China Environmental Protection Foundation (CEPF) and Friends of Nature. Most members of the first two NGOs are former members of the National Environmental Protection Agency (NEPA), while the latter is more or less independent (BfAI, 1998a: 7).

f. Employees

In general, there is a lack of environmental knowledge and safety awareness in China. Therefore BSY trains its employees on how to handle environmental and safety issues and provides them with the necessary means to do so.

Chinese employees are very proud to work for BSY; they believe that the company's environmental standards are more stringent than the national environmental standards and that BSY has demonstrated an environmental performance superior to other refrigerator manufacturers.

g. Banks

As a commercial bank, the Bank of China (BOC) is starting to pay more and more attention to environmental protection and energy conservation when appraising its lending programmes. In general, the BOC has cooperated well with BSY since the beginning. The BOC is pleased with the technological progress taking place at BSY to employ HC-technology.

III. Aventis Pharma AG (Aventis)

Responsible care and concern for image as driving factors for EMS transfer

The reputation and success of pharmaceutical corporations depend, among other things, on continuous improvement in health, safety and environmental performance. Aventis Pharma AG (Aventis) has

therefore developed an international EMS to meet the highest expectations concerning environment health and safety (EH&S). This EH&S management system and its internal auditing system are comparable to externally verifiable international standards such as EMAS or ISO 14001 certification.

This case study is based on interviews with the responsible managers in Germany and India, the environmental manager at Aventis, the management at Aventis in India,[21] local suppliers, representatives of the administration and other stakeholders. The interviews were carried out between December 1998 and July 1999 in cooperation with the Administrative Staff College India (ASCI).

1. About Aventis

At the end of 1999 Hoechst and Rhone-Poulenc merged to form Aventis. With its corporate headquarters in Strasbourg, France, Aventis has 90,000 employees worldwide and is active in more than 120 countries. It is one of the largest pharmaceutical corporations to focus on the discovery, development, manufacture and sale of pharmaceutical products. In 1999, Aventis reported revenues of DM 26.2 billion, more than 50 per cent of which were generated in France, Germany, Japan and the United States.

In 1997, Hoechst Marion Roussel (HMR)[22] was reorganized to achieve a uniform structure, and the drug innovation & approval (DI&A) unit was formed. DI&A aims to facilitate the transition from R&D to market admission and entry. It has replaced the R&D department and deals comprehensively with the whole process chain: from target selection to product realization and drug surveillance.

The Aventis group is currently refocusing on the life sciences and gradually withdrawing from the industrial chemicals business. The company planned to complete this in the year 2000 by subdividing its chemicals business and forming joint ventures. One of the objectives of the Aventis group is to use this strategic shift to turn the company into a forerunner in the fields of biotechnology and genetic engineering. Aventis discovers and develops novel therapies based on scientific innovations in these fields, and it hopes to bring those therapies to the global market in the form of brand-name prescription drugs.

Furthermore, a matrix structure has been established within Aventis. While R&D and the production of (key) active ingredients are central functions, marketing and sales are organized nationwide and pharmaceutical production regionally. That way Aventis can utilize knowledge of local markets, keep the costs of production low and avoid import taxes. Although production is decentralized, the company's headquarters maintains close control over its foreign subsidiaries regarding their choice of technology and the development of products and processes.

With Aventis' gradual shift from a volume-driven company to one that focuses on high-value market segments (such as diabetes, rheumatoid arthritis, osteoporosis and preventive medicine), high technical, environmental, health and safety standards have become increasingly important aspects of the corporate philosophy.

[21] Hoechst Marion Roussel (HMR) Ltd. in India is part of Aventis, but so far not all legal prerequisites to change the company's name have been fulfilled. In the following, HMR is used to simplify the distinction between the time before and after Hoechst and Rhone-Poulenc merged to form Aventis.

[22] HMR, the pharmaceutical subsidiary of Hoechst, was established in 1995 as a result of the merger between Hoechst's pharmaceutical division, United States-based Marion Merrell Dow and Roussel Uclaf of Romainville, France.

About Aventis in Ankleshwar (India)

Ankleshwar is one of three Aventis sites in India, the others being Mulund and Verna. The first production facilities were set up at the site in Mulund in the early 1950s, and the operations in Ankleshwar did not start until 1984. Nevertheless, Ankleshwar is the most important site as active ingredients are produced there. The reasons for investing in India were: first, that country's rapidly growing population, which represents a huge – and still growing – market; secondly, low production costs; and thirdly, a large number of qualified chemists.

India is an important production location with global significance. While 80 per cent of total Indian production remains in the country, the remaining 20 per cent is exported into other South East Asian countries, such as Bangladesh and Sri Lanka; the Indian sites supply products for a market of about 1 billion people.

2. Management processes

a. Product and technology strategy

Aventis is a globally active corporation which would face significant risks to its reputation in the event of an accident. In order to minimize this risk, and to meet stringent regulatory requirements, the company operates globally to high internal standards.

It places great emphasis on the use of the best available technologies when developing new active ingredients, including the integration of environmental protection aspects into its production processes. In particular, with respect to bio-technical processes (fermentation, genetics) and chemical synthesis, Aventis uses the latest technologies.

Efficient and fast R&D is a crucial success factor for Aventis. For this reason, the number of research centres was reduced to three (Frankfurt in Germany; Romainville in France; and New Jersey in the United States) during a phase of merging and integration. In 1997, more than DM 2.3 billion, 17 per cent of the total turnover, was invested into DI&A.

Aventis' presence in all important markets and the well-developed regional structure of its subsidiaries are two of its competitive advantages. It focuses on the 15 most important countries, which represent 85 per cent of the global pharmaceutical market. Especially where pharmaceuticals complement its products, Aventis increasingly uses licensing and co-marketing arrangements to derive maximum benefits from its marketing strength.

Although production is decentralized globally, Aventis' headquarters maintains close control over the development of technology and production processes of its Indian affiliate. All major manufacturing processes are implemented only after obtaining technological clearance from headquarters. This has generally resulted in the adoption of better and safer management systems and practices.

In addition, Aventis is in the process of establishing a cooperative network. To date, 10 biotech companies from the United States, one from Canada, and one from Germany link external and internal know-how with the help of modern information technologies.

b. Environmental management

The reputation of a pharmaceutical company, one of the key features used in marketing its products, can be severely impaired by a serious accident. Therefore, Aventis' International Steering Committee for Environment and Risk, which includes 10 experts representing various regions as well as key issues, has set up an internal audit system for EH&S. The EH&S system covers responsibilities, programmes and reporting requirements. The major elements of the environmental management system at Aventis include: EH&S review for new projects, annual audits, community outreach programmes, crisis management, change management, accident reporting, hazard identification and analysis.

Aventis' internal audit system evaluates and aims to improve environmental performance. After pilot audits are carried out, regular audits point out the strengths and weaknesses of each site and following this, the regular audits are carried out every two years. The subsidiaries are also audited regularly with respect to their compliance with the internal guidelines. This does not mean that all facilities worldwide operate to the same advanced technical standards, but the national standards represent the minimum requirement for the technologies used.

A uniform reporting system for all subsidiaries was introduced both to measure the environmental performance and to support the implementation of EH&S objectives. The monitoring reports cover the following aspects: accidents, energy consumption, water consumption, waste water, air emissions, solid waste, capital expenditures and operating costs. This system requires, among others, the immediate reporting of environmentally relevant incidents, quarterly reporting of environmental results to headquarters, and the annual publication of environmental data.

Effective implementation is ensured by vesting in the line managment the final responsibility for EH&S. In order to encourage greater participation of employees at the site, the venue for the safety meetings has gradually been shifted from the central corporate office to the subsidiaries. Initial training is provided internally by the safety departments.

All safety issues are evaluated by safety committees, which then recommend changes in standards or manufacturing processes, if necessary. In addition, the safety committees carry out detailed process analyses to identify potential safety or environmental risks and initiate corrective action and standards if needed. Minor changes are carried out at the local site, whereas major changes are closely supervised by the parent company for adherence to quality, safety and environmental norms.

Aventis introduced an integrated EH&S management system and developed environmental objectives for all business units in 1998. Four sites near Frankfurt were validated against EMAS requirements, and Topkapi (Turkey) and Brindisi (Italy) were certified according to ISO 14001. Aventis encourages all production facilities to develop an integrated EH&S system. It is, however, up to local management to choose between EMAS, ISO 14001 certification or an internal EMS.

At Ankleshwar, an internal EMS was implemented, which not only meets the standards of the host country, but also complies with the demanding internal requirements. Ankleshwar received a good score on the internal audit system. In order to further strengthen its standing and credibility within the company as well as in the local community, the site in Ankleshwar decided to obtain ISO 14001 certification for its EMS.

The Bhopal gas tragedy in 1984 brought about several changes in environmental awareness and environmental management within the chemical industry in India. Hoechst examined its operations in the wake of increased concerns about safety and environmental management in chemical companies. Safety audits of activities in Ankleshwar were started in 1986. HMR's global EH&S guidelines were

reviewed by the management in India and adapted for the Indian operations. In the 1990s, environmental issues were emphasized further due to improved environmental performance at the German headquarters.

The rapid changes in ownership have led to strategic shifts in the environment-related activities of the company. This has resulted in the dominance of the corporate office, which has produced feelings at site level that the global guidelines issued by the parent company stifle local innovations at times.

There have been some initiatives, such as the Responsible Care Programme (RCP), by chemical manufacturers in India to improve environmental performance. Hoechst India, which is a member of the Indian Pharmaceutical Association, was among the first group of companies to join the RCP in February 1994 and it also arranged a meeting for industry representatives from Mumbai at its factory in Mulund. The top management at the time actively supported these initiatives. Aventis' EH&S manager at the Mulund site participates in the safety and environmental management activities of other companies at Ankleshwar. This involves sharing Aventis' experiences in safety and environmental management with other industry representatives.

Aventis India's primary environmental concerns are related to solid waste and waste-water disposal as well as emissions control. Aventis periodically monitors dust, toxic effluents and solvents to control and improve the environmental burden of the plant's discharge. In order to limit process emissions, scrubbers have been installed. The site in Ankleshwar and AgrEvo[23] have joint use of a waste-treatment unit and an incinerator, which are both owned by AgrEvo.

The implementation of a proactive international EMS influences investment decisions as well. When deciding on new investments, the company has integrated (global) environmental issues into the investment analysis process. One such instance related to the company's plan to acquire a Mumbai-based local company in the mid-1990s to increase Hoechst's share in its production facilities in Mumbai. However following an analysis of the target company's production processes, which revealed that the company used carbon tetrachloride as an input in its production process, Hoechst decided against acquiring the local manufacturing facility in view of the negative environmental impacts of the process proposed to be acquired.

The major environmental problems of the industrial estate where the Aventis subsidiary is located are linked to the fact that small units use old technologies, there is a lack of waste segregation, a generally poorly trained workforce, and, in many cases, an ignorant attitude towards the environment.

The priorities of environmental management have changed over the past few decades, from sewage treatment in the 1960s and 1970s, to flue gas desulphurization in the 1980s, and the integration of environmental aspects into the entire production process such as life-cycle assessment in the 1990s. When expanding its activities at Ankleshwar, Aventis India focused on operating with up-to-date EMS, integrated and environmentally sound technologies.

c. Supply-chain management

In order to ensure adherence to high quality and environmental standards, Aventis has specific suppliers for key products and it frequently audits its major supplier. For other products the regulations of the pharmaceutical industry are stringent enough.

[23] AgrEvo India is part of Aventis Agriculture, but so far not all legal prerequisites to change the company's name have been fulfilled.

Many of Aventis' suppliers are themselves large companies with a well-established EMS. As Aventis has little influence on their choice of technology or environmental management practices, it focuses its training efforts on small and medium-sized suppliers, offering courses on environmental aspects as well as concrete help with the implementation of environmental standards. This kind of cooperation has led to an improved understanding of the various needs and requirements along the supply chain.

Sometimes, at the beginning of cooperation with a supplier, an Aventis executive is stationed at the suppliers' manufacturing facilities in order to ensure compliance with quality and environmental standards. Thus a transfer of knowledge along the supply chain takes place due to continuous interaction between the company and its supplier(s).

Although supplier performance has improved in the areas of environmental and quality management, the primary focus of the subsidiaries has been on quality issues. On price-sensitive markets, the smaller suppliers may opt to minimize costs by reducing investments in environmental control.

In some cases, the EH&S manager at the Aventis subsidiary in Ankleshwar has audited the facilities of suppliers. In 1998, for instance, the EH&S manager audited Elsyum Pharma, a small supplier, for noise, illumination, air supply and dust. This audit was done according to Aventis' guidelines relating to several manufacturing processes. Following the audit, the EH&S manager also conducted a short training programme on environmental and safety management for the supplier's employees, including supervisors and senior workers.

Contract manufacturers and suppliers of critical services are required to adhere to EH&S procedures consistent with those established at Aventis. Commensurate with risk, contract manufacturers are initially, and then on a periodic basis, reviewed for EH&S performance. Aventis provides them with appropriate information to foster proper handling and use of chemicals and pharmaceuticals.

d. Staff management

In addition to regular training programmes run by outside experts on aspects of technical safety and environmental management, regular exchange of experiences contributes to increasing environmental awareness among the employees. In recognition of the generally higher skill levels achieved this way and to minimize staff turnover, Aventis pays wages that are 10 to 20 per cent higher than the Indian industry average. The Indian management gains know-how from the TNC's international activities and frequent exchange with the German headquarters.

An external agency conducts medical check-ups of the employees at regular intervals.

3. External conditions for Aventis in India

a. Politics and local authorities

On the Indian market, all companies are subject to the same laws and regulations. However, the degree of enforcement seems to vary with the size of the company, and it seems that local authorities grant certain privileges to SMEs.

In the1990s, the Indian Government increased the monitoring of companies' decisions on formulation and pricing. For example, the Drug Controller of India has the authority to ban the manufacturing and marketing of certain drugs and, indeed, it has already banned some products following recommendations from an Expert Committee and the Drugs Technical Advisory Board. Its decisions

have affected Aventis and several Indian companies (such as Cadilla, Alembic, Ambalal Sarabhai), which were all forced to withdraw drugs which contained banned combinations. Furthermore, the Indian authorities gained credibility when they closed some companies that had not complied with environmental requirements. Both these occurrences led to growing demands by local companies for environmentally sound technologies and management practices (BfAI, 1998b: 14).

India has signed several international environmental agreements but their influence remains weak as they are enforced rather sporadically. This is partly due to an ill-equipped and poorly staffed environmental department that also lacks appropriate equipment and infrastructure. A situation which seems unlikely to change in near future, although environmental problems in India have increased during the last few years. Environmental instruments which are based on economic incentives, such as taxes or certificates, are seldom used (BfAI, 1998b: 13).

b. Customers and customer-relations management

As a supplier of intermediate products, Aventis is not in direct contact with patients – the consumers. As the pharmaceutical market in India is very price-sensitive, Aventis' customers, the companies using ingredients and formulations to produce drugs, are mainly concerned about the price of the intermediate products they purchase.

c. Competitors

The Indian pharmaceutical sector, with current sales estimated to be around DM 5.5 billion, traditionally operated under a regime of strict government control. The prices of over 60 per cent of the drugs and formulations were controlled. Due to increasing liberalization policies adopted during the 1990s, the domestic market for pharmaceutical products has expanded substantially. However, the sector's low barriers of entry have resulted in over-capacity in many product segments.

The market shares of the 10 major players in the pharmaceutical market only add up to about 18 per cent, indicative of the large number of companies in this segment and tough competition. Local companies are also improving operations to match international standards in order to be able to compete globally.

While brand products generally have a fixed price, generic products and formulations are very price-sensitive.

d. NGOs, the neighbourhood and the media

If possible, Aventis locates its sites on industrial estates in order to avoid any friction with local residents. Unfortunately the site in Mulund has been gradually surrounded by residential areas and will therefore be closed in the near future.

Since the Bhopal gas tragedy, environmental awareness has grown slowly but consistently in India. More than 2,000 NGOs are engaged in environmental issues. However, most of them have regional interest and influence. Only a few NGOs have gained nationwide reputations, amongst them WWF-India, which is the only international NGO (BfAI, 1998b: 14).

e. Employees

Aventis trains its employees on how to handle environmental and safety issues properly by increasing their awareness and giving them the appropriate means.

In effect, Aventis employees live in two worlds. On the one hand, the production of pharmaceuticals requires clean production conditions and compliance with stringent environmental regulations and standards; on the other hand, outside the production site the environmental impact of personal activities is not, and possibly cannot reach the same level due to such factors as poor living conditions and infrastructure.

The Indian employees are proud to work for Aventis as they produce export commodities which meet international standards regarding environmental, technical and quality aspects.

f. Banks

The influence of Indian banks on TNCs is not particularly strong and little pressure is put on the companies to improve their environmental performance.

According to two large Indian banks – the Industrial Credit and Investment Corporation of India (ICICI) and the Export-Import Bank of India (EXIM) – financial institutions in general still do not pay adequate attention to potential environmental impacts of their investments. When granting loans the analysis of financial risks is the prime consideration. Issues related to environmental protection and pollution prevention should be enforced and controlled by the relevant government authorities.

IV. Adtranz-DaimlerChrysler Rail Systems GmbH (Adtranz)

Indian Railways push technology transfer with Adtranz

In November 1998, Chittaranjan Locomotive Works (CLW) built the first three-phase state-of-the-art 6,000 horsepower electric freight locomotive in India. This was the result of a complex and unique technology transfer contract between Indian Railways, Adtranz Switzerland, Adtranz India and several Indian companies. The main advantage of the transferred three-phase technology was that when braking, the engine generates electrical energy that is transferred back to the power grid thus reducing energy use by about 20 per cent.

This case study is based on interviews with the responsible managers in Germany and India, the environmental managers at Adtranz, the product manager and the environmental manager in India, local suppliers, representatives of the administration and other stakeholders. The interviews were carried out between December 1998 and July 1999 in cooperation with the Administrative Staff College India (ASCI).

1. About Adtranz

Adtranz was founded on 1 January 1996 as a joint venture between the railway business of Asea Brown Boveri AG (ABB) in Switzerland and Daimler-Benz AG in Germany, now DaimlerChrysler AG. In 1999, DaimlerChrysler took over the shares of ABB. Adtranz is one of the largest companies in the rail industry, with marketing, development and production activities in 60 countries,

representatives in another 40 countries, and 24,000 employees worldwide. In 1998, the Adtranz Group reported revenues of approximately DM 6.6 billion.

At present the original country structure is being replaced by a matrix-like structure. Besides the original country categorization, the corporation is also divided by business segments. Since January 1999, there have been four business segments: Systems & Components, Mass Transit, Main Line, and Marketing & Service. Within the broad framework of the business segments, 15 production units constitute the backbone of the Adtranz organization. The Adtranz portfolio includes light rail vehicles and metro trains; regional, intercity and high speed trains; electric and diesel locomotives; and major activities in freight, signalling, fixed installations, customer support and total rail systems. The production units work internationally and are responsible for the global business performance, which includes the development, sales and production of their respective products and systems as well as for the management of the product portfolio. The customers thus have one competent and responsible contact point for all questions concerning their product.

The National Transportation Companies (NTC) represent Adtranz products and services in local markets according to the principle of "one face to the customer". Apart from functional company responsibilities, the NTCs are primarily involved in national sales activities.

Structural change remains the principal challenge for the railway industry and, during this period of transition, communication between operators and manufacturers is of major importance. Adtranz acknowledges the railway operators as valuable partners who can contribute to increasing the railway's market share.

Adtranz in Baroda (India)

Although India has a relatively small turnover within the Adtranz group, it nevertheless has ambitious goals for the Indian market in the near future. The revenues of Adtranz India have grown at about 15 per cent per annum over the past few years.

The new site in Baroda was built in 1996 and is wholly owned by Adtranz. The total investment was less than DM 100 million. The subsidiary is managed by former ABB managers. Although the site is new, the business has a long history in India dating back to 1963. At present, there is only an assembly operation in Baroda, with about 100 employees working there. Whether operations will be expanded to include manufacturing and eventually spray painting has not yet been decided.

2. Management processes

a. Technology management, products and services

As a long-term strategy, Adtranz is changing from a key-component supplier to a system supplier and full-service provider. This goes along with a trend towards both privatization among railway operators and the outsourcing of the manufacturing of non-key components. The production units have combined the centres of expertise and system lead centres which had worldwide responsibilities for technical development and standards for components and modules.

Balancing this worldwide standardization of processes and products, Adtranz has a very focused and highly adaptive approach in the countries in which it operates. It has generally adopted a collaborative approach with the local suppliers, customers and partners in understanding specific business

circumstances, opportunities and problems and developing solutions to them. The products are adapted to the individual customer's needs and after-sales service is given high priority.

This has not always been the case; it was only recently that Adtranz changed its market strategy. Instead of retaining a set of core technologies or key components, it is now willing to share its technology with the host country in return for manufacturing orders. The previous method of technology transfer in this sector was to buy technology and pay royalties, particularly for technology transfer to developing countries or newly industrializing countries such as India that had not yet developed their own technology.

The customer services division of the company provides services in the areas of refurbishing, maintenance, spare-parts management, re-engineering and the upgrading of workshops. Adtranz organizes training on maintenance for its own staff which is also open to its customer's personnel. These joint training courses foster both contact with the customer and the longevity of the products.

b. Environmental management

Adtranz has developed an International Environmental and Risk Managing System with clear international responsibilities and rules. It is based on the experiences of ABB and Daimler Benz. The main elements of this system are: a central EHS Group Manager, an international Environmental and Risk Management Council, an international process of programme definition, international standards, internal flow of information and internal reporting and controlling. The international standards of Adtranz are often higher than local standards. The company published the first of its annual environmental reports in 1997 and in 1999, the report was renamed *Environment, Health and Safety Risk Management Report*. The EHS report covers the most important impacts of all the company's sites worldwide, including data on energy consumption, water consumption, solvents and cleaning agents, and waste over a two-year period so as to document the continuous process of improvement. At the end of 1998 the EHS management systems in Hennigsdorf and Berlin (both in Germany) were granted the first certificates of the Safety Checklist Contractors (SCC) standard in addition to ISO 14001 certification and EMAS validation.

In general, Adtranz sets environmental and occupational health and safety targets and objectives at site level in conjunction with the site-specific continuous improvement process. However, the following five group-wide objectives were set for 1998: (i) conclude worldwide EMS implementation, including certification by external bodies; (ii) apply design for environment (DFE) and life-cycle assessment (LCA); (iii) involve suppliers and customers more closely in the EMS; (iv) finalize the education and training programme for employees; and (v) integrate health and safety management in the environmental management system and processes.

As the employees are not only Adtranz's key resource but also the main driving force to implement environmental objectives in their daily work, Adtranz attaches importance to training its workforce. So far, 70 per cent of the 24,000 employees worldwide have undergone EHS training. The following are the main environmental impacts of railway transportation and rail vehicles, which are generally considered to be environmentally benign: consumption of non-renewable resources and energy, fuel consumption, noise, waste generation (during manufacture, use, maintenance and repair) and land use. Adtranz focuses on improving energy use and noise reduction. There are two levels at which environmental impact can be reduced: products and production.

Products. The focus is on a life-cycle approach to the environmental performance of products, including the supply chain and the operation phase of the vehicles. As each product unit also has its own environmental expert, environmental aspects and impacts are considered from the very beginning.

The life expectancy of a locomotive is about 30 years. Therefore energy consumption over this life span is a relevant environmental performance indicator of Adtranz products. One of Adtranz's predecessors has, for example, developed a revolutionary technology (three-phase technology) which reduces energy use by 20 per cent. Other relevant environmental impacts are noise, diesel-emissions and and those caused during maintenance and repair. Adtranz products are built in a modular way in order to be able to replace and renew only parts and components instead of the whole system. Some Adtranz customers have environmental requirements, such as ISO 14001 certification, or requirements concerning materials used, energy consumption, noise and emissions as well as LCA and life-cycle costing (LCC).

Production. Today the activities of most Adtranz sites are limited to assembling, while other processes are outsourced. The most relevant environmental impacts of manufacturing processes are probably those of the paint shops which Adtranz still runs. Here, consideration of quality has to be weighed against environmental protection because water-based paints are less durable in the long term but more environmentally friendly. For the handling of waste, the European standard is implemented worldwide: 33 of the 37 subsidiaries worldwide, have obtained ISO 14001 certification and all German sites also participate in EMAS. The sites in Hungary and Poland are in the process of certification, whereas the sites in Australia have undergone drastic restructuring, including changes in the management, which led to a delay in the certification process.

The site in Baroda in India was built in January 1996 next to an old ABB factory. At an early stage, it was decided to work according to best practice in environmental affairs. Therefore a well-respected senior manager, who was also responsible for quality management, was made responsible for establishing environmental management at the new site. The environmental management system is partly integrated with quality management and health & safety management. There are several environmental programmes in practice, with detailed action plans that are carried out by responsible action teams. The main programmes are concerned with reducing energy, water and paper consumption. Detailed documentation of these programmes allows progress to be monitored closely.

Another programme concerns inculcating environmental awareness in all employees, contractors and suppliers. Due to the general lack of environmental knowledge and safety awareness among those starting jobs in India, Adtranz trains its employees on how to handle environmental and safety issues properly.

Indians are proud to work at Adtranz because they produce high-technology commodities which satisfy international standards.

The environmental impacts at the Baroda site are relatively limited. The main environmental problems relate to waste disposal, control of emissions from cleaning agents, use of energy and packaging materials and sanitary effluents. However, metal waste (in the form of swarf and scrap generated during drilling, manufacturing of products and process rejections) is collected, segregated, stored and periodically sold. TriChloroEthylene (TCE) is used for cleaning purposes and this can have significant detrimental effects on health. Inadequate disposal of TCE and its spillage could lead to air pollution, and in particular to soil and groundwater contamination. Therefore the company takes particular care of its safe disposal.

If Adtranz decided to expand its activities at the site, to include, for example, manufacturing and spray-painting, environmental issues would become much more of a concern. Spray-painting is of particular environmental concern due to solvent emissions, and alternatives do not yet meet customers' expectations concerning use and longevity.

The site in Baroda was one of the first foreign subsidiaries to attain ISO 14001 certification in 1998. In April 1997, a management representative was nominated and 16 months later, Adtranz India received certification from a well-known international certification body. By this time, more than 600 man hours had been invested into training the employees and contractors at the site. This training programme is ongoing.

In general it can be said, that the controls imposed by the environmental authorities are not very stringent. This is because, first of all railway systems as a product have little direct environmental impact; and secondly, at present, this Indian site only assembles electrical systems.

c. Supply-chain management

As *Adtranz India* is a systems integrator and key-component manufacturer, the production of various components is subcontracted to several suppliers. Both main products – tap changers and circuit breakers – are essentially complex assemblies which are critical for conventional locomotives. Tap changers are assembled from more than 1,000 components, while breakers are assembled from nearly 350 components. For most of these components manufacturing is outsourced, with Adtranz focusing on the manufacturing of key components only.

However, environmental issues arising from suppliers' activities, such as electroplating, can be significant and crucial if the overall environmental impact of Adtranz products and services is considered as a whole. Among the environmentally friendly measures implemented by Adtranz is its imposition of several restrictions on the disposal of scrap and waste and packing materials used. All suppliers have been instructed to use wooden packaging material instead of thermocol and plastic bags.

As a part of its strategy to strengthen the supplier base, Adtranz provides the suppliers with training on demand. It also proposes to audit suppliers' facilities and identify potential quality and environmental problems. Adtranz managers then assist in taking necessary corrective or preventive measures. In addition, a supplier-evaluation form is used to measure various technical and environmental aspects of performance. The company is also willing to share its experiences and to conduct seminars at each supplier's site.

Adtranz has attempted to raise interest in certification among its suppliers by promising to certify those who do not have the resources for a regular third-party certification. So far not all the suppliers have responded to the company's efforts to maintain high environmental and quality standards. Some suppliers, particularly SMEs, are reluctant to adopt new systems where costs are an important concern for the continuation of operations. Furthermore, some of them feel that Adtranz is not yet taking environmental issues seriously and they do not perceive any significant advantages to be gained from ISO 14001 certification.

In early 1999, the company organized a workshop with its main suppliers on quality and environmental management systems in general and concrete measures of waste reduction in particular. This kind of cooperation led to a mutual understanding of respective needs and requirements along the supply chain. In addition, a series of environmental strategy workshops was held with support from DaimlerChrysler research, with several well-known experts from the environmental, rail and traffic community sharing their views on present and future developments.

Adtranz's clear environmental policy has had a strong impact on the supply chain, especially since it began to evaluate its suppliers and customers on both their environmental policy and manageme (for example, whether they voluntarily seek ISO 14001 certification). In 1997, the evaluation of the supply

chain was initiated in Germany and it is also planned to be undertaken in other countries. Adtranz performs regular evaluations of relevant suppliers with respect to their environmental management. Their EMS implementation is investigated using a questionnaire developed by a German industry association. Suppliers demonstrating inadequate EMS implementation are requested to improve, whereas those with either ISO 14001certification or EMAS validation are not subject to further inquiries.

The strong environmental policy of Adtranz contributes to its credibility and can serve as a model. A manager of Lakshmi Engineering Works (Coimbatore), for instance, noted that the close interaction with Adtranz was the main reason to strive for both ISO 9000 and ISO 14001 certification.

Evaluation of environmental management is one of the main criteria when selecting suppliers for Adtranz's "Supplier of the Year Award". In 1998, the awarded supplier had already received validation according to EMAS for some of its sites while other sites were in the process of receiving it.

d. Staff management

Adtranz is committed to continuous improvement of its environmental performance through pollution prevention and compliance with all relevant laws and legislative requirements. In order to achieve this goal all employees are trained and motivated to carry out their tasks in an environmentally responsible manner.

The Indian (environmental) management gains know-how from frequent exchanges with staff at the German headquarters.

Adtranz has sought to optimize its production processes through various means such as intensive employee training relating to quality and environmental issues to increase productivity and environmental awareness, increasing worker flexibility through job rotation, and emphasizing teamwork at all levels.

3. External conditions for Adtranz in India

a. Customers and customer-relations management

The market for rail systems in India has expanded rapidly over the past decade. Indian Railways (IR), the only customer, is a State-run enterprise which acts as a systems integrator and operates the entire rail transportation system in the country. The main direct customer is CLW through IR.

Adtranz tried to enter the Indian market with a new, three-phase technology, for a new railway locomotive through licensing from Adtranz Switzerland, but there was no supply base for this technology in India. Therefore Adtranz was willing to transfer the latest technology to India, including to other Indian competitors, on the condition that Adrantz would be given manufacturing orders at the same time.

b. Competitors

It is in IR's interest to strengthen the national supplier base for railway technology and to increase competition between TNCs. Indian managers and bureaucrats regard transferred technologies as being either inferior, old or at an experimental stage.

In line with their strategy of minimizing risk and reducing their dependence on a single TNC, Indian Railways have recently introduced new competitors, such as the Hungarian company Ganz, into the Indian tap-changer market, which had previously been dominated by ABB/Adtranz. The major segments for technology transfer are electromechanical parts (supplied by ALSTOM), Diesel locomotives (jointly supplied by Siemens and General Motors) and electric locomotives (supplied by Adtranz).

In order to avoid becoming dependent on Adtranz and its new technology, IR made use of its monopolistic demand position and negotiated a unique and unconventional technology transfer with Adtranz. IR bought the new technology and licensed Indian companies to produce this technology or components for it, thereby creating a supply oligopoly. One of these Indian companies is Adtranz India. This was a unique and complex arrangement. It was unique as it was an unconventional way to transfer technology and would result in several segments of Adtranz' technology getting into the hands of its local competitors, such as Bharat Heavy Electrical Limited (BHEL), Crompton Greaves, Kirloskar and others. It was complex because over 50 different organizations would be involved in the technology-transfer process with CLW acting as an intermediary overall systems integrator. Furthermore, to prevent any unfair cost advantages accruing to the company, Adtranz India was also required to repurchase the technology from IR. This kind of transfer increases the dissemination of technology to the host country and also to host companies, enabling a diffusion of technology right from the start.

The process of negotiations began in 1984, and in 1993 orders were placed with Adtranz; in 1995, the technology transfer began and by mid-1997 IR sought local tendering. In 1998, Adtranz India secured orders and in November of the same year, CLW built the first three-phase, state-of-the-art, 6,000 horsepower electric freight locomotive in India.

c. NGOs, the media and the neighbourhood

Adtranz has recognized the need to be identified as a local Indian company and has made a conscious effort to maintain that identity. It built a modern medical center for its employees and their families and thereby obtained broader public acceptance.

As Adtranz focuses on the production of a limited number of critical components, local suppliers are able to manufacture the other components, thus promoting linkages with the local economy.

Adtranz India attracted considerable publicity through the unconventional planting of about 1,300 trees on its site in order to keep the local ecosystem in balance. In addition, 1,000 trees were to be planted on the site by the year 2000.

d. Banks

The Asian Development Bank had made its credit for Adtranz conditional on requirements for technology transfer to India.

As for Indian financial institutions, generally they do not closely monitor the environmental performance of the companies to which they grant credits. In consequence, environmental issues did not figure significantly in the granting of loans by India's financial institutions to Adtranz's suppliers.

V. Burgmann Dichtungswerke GmbH & Co. KG (Burgmann)

High quality ensures environmental protection and technology transfer

Burgmann, one of the leading manufacturers of sealing technologies worldwide, has implemented high quality standards in Germany and the host countries. The company also expects its suppliers to implement these standards because the quality of sealants depends also on the quality of the supplied goods. High quality sealants contribute not only directly to environmental protection but also to lower energy and resource consumption. This case study reveals that the company's advanced technology in manufacturing mechanical sealants has contributed to the diffusion of environmentally sound technology.

This is a cross-country case study of Burgmann's investments in China, India and Malaysia. The study focuses on analysing critical factors for successful technology transfer. It is based on interviews with responsible managers in Germany, the management and employees in China, India and Malaysia, local suppliers, representatives of the local authorities, and other stakeholders. The interviews were carried out between December 1998 and May 2000 in cooperation with the Centre for Environmentally Sound Technology Transfer (CESTT) in China, the Centre for Environmental Technologies (CETEC) in Malaysia and the Indo-German Chamber of Commerce (IGCC) in India.

1. About Burgmann

Founded in 1884, Burgmann Dichtungswerke GmbH & Co. KG (Burgmann) manufactures a wide range of products such as standard mechanical seals, special designed mechanical seals, gas-lubricated seals, agitator seals, seal supply systems, magnetic couplings, packaging materials, static seals, automotive seals, expansion seals and rotary kiln sealing systems.

The company has undergone enormous changes over the past few decades. In 1998, it reported revenues of about DM 411 million. In the late 1970s it established its first subsidiaries in Brazil, France, Switzerland and the United States, and in the late 1980s expanded its international presence with several additional subsidiaries. Output from operations abroad accounts for 60 per cent of the group's total output and this share is steadily increasing. Burgmann today has 2,700 employees, 18 sales offices in Germany, more than 40 subsidiaries, joint ventures and associated companies worldwide, and agencies in more than 70 countries.

Burgmann's businesses in China, India and Malaysia

Malaysia

Burgmann Malaysia Sdn Bhd is a Malaysian-German joint venture between Antah Holdings (40 per cent ownership) and Burgmann Dichtungswerke GMBH & Co. KG (60 per cent ownership). The company has been operating in Malaysia since 1992. However, Burgmann has had agents in Malaysia to market its sealants since the 1980s.

Burgmann Malaysia manufactures mechanical sealants, static sealants, packaging matterials and expansion joints. The company's manufacturing site is located in Subang Jaya and there are four sales offices, in the east coast, Johor Bahru, Kuching and Penang.

The total number of sealants manufactured annually is about 3,000. Nearly all the products are manufactured for the Malaysian market and only about 1 per cent is exported to the neighbouring countries. The company has 58 employees that are equally distributed among the sales, production and administrative departments.

In addition, Burgmann has three other joint ventures in Malaysia: Eurocam Technology Sdn. Bhd., Jaya-Kuala Lumpur (70 per cent), Burgmann Manufacturing Sdn. Bhd., Kuala Lumpur (60 per cent) and Burgmann Sealing Teknologi Sdn. Bhd. Kuala Lumpur (18 per cent).

India

Burgmann India Pvt. Ltd. was founded in 1993 as an Indo-German joint venture between A.K. Engineering of the Balwa Group (that owns 49 per cent) and Burgmann Dichtungswerke GmbH & Co. KG (that owns 51 per cent). The Indian partner provides the entire management for the joint venture. However, main strategic decisions are subject to approval by the German headquarters.

Total investment has amounted to DM 2.5 million. To date, Burgmann India has about 200 employees working in the sales, production and administrative departments. The manufacturing unit is at Goregaon, Mumbai. The sales and service networks are spread over India in 15 centres: Bangalore, Baroda, Calcutta, Chandigarh, Chennai, Cochin, New Delhi, Hyderabad, Kota, Mangalore, Panvel, Pune, Surat, Tarapur and Vishakapatnam.

Over 100 Indian companies had expressed interest when Burgmann was searching for a joint-venture partner to enter the Indian market. Based on the responses to a questionnaire that was sent to several Indian companies, five companies were evaluated in more detail and finally A.K. Engineering of the Balwa Group was selected. It had five years' experience in mechanical sealant manufacturing for the Indian market. The manufacturing site located in Mumbai covers an area of about 2,000 square meters and has 53 employees.

Factors of paramount importance in the choice of the manufacturing site for the joint venture were market volume, market proximity and market access, not only to India but also to the neighbouring countries of Afghanistan, Bangladesh, Burma, Nepal, Pakistan and Sri Lanka. Other factors such as capital cost, level of infrastructure, transportation and logistics, particularly proximity to the international port/airport, proximity to vendors/raw material, availability of skilled labour and legal certainty were also considered very important. Since Mumbai seemed to fulfil most of these criteria it was chosen as the ideal location. Level of training, labour costs, political stability, environmental regulations and standards and availability of natural resources were all considered to be of medium importance.

Burgmann has two other joint ventures in India: Keld Ellentoft India Pvt. Ltd., Chennai (40 per cent) and KE-Burgmann Fiber India Pvt. Ltd., Kharagpur (22 per cent).

China

Burgmann's first joint venture in China was established in Shanghai Municipality in 1995, the second in Dalian City, Liaoning Province in 1997 and the third in Cixi City, Zhejiang Pprovince. These three joint ventures are intended to further open up the South-East Asian market and supply it with locally manufactured products on a cost-effective basis. Burgmann continues to see Asia as one of the fastest growing markets of the future.

The main reasons for creating three joint ventures in China within the last four years are China's huge market, legal certainty and political stability. All three manufacturing sites are located in the coastal regions in order to ensure good transportation infrastructure.

Burgmann Shanghai Ltd. was established in 1995 as a joint venture between Burgmann Dichtungswerke GmbH & Co. KG and the Mechanical Seal Factory of Shanghai Pump Works in which had over 30 years of experience in the production of mechanical seals. Burgmann holds 51 per cent of the shares and the Shanghai Pump Works the remaining 49 per cent.

At present, Burgmann Shanghai Ltd. has 101 employees, and is run by Chinese staff only. It is a very lean company with a simplified management structure. In 1999, it had sales of about DM 4.9 million, which has grown since then by an average of 45 per cent. According to the statistics of the Economic Information Centre of the State Bureau of Machinery Industry, Burgmann Shanghai Ltd. was ranked 453rd among China's top 500 companies in 1998.

Burgmann has two other joint ventures in China. Burgmann Dalian Ltd. was formed in 1997 with the Dalian Acid-Proof Pump Plant, involving an investment of DM 13 million. Burgmann holds a 51 per cent share and the Dalian Acid-Proof Pump Plant holds the remaining 49 per cent. In May 1999, Burgmann Sealing Material Co. Ltd., sited in Cixi City, was established as a joint venture with the Cixi Sealing Factory. Burgmann Dichtungswerke GmbH & Co. KG holds two thirds of the shares and Cixi Sealing Factory the remaining third. Total investment amounted to DM 2 million.

2. Management processes

a. Product and technology strategy

The company's main product, seals, help to reduce leakage of from a pump. Pumps are used in almost all industrial processes where the medium, in any form, whether liquid or gas (e.g. water, oil, chemicals, beverages or effluents) is moved from one space to another. The company's products find application in virtually all lines of industry such as power stations, chemical plants, refineries, shipbuilding, marine engineering, aerospace, offshore installations, automotive engineering, paper making and sugar production.

Burgmann is the world leader in fabric expansion joints, and among the leading suppliers of its other products. Its strong market position is the result of intensive R&D, consolidation and maintenance of the quality assurance procedures through customer orientation and progressive internalization.

The company was one of the first seal manufacturers in Europe to develop an independent quality assurance system, which is recognized by numerous international organizations and has played an important role in Burgmann's success. Quality audits conducted by certification bodies verify that Burgmann's quality systems comply with the requirements of international standards. In 1990, as a leading manufacturer of mechanical sealants, Burgmann obtained ISO 9001 certification. The company is also certified by the United States Quality Management Standard QS9000 as subcontractor for the automotive industry. In addition, Burgmann received the German "RAL" quality mark for its expansion joints.

Burgmann provides state-of-the-art machinery, such as computer numerical control (CNC) lathes, CNC lathe milling machines, CNC rotary tables, CNC lathe machines, centre lathes with numerical control, digital readouts, centre lathes, drilling machines, grinders and lapping machines, to manufacture high precision products to meet the requirements of its customers.

The parent company in Germany undertakes the R&D because its testing facilities comply with the highest general standards as well as with the standards of the American Petroleum Institute (API). It adopts an integrated approach to problem solving, with R&D focusing on sealant face materials and new product designs that enhance the product life of the sealants.

In all three countries, Burgmann has already begun designing at the local level for some of the orders submitted by the customers, though most of the standard high-precision components are designed and manufactured in Germany. Furthermore, this local designing has constant support and guidance from the German headquarters, especially via online IT services.

Malaysia

Burgmann Malaysia supplies original Burgmann seals, modification and fabrication of Burgmann seals and seals of other manufacturers. The production methods do not comply with the highest technology standards, but the company's high precision machines are more advanced than those of the local manufacturing companies. The company has plans to bring in new production technology such as computer numerical control and rapid prototype manufacturing, and is aiming for eventual ISO 9001 certification. Some design modifications are undertaken with the help of the headquarters in Germany. For this purpose some of the seals produced in Malaysia are sent to Germany for testing.

All seals used in Malaysia are made abroad as there is no local manufacturer. Seal production is considered a high-tech industry and the materials needed are not available locally. The seals are components of pumps and all pumps used in Malaysia are also made abroad. Thus any seals to be replaced are foreign made in order to ensure the secure functioning of the pumps.

Generally, hydraulic pumps use single seals. However, this kind of seal means possible leakage. Burgmann is able to produce better quality seals or provide three-piece seals for a more effective prevention of leakage. But as long as the Department of Envrionment (DOE) does not impose higher standards on effluent discharge, the industry will continue to use single seals or low quality seals.

India

Burgmann India is one of the major players in the field of sealing technology. The company produces mechanical seals, seal supply systems and components. Burgmann seals are employed in various sectors of the Indian industry such as petrochemicals, refineries, fertilizers, energy, marine, nuclear power plants and original equipment manufacturing.

Standardization, qualified staff, and the meeting of productivity and customer requirements were considered to be extremely important when deciding on processes and technologies applied in the host country. The production methods used at the Indian sites are the same as those used by the parent company in Germany, and they comply with the highest standards of technology, involving CNC machines, digital readouts fixed in all the machines, timers for lapping machines and ultrasonic cleaning, among others.

In 1997 Burgmann India obtained ISO 9001 certification, and has also achieved the rare distinction of manufacturing certain products in accordance with the specifications of the API. This accomplishment is the result of expertise and technology transfer from the parent company.

The components made of steel are produced in India while most of the smaller components, especially those of high precision, are imported from Germany or abroad. Some other materials such as springs are supplied locally.

China

In 1997, Burgmann Shanghai Ltd. received ISO 9001 certification by the German TÜV Co. To date, the two other joint ventures have obtained the ISO 9001 certificate from German certification bodies as well. Meanwhile, the company was selected to become a supplier to the Guangdong Nuclear Power Station of mechanical sealing services. The products of Burgmann Shanghai Ltd. are already widely employed in nuclear power stations, petrochemicals, oil refineries, marine industries and thermal power stations.

b. Environmental management

Although Burgmann does not subscribe to any international environmental guidelines, it has a worldwide standardized environmental policy. This policy includes an internationally coordinated process of defining environmental targets, and standards applied throughout the company's operations worldwide concerning both technology and health and safety. The environmental policy of the parent company is clearly defined.

Burgmann was the first manufacturer of sealing systems to be EMAS validated: in 1996, for the production facilities at Wolfratshausen and Eurasburg (both Germany), and in 1997, for its facilities in Judenburg (Austria). In 1999, when being re-audited, both German sites obtained ISO 14001 certification as well.

Seals are environmentally friendly products because they prevent unnecessary spillage or loss of liquids and gases, thus preventing pollution and at the same time reducing the use of resources and materials.

Malaysia

Burgmann Malaysia follows the same environmental objectives as its parent company. The company stresses the avoidance of polluting emissions and effluents and the conservation of resources by carrying out environmentally friendly production processes and by ensuring that its sealants are of high quality and meet customer's high environmental requirements.

However, the company has not implemented an EMS and does not comply with the high environmental standards of the home country because its operations are different in Malaysia. They involve mostly "dry processes" where seals are designed and assembled. There are no air polluting emissions or any major effluents. Furthermore, noise emissions are kept at a minimum. The main environmental effects that are relevant to the activities of the company include office waste, steel remnants and cooling liquids. The remnants of the steel are sold to scrap metal recyclers and other waste is collected by CITAMAS Sdn. Bhd., a private waste collector. The company is therefore not subject to any regulations of the Environmental Quality Act of 1974. There have been no safety or environmental problems since 1992.

Responsibility for environmental management lies with the top management. In order to reduce negative effects and impacts on the environment, staff training is conducted as well.

India

Burgmann India contacted the Indian Government and the local environmental authorities to discuss the relevant environmental legislation or environmental standards to be complied with. The local environmental authorities offered information about the local environmental conditions and the

relevant regulations. Hence environmental regulations and standards are still taken seriously, and not just when the site selection was made.

The Indian subsidiary does not ensure compliance with the high environmental standards of the parent company in Germany, for the same reasons as Burgmann Malaysia does not: this company's production process is also a "dry process". It is basically a process with neither electroplating nor major effluents and there are no major air emissions to be controlled.

The main environmental effects that are relevant to the operations of the company include office waste, steel remnants and cooling liquids. The remnants of the steel are sold to scrap metal recycling plants and other waste is collected by the municipal waste collectors. There is only a small amount of cooling liquid (Super H4) used for the machining process. There have been no safety or environmental problems since the beginning of the joint venture in 1993.

China

Burgmann Shanghai Ltd. applies Chinese environmental and safety standards. The company implemented a health & safety management system, accident preparedness plan, and safety training to prevent potential risks. It has appointed staff for environmental and safety tasks but has not established an EMS. The company is not seeking ISO 14001 certification.

Environmental impacts and effects related to the manufacturing of mechanical seals are not substantial. The primary wastes are metal remains, cooling liquid waste and office waste. So far, the company has not violated any of the Chinese environmental standards.

Like all Chinese enterprises, Burgmann Shanghai Ltd. is only required to submit an annual environmental statistical report to the local EPB. In general, this environmental information is seldom released to the general public. Therefore, there is no common channel for disseminating information on a company's environmental performance to those interested.

So far, Burgmann Shanghai Ltd. has neither released any information about its environmental performance nor advertised the environmental potential of its mechanical seals in improving the energy efficiency of the equipment in which they are used.

c. Supply-chain management

Burgmann was the first manufacturer of sealing technologies that sought ISO 9001 and ISO 14001 certification. To date, the company expects its suppliers to implement the same high quality standards required by ISO 9001.

The company offers training programmes to its suppliers in order to ensure their compliance with the same high quality requirements set for Burgmann seals.

Malaysia

The company trains its suppliers on quality but not on environmental aspects of their operations. It does not work closely with the suppliers on environmental issues concerning production processes and products.

There are no significant suppliers for Burgmann in Malaysia; most of Burgmann's supplies come from Germany and only simple components for the seals are supplied locally.

India

Since the new management took over, there has been a dialogue between the suppliers and the company and also informal training to the suppliers on quality, risks due to substandard product supplies and other environmental aspects of the companies' operations. The simple components that are supplied locally undergo an additional quality check at Burgmann before they are used for manufacturing. To date, the company works closely with its suppliers, and increased competition amongst suppliers has increased their willingness to cooperate on environmental issues.

Burgmann India insists on its suppliers implementating quality management standards such as those of ISO 9001. The company mainly provides training on the effective maintenance and operation of the seals to its customers, while their suppliers receive regular training on the functioning of the components that they purchase. Such interaction with both suppliers and customers on various aspects of the products clearly shows the spillover effects of FDI on local companies.

China

Chinese suppliers are contributing to nearly 90 per cent of Burgmann's raw materials and parts. The remaining 10 per cent are supplied by international companies. Burgmann Shanghai Ltd. imposes quality requirements on its local suppliers, whereas the environmental performance of its local partners is still not subject to any requirements. Burgmann's staff audits the local suppliers according to an inspection/audit plan in order to ensure the quality of the products supplied. The major factors in the choice of suppliers are high quality of the products according to Burgmann's requirements and rice competitiveness.

In general, there is no dialogue concerning environmental standards and technology between Burgmann Shanghai Ltd. and its suppliers. Chinese SMEs have not benefited in the field of environmental management from Burgmann Shanghai Ltd. but they have benefited in the field of environmental technology and quality management.

d. Staff management

Burgmann provides a broad programme of training and further education in order to meet the constantly rising requirements for qualified and well trained personnel. The training includes quality issues in order to meet the company's own high requirements under ISO 9001 but environmental issues are also covered. Within the last few years, environmental management has gained importance as evidenced by the company's ISO 14001 certification and EMAS validation.

Malaysia

Staff training is provided on the use of products and on technical aspects in the assembly and design of the products. Burgmann also offers some training in trouble shooting with regard to servicing the pumps. Most of the training is done locally, but for the top managers, in particular, training in Germany is provided.

The company does face a shortage of local expertise in designing. The company currently employs one foreign expert from Burgmann's headquarters, who also provides training. In addition, some employees in the marketing department are sent to Germany to learn more about the seal products and to improve their knowledge of the environmental performance of the seals.

Local management is responsible for conducting staff training with a view to reducing negative effects on the environment. This training stresses issues of safety, waste reduction and waste sorting.

India

For the first three years after establishing Burgmann India Pvt. Ltd., technical experts were flown from Germany to India as part of the technology and know-how transfer. The experts trained the staff on the equipment, the technical aspects of assembly, machine shop, lapping, product design, marketing and application of the products. Some training on trouble shooting in servicing the pumps was also provided. Today their continuous presence in India is hardly required but they visit twice a year to provide training on the latest technology from the German headquarters.

Relevant training to responsible employees from sales, design, quality, planning and production is offered regularly in Germany. It lasts for 2–3 weeks, and, in some cases, 2–3 months. Staff training includes among other aspects safety, waste reduction and waste sorting.

The top management in India is directly involved in corporate environmental protection policy in order to communicate any new developments concerning production technology to the Indian subsidiary. With the assistance of engineers, training programmes are conducted at regular intervals with the aim of reducing any negative effects on the environment. Continuous interaction between the various departments enables better coordination amongst the employees. Furthermore, the employees are informed about the environmental impacts and possible environmental risks to the customers that may be caused through the seals.

The company particularly stresses waste reduction and the maintaining of cleaner working conditions at the production sites. Quality consciousness and the education level of the skilled labour force have been enhanced through appropriate training and proper management practices at Burgmann India.

China

Staff management is regarded as vital to improving technological capacity and competitiveness. Thus, a comprehensive training programme for all employees of Burgmann Shanghai Ltd. has been developed.

Key managers in technological, engineering, quality and sales receive training on the latest developments in their respective areas. For instance, the quality manager has been closely following the development of ISO 9000 series (year 2000 version) and aims to incoporate the relevant standards as soon as the amended ones are passed.

The training of newly recruited workers includes technical skills, safety and environmental protection. The company also offers specially designed training to recently appointed technical staff.

Middle management receives training at the Burgmann headquarters in Germany. This training includes information about the environmental policy at headquarters. At present the overseas training is focused on the sales and engineering staff.

3. External conditions for Burgmann in China, India and Malaysia

a. Politics and the local authorities

Malaysia

In 1989, the Malaysian Industrial Development Authority (MIDA) approved Burgmann's investment project. The company was offered pioneer status and an investment tax allowance. As a standard practice, MIDA had advised the company to contact DOE to ascertain whether it would require environmental approval to set up the project in Malaysia. The DOE is the government agency responsible for managing and controlling environmental issues and has prepared a set of guidelines regarding environmental requirements for investors.

DOE had indicated that Burgmann was not subject to the Environmental Impact Assessment requirement during the initiation of the investment project because it does not engage in the activities for which Environmental Impact Assessment is required. The DOE had also not visited the Burgmann operation because its operation has little environmental impact. There is no significant effluent or emissions in the operation. As such there is no communication between DOE and Burgmann. The companies' activities does not appear to come under the purview of the environmental regulations of Environmental Quality Act 1974 like standards for effluent discharge and emission to the air.

India

Burgmann had to pass through a standard procedure for FDI in India for which the Reserve Bank of India provides information materials and guidelines. This information includes the economic and political situation, laws and standards which need to be complied with. Once the Secretariat for Industrial Assistance and the Reserve Bank of India were satisfied that Burgmann fulfilled all the relevant conditions, they approved its investment project at the end of 1993.

In addition, Burgmann was informed about corporate tax and other matters concerning funding schemes and investments. The Government offered no concessions to the company, since all FDI is subject to the same governmental procedures and requirements. The company was also advised to approach the Ministry of Environment & Forests and the State Pollution Control Board, in order to ascertain whether environmental approval was required to set up the project in India.

According to the policy regulations of the Export-Import Bank of India (EXIM), some of the manufactured products have to be exported in order to be eligible for concessions for the import of raw materials and semi-finished goods. Therefore, the business objective of Burgmann India was not only to have sales and services of Burgmann products in India, but also to manufacture products that were at the forefront of sealing technology for pumps, valves, agitators, compressors and other applications around the world. Today the company in India exports 15 per cent of the products manufactured there.

China

China has been adopting a variety of preferential policies to attract FDI since the beginning of the 1980s. Burgmann Shanghai Ltd. has benefited from the most important incentive: the preferential taxation policy. The company was exempted from income tax for two years and benefited from a 50 per cent rebate on income tax for the following three years.

In China, the same environmental regulations and standards apply to all companies, foreign and Chinese. The environmental authority in Shanghai has simplified access to information on environmental regulations by providing it on the Internet: Shanghai Environment Online is a good example of an environmental website. In order to become a "model district" in environmental protection, the local government is working hard to improve environmental quality and to raise the environmental performance of industry located in the district. The local authorities are generally satisfied with the environmental performance of Burgmann Shanghai Ltd.

b. Customers and customer-relations management

Burgmann is aware of the importance of customer service and offers a comprehensive service package which includes offering of environmentally compatible solutions to problems, standardization and applications testing, after-sales services embracing installation, start-up, repair and damage analyses, practical training and seminars on sealing technology.

Besides providing extensive technical literature (including the book, *ABC of Mechanical Seals*) Burgmann offers a continually growing range of seminars and training courses for maintenance personnel, plant foremen and engineers from diverse industrial sectors. The seminars can be conducted at the customer's company when required.

The regular training provided by Burgmann to its customers' technical staff also indicates its commitment to ensure efficient transfer of technology, in terms of capacity to maintain the high efficiency of its seals technology. In the countries where Burgmann operates, it has branches in all major centres.

Malaysia

The company provides after-sales services such as maintenance, trouble-shooting and training for its customers. Most of the customers welcome and appreciate Burgmann's provision of training on the efficient maintenance and operations of its seals. The objective of the training is to enhance the life span of the seals and reduce or prevent leakage. This directly improves the environmental performance of the customers.

However, even though the company's customers include those with large industrial operations that require high quality seals technology (e.g. the national sewage company, Indah Water Konsortium SDN BHD, and the national petroleum company, Petronas BHD), hardly any customers impose environmental requirements on Burgmann's management and operations as a prerequisite for buying Burgmann's products or using its services. The main criteria for the choice of Burgmann's seals are high quality, price competitiveness and good after-sales services.

India

Burgmann India is one of the major players in the field of sealing technology. The seals are employed in various sectors such as petrochemicals, refineries, fertilizers, power, marine and aerospace industries. The seals are specified worldwide by leading engineering consultants such as EIL, PDIL, UDHE, TOYO, CHEMTEX, ICB, DALAL, H&G, LINDE, LURGI and TDC.

The company supplies original Burgmann seals from Germany, seals manufactured in India and any special seals to suit customer requirements. The company's main advantage, as stated by its customers, include its ability to provide high quality products, price competitiveness compared to

other foreign seals and the high standard of its after-sales service (which includes installation, maintenance, trouble-shooting and training for its customers).

The demand for environmentally friendly products and production in India is rapidly as is customers' awareness. The supply of such products does seem to have an influence on the market. In particularl, the company's know-how and standards have satisfied its customers' needs. The latter in turn gain through the technology know-how provided by Burgmann India; for example the excellent performance of the product and the after-sales service.

China

The products of Burgmann Shanghai Ltd. are sold to a number of industries such as nuclear power stations, petrochemical facilities, oil refineries, producers of air conditioning equipment and thermal power stations. In 1999, Burgmann Shanghai Ltd. sold 88 per cent of its products to Chinese customers and only 12 per cent (amounting to DM 1 million) were earmarked for export to countries such as Mexico, Argentina, the Republic of Korea and Germany.

Superior product quality and price competitiveness are the main requirements of Burgmann's customers e.g. Flyght (United States) and EBARA (Japan). To date, neither Chinese nor international customers have imposed any environmental performance requirements on Burgmann Shanghai Ltd.

c. Competitors

Malaysia

In Malaysia, pumps are imported from China, Germany, Japan, Taiwan Province of China, the United Kingdom and the United States, and the seal suppliers are therefore also mainly from these countries. There is no local manufacturer of seals or pumps. However, there are a few local engineering and machining companies that provide seals maintenance services in competition with Burgmann.

The main competitors for Burgmann seals are John Crane (United Kingdom) and Flowserve (United States). There are no official statistics available on the market for seals in Malaysia, but it is estimated that Burgmann Malaysia has an almost 30 to 40 per cent share of this market.

Many stakeholders acknowledge that Burgmann is the only company that can provide the full range of services relating to pumps and seals. However, it is difficult to ascertain whether Burgmann has a better environmental performance or strategic advantage over its competitors, though it is recognized that Burgmann's engineering facilities and machines that provide high quality seals are better than those of other companies.

India

There are several pump manufacturers in India, both foreign and Indian. There are some local small-scale companies that manufacture seals (e.g. KSB Pumps, Sulzer and Kirsloskar Brothers Ltd. (KBL)). However, the main competitors are international corporations such as John Crane and Durametallic, both of the United Kingdom.

The technological know-how has definitely provided the company with a competitive edge over many other competitors. It has successfully captured the Indian market and is surging ahead.

There are no official statistics available concerning the market for seals in India; however it is estimated to be approximately DM 2 million, of which Burgmann India is estimated to have an almost 15 to 20 per cent market share.

China

The Chinese market for seals is witnessing fierce competition. Because the price of mechanical seals manufactured by Burgmann Shanghai Ltd. is usually higher than that of the products made by local seal manufacturers, the company has to maintain higher product quality to compete for its market share. The company has succeeded in substantially increasing its sales over the past few years.

d. NGOs and the neighbourhood

Malaysia

When Burgmann Sdn Bhdset up its manufacturing facilities, it did not contact any NGOs, and to date the company's activities have not led to any conflicts with or complaints from NGOs.

India

The manufacturing site of Burgmann existed even before the commissioning of the joint venture between Burgmann Dichtungswerke GmbH & Co. KG and A.K Engineering Pvt. Ltd. at Goregaon, Bombay. Neither A.K. Engineering Pvt. Ltd nor its successor, Burgmann India, have had any problems with (environmental) NGOs or their immediate neighbourhood.

China

The influence of NGOs and the neighbourhood surrounding Burgmann Shanghai Ltd. has been and still is very limited.

e. Employees

Malaysia

The current level of training of Burgmann's employees is adequate for carrying out high quality manufacturing of seals. Most of the workers have been with the company since its establishment.

India

The employees are highly satisfied with the benefits of training they obtain from Burgmann and/or external experts.

China

There is a lack of environmental knowledge and safety awareness among employees, which Bergamann is rectifying through training. The working language of the staff at Burgmann Shanghai Ltd. is primarily Chinese whereas English language skills are limited. This facilitates the operation of Burgmann Shanghai Ltd. within China but hinders exports.

f. Banks

Malaysia

Banks and insurance companies in Malaysia generally do not request information about the environmental performance of companies before they do business with them. At the same time, Burgmann has not demanded any loans from the local banks so far.

India

The company's sound finances and also the soft loans obtained from the German Development Bank (KfW) were considered when investing in India. The company did not negotiate with the Indian Government or other Indian institutions for funding schemes or investment grants.

Banks and insurance companies in India generally do not request information about the environmental performance of companies if they do not provide them with services. Hence they did not conduct any checking of Burgmann's environmental policies or track record.

China

Burgmann Shaghai Ltd. has not been questioned by any bank concerning its environmental performance or impact and Burgmann has not sought any loan from local banks.

D. Conclusions

The findings of the case studies described below in part D, section II allow us to draw some conclusions based on the answers to the research questions formulated for this project. As mentioned in part B, section V.2, the fact that low environmental standards are not an important variable in the companies' site-selection process does not mean that FDI necessarily leads to the diffusion of modern technologies, management know-how and eco-efficiency. The question therefore arises as to how FDI can contribute to sustainable development in the host countries and what factors are necessary for its successful contribution. The conclusions and recommendations drawn from the analysis conducted so far are provided in part D, section III.

I. Methodology of the case studies – a word of caution

As described in part B, the results of previous studies on the technological effects of FDI and its environmental impacts were inconclusive in terms of the objectives of this project. For this research, therefore, a methodology based on company-level case studies and a multi-stakeholder perspective was selected in order to be able to identify the critical success factors for positive environmental effects of FDI. While this approach allows a more in-depth consideration of the specific circumstances on which the effects of FDI depend, there is, nevertheless, an important reservation to the conclusions drawn from the case studies: the companies willing to participate in a research project on such a delicate topic are quite likely those whose behaviour and performance are the closest to best practice. In particular, the aspect concerning stakeholder involvement and evaluation of their interests is likely to have reduced the number of companies willing to participate. It is therefore important to bear in mind that the methodology does not allow general conclusions to be drawn on the behaviour of TNCs.

The case studies were conducted in cooperation with local institutes in the FDI host countries, which facilitated the gathering of in-depth information (e.g. on local suppliers and authorities); this would have been more difficult had the studies been conducted from Germany.

Furthermore, the findings and conclusions only build upon four case studies carried out with German TNCs and their foreign subsidaries in three countries: China, India and Malaysia. To substantiate the recommendations which have been drawn on the basis of these cases, it will be necessary to broaden the empirical basis. This will be especially important if a set of indicators for technology transfer and diffusion have to be determined, as was recommended at the UNCTAD workshop on Strengthening Capacities for Trade and Environment Policy Integration held in Jaipur in January 1999. It will be all the more relevant for the definition of best practice for different industries and stakeholders in different countries concerned with technology transfer and the diffusion of environmentally sound technologies and management practices through FDI.

Despite these problems, the case studies are an important contribution towards achieving the project's research objectives.

II. Findings

Although there are differences between the companies and countries involved, a picture can be drawn which helps to illuminate the TNCs' strategies and to identify critical factors for further improvements

in technology transfer and diffusion. The following 10 findings emerge from the case studies. The findings were first presented and discussed at the Pre-UNCTAD X Seminar in November 1999. They can be divided into three categories: the overarching trend of globalization as a driver for standardization (point 1), findings concerning a company's internal factors (points 2– 4), and external drivers (points 5–10).

1. Globalization is a driver for standardization

FDI was part of the globalization strategy of all the companies which participated in the case studies. This means that access to markets is the main motivating factor for them. Due to the TNCs' strategies to rationalize development and production and due to the growing integration of markets, there is a tendency for TNCs increasingly to standardize their products and processes worldwide and adapt them to suit local needs. This seemingly general trend in industry was also observed in the case studies, and is a process that leads to the transfer of new technologies into newly industrializing and developing countries.

Independently of this trend, the innovation process leads to a switch from "end-of-pipe technologies" for environmental protection to "integrated technologies". Therefore, worldwide standardization of components and products also accompanies the increasing implementation of "integrated technologies", as they cannot be separated from process or production technologies. BSH, for example, decided to implement the same technology (HC-technology) for its refrigerators worldwide, making just a few local adaptations. This strategy was developed simultaneously with the decision to enter the Chinese and Brazilian markets. However, this trend does not necessarily apply to "end-of-pipe technologies", as these are additional investments which are not automatically linked to the introduction of new processes and products. Investments for "end of pipe" solutions can, in special cases, amount to 30 per cent of an investment. For these, special efforts concerning environmental improvements are therefore required.

All in all, this shows that globalization strategies and technology trends can support technology transfer through FDI. TNCs' overall technology and product strategies, and the degree of innovation, especially with respect to "integrated technologies", are critical factors supporting this trend.

2. TNCs organize their corporate environmental responsibilities internationally

All TNCs involved in the case studies have organized international environmental management, defining responsibilities, management processes and standards, and reporting procedures worldwide. Through these international systems or networks, TNCs transfer their management know-how to foreign subsidiaries. The systems they have developed differ, depending on the specific characteristics of the industry and technologies. The differences mainly occur in the degree of international centralization, the quantity and quality of standards, the audit systems and processes, and reporting requirements.

The degree of international centralization relates to management responsibilities for such areas as investments, technology decisions and compliance. The environmental standards differ in the scope of the aspects covered and the degree of specification. Some are pure management standards, others are technical specifications and/or material-selection or emissions standards.

However, TNCs differ in the degree of control the head office exerts over the implementation of the prescribed standards. HMR, for instance, has developed detailed international environmental management guidelines and a fairly centralized internal audit process and reporting system to control

the implementation of these guidelines. BSH, on the other hand, places the onus for implementation on the site management.

While it appears to be "best practice" to organize corporate environmental responsibilities and reporting systems internationally there is no single overall best practice on *how* international environmental management should be organized. There might be sector-specific best practice, but this could not be examined by the case studies.

The observed management practices show that TNCs increasingly work towards international transparency within their companies and in the management of their environmental responsibilities globally. This helps to transfer good management practices and environmentally sound technologies through FDI.

3. Management's commitment to environmental issues is essential; corporate values and training can greatly enhance this commitment

Implementing environmental management procedures at an international level is not always a straightforward process. The successful implementation of EMS depends on its consistency with overall corporate values. The top management's commitment in both host and home country is crucial for overcoming any conflicts of interest and obstacles which might occur during daily operations.

Training can help build common understanding and awareness and support corporate culture. It can also enable staff to carry out their tasks in an environmentally responsible manner.

Aventis, for example, offers regular training programmes, run by outside experts, on aspects of technical safety and environmental management. The training and exchange of experiences contributes to creating greater environmental awareness among the employees. Aventis' Indian management gains know-how from its international activities and from its frequent exchanges with the German headquarters.

4. Environmental supply-chain management is starting

Traditionally, management requirements along the supply chain have been strongly related to quality issues. Especially in sectors where the final product is subject to high technical requirements, the quality of the supplied goods is extremely important. All TNCs have ongoing training and auditing processes for their suppliers.

Environmental managers are not normally in contact with suppliers or exchange information with them. Through cooperation, TNCs can influence the supply chain to increase environmental awareness and support the implementation of environmentally sound management practices and technologies.

Through its involvement in the case studies, Adtranz India, for example, was inspired to hold a workshop with important suppliers that focused on environmental issues. In newly industrializing and developing countries, the impact of such efforts is particularly significant. Adtranz has also attempted to increase suppliers' interest in certification by promising to certify suppliers who do not have the resources for regular third-party certification. HMR, however, believed it had little influence on large suppliers' EMS, and that it was only able to focus its efforts on smaller companies, offering, for example, help with the implementation of environmental standards.

So far TNCs have only recently started to work in this direction, and they agree that environmental supply-chain management is an important trend and a challenge which could have an enormous

impact. Of critical importance for the successful integration of environmental requirements into specifications for the suppliers will be whether this will lead to cost reductions and/or whether the market will give due credit to the resulting improvement in the environment.

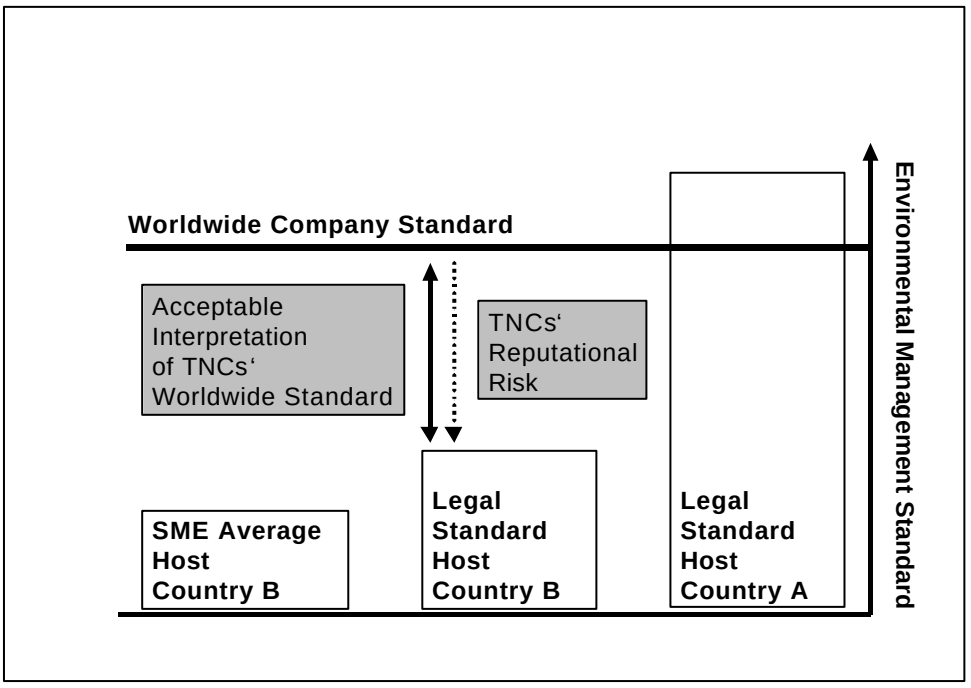
A restriction on environmental supply-chain management can be the limited supply of sophisticated materials and components in the host countries.

5. The high degree of risk to TNCs' reputation requires strict global standards

TNCs are expected to operate to high environmental standards worldwide. The public in general and NGOs in particular keep them under close scrutiny, and their reputations are thus permanently at risk. The magnitude of this risk seems to be a driving force behind the definition of the standards.

Figure 1 illustrates how many TNCs set themselves a worldwide company standard on environmental measures, yet may choose to exceed this standard in one host country while remaining below it in another. In the latter case, the difference between the worldwide company standard and the (lower) legal standard in the host country equals the degree of risk to the company's reputation. That lower standard is, nevertheless, in many cases still above the average standard for SMEs in the host country concerned. Given varying degrees of specification of the worldwide company standard in different fields of activity, a standard between that of host countries A and B may be interpreted by subsidiaries to be acceptable, given the local situation and requirements (figure 1).

Figure 4: TNCs' global environmental management standard



6. Global environmental transparency requires inclusion of TNCs' foreign subsidiaries into environmental reporting

In documenting their efforts, TNCs increasingly tend to incorporate information about their foreign subsidiaries' environmental conditions and performance into their international corporate reporting. Adtranz's environmental report, for example, includes the most important impacts of all sites worldwide. This does not mean that TNCs will always actively use their environmental performance for public relations activities in the host countries. It is more likely that a silent or defensive strategy will be preferred.

7. Cost reduction is an important incentive for energy conservation

Due to high energy costs or unreliable supplies, energy conservation is one of the main environmental issues for companies operating in newly industrializing or developing countries. It seems to be an important customer requirement as well. The transfer of energy-efficient technologies (including those for consumer products) has therefore been particularly successful.

Much of the success of BSH and Adtranz can be linked to the energy efficiency of their products. Aventis has implemented an energy-saving programme through a reorganization of the production process. This shows that there is a potential to use FDI for the transfer of energy-saving technologies.

8. Purchasing by public authorities can play an important role in improving technology transfer

By setting environmental requirements, public authorities can use their purchasing power to induce the transfer of environmentally sound technologies into their country. Even more so, they can encourage the diffusion of technologies by buying licences and/or intellectual property rights for environmentally sound technologies, thus making them accessible to local industry.

The case of Adtranz shows the impact of purchasing power by public authorities on technology transfer. Indian Railways combined their interests in energy-efficient technologies with their national interest in order to strengthen the Indian industry base. They also used the economic interests of a TNC to obtain the new technology both for the railways and for national suppliers.

9. NGOs can initiate technology transfer

Non-governmental organizations – especially international NGOs and those with technological competence – can have a huge impact on technology transfer and diffusion. NGO campaigns and other activities can influence corporations to change their technologies and implement environmentally sound technologies.

For example, Greenpeace played a significant role in influencing a shift to the production of CFC-free refrigerators. This NGO acted not only as a pressure group, but also as a driver of innovation and as a public relations or marketing agency for a new technology. Starting in Germany, Greenpeace also used its competence for an international promotion or transfer strategy especially in China. After the successful introduction of the environmentally friendly HC-technology on the German market, the new technology went on to conquer the European market as well. Consequently, BSH and other European corporations now transfer HC-technology all over the world.

10. TNCs can be subject to more stringent enforcement of regulations than local companies

It appears that in some cases national or local authorities subject TNCs and their compliance with regulations to close scrutiny. This could be because TNCs are often comparatively large companies and because they are foreign companies. Local environmental authorities seem to enforce compliance with regulations more strictly with TNCs' than with local, especially small, competitors.

Summary

This study has shown that FDI can accelerate the diffusion of modern eco-efficient management know-how, technologies and their spillovers. The findings show that there are important drivers for eco-efficiency influencing the performance of FDI. Globalization can be a driver for eco-efficiency in the industrial sector.

Additional *external drivers* are: market opportunities, stringent enforcement of environmental regulations, energy prices and risks to reputation.

Additional *internal drivers* are: cost savings and a change of management attitudes, both at headquarters and in the host countries.

As important general *best-practices*, the following measurements can be defined: international coordination of environmental responsibilities, definition of worldwide environmental (management) standards, external or internal audits, dissemination of up-to-date, eco-efficient technologies and good management practices along the supply chains, and integration of foreign activities into environmental reporting.

The diffusion of eco-efficient technologies to competitors in host countries can be an important side-effect of FDI.

III. Recommendations

1. Preliminary remarks

Research projects such as this cannot be conducted within a political vacuum. Vital (economic and social) interests, especially of the FDI host countries have to be taken into account. Most newly industrializing and developing countries go through a period of change from a closed (and planned) economy to an open market economy. Their conditions and regulations for FDI are likely to be further liberalized in the future, which would increase the significance of FDI (compared to other forms of capital flows to non-OECD countries, especially official aid). Worldwide consensus on environmental and social standards is also likely to develop, even though, probably, only on a limited number of global issues (such as CFCs).

Therefore, there is an intensive and ongoing debate about what needs to be done to harness the potential positive effects of FDI in the host countries. Several measures have been discussed in this ongoing debate, including in the different meetings and interviews conducted during the project. The following are some of the major aspects discussed:

- International and national standards need to be defined and their implementation enforced. NGOs are already a driving force in this process. It is hoped that through this, the transfer of environmental management know-how and environmentally sound technologies by TNCs will occur. Whether an international investment regime could define such standards and obligations is still being debated.[24]
- Education and training efforts should be intensified to strengthen awareness and to improve knowledge about environmental issues and impacts, as well as to raise the level of environmental commitment.
- The public sector should use its purchasing power and influence when using public funds to support both R&D and the dissemination of environmental management systems and environmentally sound technologies.
- The institutional capacities of public authorities, the scientific community, companies and NGOs to manage and solve environmental problems should be strengthened.
- Access to information sources and flows should be improved, especially for newly industrializing and developing countries.

Before drawing attention to our recommendations, some remarks concerning the connection between FDI and the implementation of international environmental agreements are in order.

2. FDI and international environmental agreements

Besides the main objectives of the study described in section A.I, the project should also help contribute towards finding some means for integrating environmental aspects into international agreements on investment and for implementing international environmental agreements.

However, what needs to be taken into account is that this study considered FDI at a corporate level, whereas the implementation of international environmental agreements is a responsibility of governments. Therefore, general conclusions about these questions cannot be drawn from the results of this research project.

Nevertheless, two case studies show at least an indirect connection between international environmental agreements and the potential impact of FDI.

In the BSH case, the Montreal Protocol banning the production of CFCs promoted the technology switch to HC refrigerators. Due to public pressure and to the fast implementation of the Protocol in Germany, companies such as BSH were forced to speed up the innovation process. This enabled BSH to use the new technology as a competitive advantage internationally, as well as in host countries such as China, where the switch to this technology was made through FDI, probably faster than had there been no such FDI.

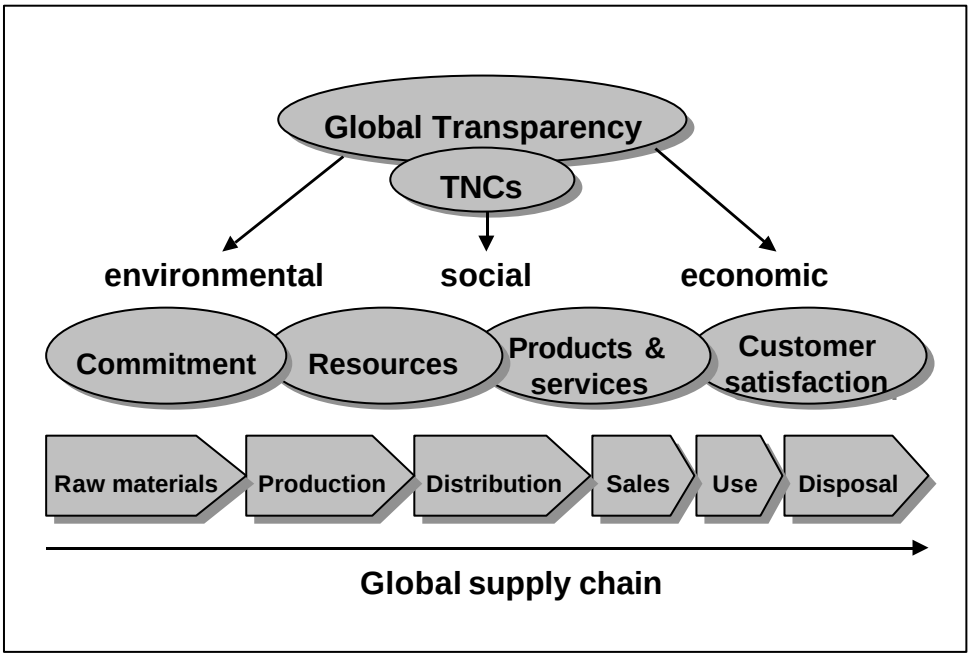
In the Adtranz case, the energy efficiency of the locomotives produced by Adtranz is important for the implementation of the Kyoto Protocol, as energy-efficient locomotives contribute to the reduction of greenhouse gases. Adtranz had developed this technology originallly for the Swiss railways which had special requirements regarding energy efficiency. Therefore, in this case, FDI helped to promote the goal of an important international environmental agreement.

[24] Cf. Molktke, 2000.

3. Recommendations concerning transparency and the supply chain

We wish to focus attention on two main recommendations which can be drawn from the case studies: *improvement of global transparency in environmental reporting* and the *greening of the supply chain*. Both recommendations build on strong global trends and can be utilized for an improved integration of environmental requirements into FDI. They are addressed mainly for the attention of TNCs and the public sector in the host countries. See figure 5 for an overview of these two global trends.

Figure 5: Global transparency and the global supply chain



1. Global transparency

The recommendation concerning *transparency* builds on the trend towards an information society. Shareholders and stakeholders, the general public and the media have a growing interest in and high expectations from information about practice and performance of companies and their products, especially those of TNCs. Market transparency is one of the driving factors for competition, and therefore important for the efficiency of market economies in general. This is not only true for financial markets and product markets; it is also more and more true for environmental performance.

All companies pointed out that an improvement in reporting practices was crucial for managing their environmental performance globally. The practice of environmental reporting – internal and external, voluntary or mandatory – should therefore be spread globally and improved further. There should also be a more active use of the effects of transparency to improve environmental efficiency, especially in developing countries. It can lead to the dissemination of environmentally sound management practices and technologies, resulting in positive environmental impacts. In this regard, the following points are particularly important:

- Environmental transparency can play an important role in increasing knowledge and improving both environmental impacts and the reputation and credibility of companies.
- Environmental reports by subsidiaries in the host countries could serve as an example to other companies in these countries. These reports help to disseminate environmentally sound management practices and technologies.
- Published reports can also be useful for companies and technology intermediates to identify benchmarks and best practices. They help to speed up the process of global learning for sustainable development and the dissemination of best practices.
- The reports should cover environmental aspects of all subsidiaries' activities, including inputs (e.g. energy, water and materials consumed) and outputs (e.g. solid wastes, emissions or effluents produced) as well as achievements, strategies and programmes for activities which have a significant environmental impact. In addition, impacts and effects on the supply chain could be mentioned.

An improvement in transparency about TNCs' environment activities can be made by the TNCs themselves, as well as by industry associations, sector associations, banks and governments. Each of these has opportunities to improve TNCs' environmental reporting, as follows:

TNCs could undertake **voluntary activities** and **commitments** concerning reporting of their environment-related activities and contribution to sustainability. These reports may contain their impacts and effects in both the home and host countries, in particular the transfer of technology and know-how. In addition, the impacts and effects of supply-chain management may be mentioned.

Industry associations (national or international) could encourage **voluntary agreements** concerning industry reporting on environmental and sustainability activities. These agreements may include codes of conduct for corporations, which could require publication of more information about the TNCs and consideration of the environmental effects of their activities in foreign countries.

Sector associations : Voluntary sector reports or **guidelines** for sectors of particular interest would help increase sector-specific transparency, and thereby increase the (environmental) credibility of the sector. These reports and guidelines may provide some idea of the contents of codes of conduct for corporations. Such codes could require greater consideration of environmental aspects and effects of corporations' activities abroad as well as requirements for companies to report on their environmental and sustainable development activities.

Banks: The **granting of loans** for FDI through national and international public banks could be related to appropriate reporting of environmental and sustainability-related activities. To date, banks only have environmental guidelines for loan appraisal, but no guidelines for environmental reporting. The public banks, in particular, often grant credits for companies investing in newly industrializing or less developed countries. These loans may be tied to environmental and sustainability reporting of corporations' foreign investments.

Governments: Mandatory reporting on environment-related FDI should be integrated into future agreements on FDI. Such environmental reporting standards could, in some cases, supplement, or even substitute, new technical standards. These standards may include (sector) specific environmental indicators in order to make it easier to monitor continuous improvement of environmental protection and performance by companies.

2. Greening the global supply chain

Recommendations concerning the *supply* chain are based on the global trend to re-engineer the value chains of companies. Information tools developed in recent years have made it possible for companies to optimize their business, from their second- and third-tier suppliers to their distribution processes. New process-related controlling systems, auditing processes, greater transparency through easier access to information, and training programmes have been developed along the value chains of companies and for their different product lines.

Supply-chain management is mainly driven by one factor: customer satisfaction. Thus customers' requirements and specifications are important drivers, including those relating to the companies' environmental performance. In some cases, the government is the biggest or only customer. Since both TNCs and the public sector are powerful customers, especially in host countries, they can have a significant impact on the supply chain.

The integration of environmental aspects and performance indicators into purchasing specifications can be an important driver for environmental improvements along the supply chain, and thereby support the transfer of know-how and initiate technology transfer.

It is therefore recommended that more efforts be made for "greening" the supply chain. Indeed, some of the environmental performance requirements may even lead to cost reductions, such as lower energy costs and risks. However, they can also lead to additional costs or investments, which may cause problems because of lack of financial resources and technical capabilities. Nevertheless, use of the leverage effect for "greening" the supply chain is recommended in order to further improve the environmental impact of FDI and the dissemination of environmentally sound management practices and technologies.

Three conclusions and recommendations concerning supply chain management can be drawn from the case studies, which are directed towards companies, business associations and governments.

TNCs: There should be a voluntary exchange of both **experiences** and **best practices** along the supply chain, for instance by offering training courses to the suppliers, supporting the suppliers when implementing their EMS and organizing workshops for the mutual exchange of experiences.

Voluntary exchange of **data on material flows** along the supply chain could include input and output flows within a company, between a company and first-tier suppliers, or even along the entire product life-cycle, that means second- and third-tier suppliers as well as recycling and disposal. This data exchange may optimize the products' quality as well as its environmental impacts and effects along the entire value chain.

Business associations: Voluntary sector activities and **commitments** should promote the documentation of material flows and the creation of data banks. Against the background of the pure material inputs and outputs this may help to minimize the overall environmental impacts and effects of products and production processes. Such data banks could increase sector-specific transparency and thereby improve the (environmental) credibility of the sector.

Governments: The public sector can influence the diffusion of technology on the host markets, through its **purchasing power**. Since it is governments that allow market access into the host country they can exercise enormous influence on the market, especially when the public sector is the only customer. This influence may extend to the transfer, and above all, the

diffusion, of modern environmentally friendly technologies and management systems to various competitors and suppliers in the host market.

4. Opportunities and risks

These findings and recommendations show that there are important drivers for further integrating environmental considerations into FDI. *Improvement of global transparency in the environmental activities and impacts of TNCs* and of *environmental performance along the supply chain* are two vital "starting points" with a high potential impact on the dissemination of environmentally sound technologies and environmental management practices. The enforcement of these two drivers is certainly a challenge for both TNCs and host countries. The implementation of measures to encourage the use of these drivers should be designed with respect to the different needs and interests of the companies, employees and countries concerned.

In the discussions with companies and stakeholders the following conflicts of interests, opportunities and risks were identified. The degree of opportunities or risks depends on specific conditions and competencies of the involved parties and on the implementation strategies chosen by the different actors.

Potential opportunities for TNCs:

- Gaining credibility through the provision of honest and complete information
- Reducing risks to their reputation
- Improving stakeholder dialogue
- Gaining competitive advantage through high EH&S standards

Potential risks for TNCs:

- Increasing the risks to their reputation through spin-doctoring
- Increasing pressure to meet international and national agreements/standards
- Higher production costs without added value to the customer
- Losing competitive advantage through high production costs

Potential opportunities for host countries:

- Gaining better access to environmental know-how and technologies
- Gaining better access to environmental benchmarks
- Improving sustainable development and sustainable consumption

Potential risks for host countries:
- Higher production costs
- Local companies' loss of competitive advantage
- Host countries' loss of competitive advantage

The conclusions and recommendations were presented and discussed at a pre-UNCTAD X seminar in November 1999 and at an UNCTAD seminar in June 2000.

Outlook: Rio-plus-10 and beyond

It is planned to create a network of institutes to carry out research on the interrelationship between FDI, global supply-chain management, eco-efficiency and sustainable development. This international network should include institutes from OECD countries, newly industrializing and less developed countries, and the transition economies of Central and Eastern Europe. It is particularly important that institutes from FDI host countries participate in this network in order to contribute to an understanding of the particularities of these countries and their markets. Systematic and in-depth multi-stakeholder company-level case studies can help in the evaluation of sector-specific best practices and recommendations to promote the transfer and diffusion of environmentally sound technologies and management through FDI and global supply-chain management. TNCs should be encouraged to further develop global transparency, especially concerning their FDI and global supply-chain management.

This network of research institutes should, *inter alia*,

- Carry out further company and sector-level case studies;
- Support dialogue between the participating countries and institutions;
- Encourage TNCs to improve transparency in their global activities concerning their environmental performance and sustainability;
- Identify best practices and critical success factors;
- Help accelerate the diffusion of eco-efficient technologies and know-how along the supply chain; and
- Investigate the efficacy of specific best practice guidelines and develop them further.

The partners involved in this project consider the improvement of transparency and bottom-up research through company and sector-level case studies to be important for a continued, systematic and results-orientated international dialogue on globalization and sustainability.

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Appendix: Long questionnaire

Globalization and Sustainable Development: Starting-points for an improved integration of environmental requirements into foreign direct investment activities

Schedule for Interviews

Institut für Ökologie und Unternehmensführung
(Sustainable Business Institute)
at the European Business School e.V.

Globalization and Sustainable Development: Starting-points for an improved integration of environmental requirements into foreign direct investment.

In the course of economic globalization, a significant increase in foreign direct investment (FDI) has been observed. Whereas the economic effects on growth and wealth are widely acknowledged, the repercussions on the environment are extremely controversial.

For this reason an analysis of the relationship between FDI and the environment is needed.

The German Federal Ministry for the Environment and the Federal Environmental Agency have therefore commissioned the Institut für Ökologie und Unternehmensführung (Sustainable Business Institute) at the European Business School e.V. to undertake a study on *Globalization and Sustainable Development: Starting-Points for an Improved Integration of Environmental Requirements into Foreign Direct Investment.* This study forms part of the UNCTAD project on Trade, Environment and Investment which aims to determine to what extent trade and FDI may contribute to sustainable development.

The study **aims** at an evaluation of the critical success factors concerning:

- Best practices of environmental management in FDI; and
- How FDI could facilitate technology transfer and diffusion of eco-efficient technology.

For this purpose five case studies will be conducted, which will provide the empirical basis for recommendations on:

- The integration of environmental aspects into international agreements on investment; and
- How FDI could facilitate the implementation environmental agreements.

The entire project will be conducted within a **time-frame** of 18 months, subdivided into roughly three project phases, as follows.

Phase I (August 1998 – January 1999) covers empirical research of the topic, determining the aspects to be examined in the case studies. The project design, especially the case studies, will be finalized.

January 1999: Workshop in India in which representatives from the German Federal Environmental Agency, the German Federal Ministry of Environment, UNCTAD, governments and business will participate, along with, if possible, those from the institutes and companies involved in the case studies.

In **Phase II (February 1999 – May 1999)** the case studies will be undertaken. They will focus on German companies of different sizes and in different industrial activities (automotive industry, chemical industry, electrical engineering industry) engaged in FDI in China, India and Malaysia. The case studies will be conducted partly from the Federal Republic of Germany and partly within the host country in partnership with local institutions. In particular, our aim is to examine the behaviour and deciding factors of companies in undertaking FDI as well as the conditions they face, such as external general conditions, international and national regulations, the behaviour of national/local authorities and infrastructure. The internal corporate structures and processes as well as the effects of FDI on the transfer of technology and know-how, on growth and on general political conditions are also to be analysed. The case studies will conclude with a workshop in the host country.

Phase III (June 1999 – December 1999) represents the final phase, when the case studies will be evaluated and the hypotheses validated. Based on these results, measures will be determined for the different parties to undertake at the national and international levels with the objective of making FDI both contribute to sustainable development and support the implementation of multilateral environmental agreements.

December 1999 Final presentation at UNCTAD in Geneva.

The **Schedule for the Interviews** comprises an essential part of the case studies. For their successful realization, it is necessary that your company name one mentor at your head office and one on the spot (in the host country). This would facilitate our research considerably. These mentors do not necessarily have to be in charge of environmental questions. Some of the interviews will take place at the German head office, while others will be conducted by an institute located in the host country. The case study will be kept confidential until the final workshop in the host country or until permission is granted by the company concerned.

For **further information**, please contact our managing director, Dr. P. von Flotow,

Institut für Ökologie und Unternehmensführung at the EUROPEAN BUSINESS SCHOOL e.V..

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Structure of the Schedule for the Interviews

Part I – Companies/Management Process

1. **General information about the company**

2. **General information about the company abroad/direct investment abroad**

3. **Process and criteria of decision-making**
   - Locational factors
   - Government and authorities of the host country
   - NGOs
   - Banks and Insurance companies
   - Environmental situation in the host county
   - Choice of technology

4. **Environmental policy and management process**
   - Environmental-policy and -managementsystem
   - Supply-chain management
   - Customer-relations management
   - Competitive strategy

5. **Environmental effects**

Part II Stakeholders' perspective

A. Customers

B. Suppliers

C. Government

D. Environmental authorities

E. Banks and insurance companies

F. NGOs and the neighbourhood

G. Employees

Context for the Interview sections

Part I – Companies/Management Process

Part I (1) and (2) of the " Schedule for the Interviews" covers your organization, in particular background information on the parent company in Germany (i.e. organizational structure and core businesses of the group), and the subsidiary in the host country. Part I (3) aims at defining the relevant influences on FDI, Part I (4) deals with the design of the environmental management system and policy in both home and host country, and Part I (5) deals with the environmental effects of your FDI.

General information about the company

1. Direct investment abroad in China, India or Malaysia

We are interested in background information on your FDI. We would like to gain an impression of the investment's relative importance both for your group and for the economic development of the host country.

2. Environmental policy and management process

This section covers the factors which have influenced your FDI decision. We would therefore like to gain an impression of the importance of site-related factors (e.g. labour costs, infrastructure and environmental regulations in the host country) in determining your investment decision. The political, regulatory and environment context in the host country will be covered at greater depth. This encompasses the environmental situation, choices of technology as well as relations with the stakeholders (e.g. NGOs, banks and insurance companies).

3. Environmental policy and management process

This section deals with your environmental policy and management system. We are interested in knowing to what extent your environmental policy is linked to environmental regulations and standards, in particular with respect to your subsidiary's policy. Possible differences between parent company and subsidiary are particularly relevant. Furthermore, we would like to determine which know-how and technology-transfer and spillover effects can be observed. Therefore we are not only looking at the management process and performance of the factory, but also asking for information regarding supply-chain management, customer relations and effects on competitors.

4. Environmental effects

The main focus of this section concerns the environmental effects of your FDI. We are interested in the scale and nature of any environmental impacts, as well as the organizational measures which were taken to address these. This section is connected to Parts I.3 and I.4 which will be dealing with the environment as a locational factor as well as your organization's environmental performance.

Part II Stakeholders' perspective

Part II deals with the perspective of the stakeholders with which the company is involved (customers, suppliers, governments, environmental authorities, banks and insurance companies, NGO and employees). The aim of this section is to obtain further information on the environmental effects and on know-how, which can supplement the companies' internal perspective. Furthermore the influence of stakeholder groups regarding the effects of FDI as well as potential spillover effects are to be determined.

Part I. Companies/ Management process

1. General information about the company

1.1 Corporate name and head office

_____
_____
_____
_____

1.2 Contact

_____
_____

1.3 How is your company organized? Which of the following statements are the most appropriate?

π Network structure with subsidiaries which act independently with regard to business decisions

π Centrally controlled company with subsidiaries which cannot make decisions independently

π Subsidiaries are formed according to regions

π Subsidiaries are mainly formed according to technologies or products

π Company and subsidiaries respectively are managed according to central business processes (development, production, buying etc.)

π Company and subsidiaries respectively are managed according to central divisions (market/technology)

1.4 a) How many lines of business or lines of products do you have worldwide?

_____

b) Which of these are the most important ones?

_____
_____
_____
_____
_____

2. Direct investment abroad in China, India or Malaysia

We are interested in background information on your FDI. We would like to gain an impression of the relative importance of your FDI for your group as well as for the economic development of the host country.

Location

_____
_____

Address

_____
_____

_____

Contact

_____

2.1 How many sites form part of this company?

_____

2.2 How many employees does this company have?

_____
_____

2.3 a) Which are your main lines of business or products?

_____
_____
_____
_____

b) Which is your most important product?

_____

2.4 The total turnover in the host country amounts to

less than DM 100m π less than DM 500m π

less than DM 1bn π more than DM 1bn π

2.5 The turnover for your most important product amounts to

less than DM 100m π less than DM 500m π

less than DM 1bn π more than DM 1bn π

2.6 Are there local content regulations in the host country?

Yes π No π

2.7 a) To what extent do your local suppliers contribute to the value concerning your most important finished product?

to less than 20% π to less than 60% π

to less than 40% π to less than 80% π

b) To what extent does your company abroad contribute to the value concerning this finished product?

to less than 20% π to less than 60% π

to less than 40% π to less than 80% π

c) To what extent do other subsidiaries of your parent company contribute to the value concerning this finished product?

to less than 20% π to less than 60% π

to less than 40% π to less than 80% π

2.8 Which share in sales does the local market represent?

_____

2.9 Which share in sales do exports represent?

_____

3. Process and criteria for decision-making

This section covers the factors which have influenced your FDI decision. We would therefore like to gain an impression of the importance of site-related factors (e.g. cost of labour, infrastructure and environmental regulations in the host country) for your investment decision. The political, regulatory and environmental context in the host country will be covered in greater depth. This encompasses the environmental situation, technology choices as well as relations with stakeholders (e.g. NGOs, banks and insurance companies).

Locational factors

3.1 a) How would you rank labour costs in the host country?

very high π high π medium π low π very low π

b) How much importance was ascribed to labour costs when the decision on investment location was made?

very much π much π medium π little π very little π

3.2 a) To your mind, how are capital costs in the host country?

very high π high π medium π low π very low π

b) How much importance was ascribed to the capital cost when the decision on investment location was made?

very much π much π medium π little π very little π

3.3 a) To your mind, how is the level of training in the host country?

very high π high π medium π low π very low π

b) How much importance was ascribed to the level of training when the decision on investment location was made?

very much π much π medium π little π very little π

3.4 a) To your mind, how is the level of infrastructure in the host country?

very high π high π medium π low π very low π

b) How much importance was ascribed to the level of infrastructure when the decision on investment location was made?

very much π much π medium π little π very little π

3.5 a) To your mind, how is the legal certainty in the host country?

very high π high π medium π low π very low π

b) How much importance was ascribed to the legal certainty when the decision on investment location was made?

very much π much π medium π little π very little π

3.6 a) To your mind, how are the environmental regulations and standards in the host country?

very high π high π medium π low π very low π

b) How much importance was ascribed to the environmental regulations and standards when the decision on investment location was made?

very much π much π medium π little π very little π

3.7 a) To your mind, how is the political stability in the host country?

very high π high π medium π low π very low π

b) How much importance was ascribed to the political stability when the decision on investment location was made?

very much π much π medium π little π very little π

3.8 a) To your mind, how is the availability of natural resources in the host country?

very high π high π medium π low π very low π

b) How much importance was ascribed to the availability of natural resources when the decision on investment location was made?

very much π much π medium π little π very little π

3.9 How much importance was ascribed to the market volume/market proximity/market access when the decision on investment location was made?

very much π much π medium π little π very little π

3.10 a) What role did transportation and logistics expenses play when the decision on investment location was made?

_____

_____

b) How much importance was ascribed to these aspects when you decided upon the FDI?

very much π much π medium π little π very little π

3.11 Which other locational factors were taken into account when deciding upon the FDI?

_____

_____

3.12 Why is the host country more attractive than Germany

_____

_____

3.13 a) Were you subject to

barriers to capital transactions? π

tariffs/duties? π

import restrictions? π

other barriers to trade?

_____ π

b) How far did these factors enter into your decision on FDI?

_____

_____

3.14 a) Did you apply for / receive international financing funds?

Yes π No π

b) How far did this enter into your decision on the FDI?

_____

_____

3.15 Apart from economic factors, cultural differences are important to the success of a co-operations.

a) Which cultural differences did you notice?

_____

_____

b) How do you prevent that misunderstandings arise from cultural differences?

_____

_____

_____

c) Are there cultural differences which have environmental effects?

_____

_____

_____

Government and authorities of the host country

3.16 a) Did you negotiate with the host country's government about the corporate tax burden?

_____

b) How far did the corporate tax burden enter into your decision on the FDI?

_____

_____

3.17 a) Did the host country's government offer funding schemes or investment grants?

_____

b) How far did this enter into your decision on the FDI?

_____

_____

3.18 a) Did you contact the host country's government to discuss the relevant environmental legislation or environmental standards to be complied with?

Yes π No π

b) Did you agree upon special arrangements with the government in this respect?

Yes π No π

c) How far did this enter into your decision on the FDI?

_____

_____

3.19 a) Did you contact the local environmental authorities?

Yes π No π

b) When?

_____

_____

3.20 Did the local environmental authorities offer you information about the local environmental conditions and the relevant regulations?

Yes π No π

3.21 a) Did the local environmental authorities offer to take the specific circumstances of your company into account?

Yes π No π

b) Were you able to reach in your favour in the negotiations with the local environmental authorities?

Yes π No π Neutral π

c) Could you tell us these compromises?

_____

_____

_____

NGOs

3.22 a) Did you contact local environmentalist NGOs?

Yes π No π

b) Could you tell us whom you have contacted and when?

_____

_____

_____

c) What is there purpose?

_____

_____

d) Are you cooperating permanently?

Yes π No π

e) Please give us concrete details:

_____

_____

_____

3.23 a) Are there conflicts between the company and the local environmentalist NGOs?

Yes π No π

b) Could you tell us to what issues they concern?

_____

_____

c) How have they been addressed?

_____

_____

Bank and insurance

3.24 a) Did the financing bank ask you about environmental risks or the environmental management and risk management in your company?

Yes π No π

b) Which role did these aspects play in credit negotiations?

_____

_____

3.25 a) Did your insurance company ask you about environmental risks or environmental management and risk management in your company?

Yes π No π

b) Which role did these aspects play in your insurance contract?

_____

_____

Environmental situation in the host county

3.26 a) Had you informed yourself about the geographical patterns of industries at the location?

Yes π No π

b) Had you informed yourself about the existence of environmental pollution at the location?

Yes π No π

c) Did you obtain information relating thereto?

Yes π No π

d) Did you find out whether your production site would have an impact on the environment situation at the location?

Yes π No π

3.27 a) Have you conducted an environmental impact assessment (EIA) either before commencing your operations or before undertaking any expansions?

Yes π No π

b) Has your EIA been reviewed by any major NGO, government or certification agency?

Yes π No π

3.28 The environmental management or environmental issues were involved in the process of decision-making at which stage? When deciding upon

the host country π

the site π

the technology applied π

the course of action in case of industrial hazards / accidents π

other aspects:

_____ π

Choice of technology

3.29 a) Do you apply the same technologies both in your home country and in the host country?

Yes π No π

b) How far did the following criteria enter into your decision on processes and technology applied in the host country?

Please assess them according to their importance
(from 1 = little to 5 = much importance):

standardization (same technology at all locations)	_____
costs	_____
required staff qualification	_____
repair expense	_____
productivity	_____
regulations in the host country	_____
guidelines of the group	_____
maintenance of a positive image	_____
customer or supplier requirements	_____
other criteria:	
_____	_____

3.30 a) Which production methods are applied at the sites in the host country?

_____
_____
_____

b) Are they considered to be BATs?

Yes π No π

c) Are they considered to be state of the art?

Yes π No π

d) Are new substitute technologies available on the market?

Yes π No π

3.31 a) Which environmental technologies are applied?

_____
_____
_____
_____

b) Are they considered as BATs?

Yes π No π

c) Are they considered to be state of the art?

Yes π No π

d) Are new substitute technologies available on the market?

Yes π No π

3. Environment policy and management process

This section deals with your environmental policy and management system. We are interested in knowing to what extent your environment policy is linked to environmental regulations and standards, in particular with respect to your subsidiary's policy. Possible differences between parent company and subsidiary are particularly relevant. Furthermore we would like to determine which know-how and technology-transfer and spill-over effects can be observed. Therefore we are not only looking at the management process and performance of the factory but also seeking information regarding supply-chain management, customer relations and effects vis-à-vis competitors.

Environmental policy and management system

4.1 Does your company have

an environmental management system? π

an environment policy? π

environmental objectives? π

an environmental organization? π

an environmental controlling system? π

4.2 a) Does your company edit an internal environment report?

Yes π No π

b) Does your company edit an environment report for the public?

Yes π No π

4.3 a) Does the environment policy of your company take into account sustainable development as set out in agenda 21?

Yes π No π

b) Which of the following aspects does your environment policy stress?

preservation of the natural basis of life, also for future generations π

avoidance of overexploitation of natural resources π

reduction of material and energy input π

transformation of material streams into closed-loop systems π

avoidance of polluting emissions π

other aspects:

_____ π

c) How are these concerns addressed and reflected in the production process or final product?

_____

_____

_____

4.4 a) Does your environment policy take into account the objectives of multilateral environmental agreements (MEAs)?

Yes π No π

b) Could you tell us how ?

_____
_____
_____

c) Which agreements does your environment policy observe ?

London Convention (Prevention of Marine Pollution)	π
Montreal Protocol on Substances that Deplete the Ozon Layer	π
Framework Convention on Climate Change, New York	π
Basel Convention (Movement of Wastes and their Disposal)	π
Results of the Kyoto Conference	π
Other agreements:	
_____	π

d) Are the environmental issues addressed by the MEAs taken into consideration

ozone depletion?	π
climate change?	π
marine pollution?	π
waste management?	π
waste minimisation?	π

4.5 Which other measures form essential parts of your environmental policy or programs?

safety and environmental audits	π
energy saving measures	π
regular meetings for an exchange of experiences	π
transparency (residents, NGOs etc.)	π
compensating measures (reforestation etc.)	π
other measures:	
_____	π

4.6 Does your company comply with voluntary guidelines/international standards?

	Yes	No	Planned
certification according to ISO 14001	π	π	π
certification according to ISO 9000	π	π	π
UNEP environmental guidelines	π	π	π
ICC environmental guidelines	π	π	π
other guidelines			
_____	π	π	π

4.7 a) Is your environmental management system integrated into other management systems?

Yes π No π

b) If yes, into which?

_____

_____

4.8 a) Do you apply the high standards of environmental management procedures of your home country in the host country?

Yes π No π

b) If not, on what is the environmental management of your affiliate based?

_____

_____

c) How does it defer from the environmental standards applied in the home country?

level of environmental performance π

environmental management π

others:

_____ π

4.9 a) Which other non-technical measures did you integrated into your environmental management system to reduce negative effects on the natural environment?

register of all environmental effects π

register of all materials/substances/products π

staff training π

other measures:

_____ π

b) Which share do the costs for these measures have in the total costs?

_____

4.10 Which departments / functions are involved in corporate environmental protection?

top management π

production π

marketing π

strategic planning π

R & D π

market research π

public relations π

human resources π

accounting / controlling π

4.11 a) How does your environmental management system ensure compliance with relevant regulation in the host country?

_____

_____

_____

_____

b) Have you had to make any modifications regarding the production process, the product or environmental management in order to comply with these regulations?

Yes π No π

c) Do environmental regulations in the host country concern or affect your production?

Yes π No π

d) In what way?

_____
_____

e) Which are the locally relevant regulations?

_____
_____
_____
_____
_____

f) Is the group's head office informed of these regulations?

Yes π No π

g) Does the group's head office assume a part of the responsibility for the compliance with locally relevant regulations?

Yes π No π

4.12 Which influence does your joint venture partner bring to bear on your environmental philosophy and environmental management?

_____
_____
_____
_____

4.13 How would you describe your own environmental performance in comparison with other similar locations in this country and abroad?

higher π

on the same level π

suited to the different circumstances in the host country π

lower π

not comparable given that the production processes / goods produced differ π

4.14 a) Have you established any research facilities in the country?

Yes π No π

b) Does your company carry out R & D on environmental related issues? e.g.

regenerative energies π

recycling π

energy efficiency π

emission reduction / control π

other activities:

_____ π

Supply-chain management

4.15 Do you ask your suppliers to specified environmental standards, either in the process of production or of the product itself?

Yes π No π

4.16 Did you offer any assistance to your suppliers to meet these standards?

Yes π No π

4.17 a) Did you train your local suppliers?

Yes π No π

b) Did you train your local suppliers with regard to environmental aspects?

Yes π No π

4.18 What in your opinion has been the major learning of your suppliers on the environmental front from working together?

_____
_____

4.19 a) In your impression, do your specifications facilitate the spread of environmental technology know-how to your suppliers?

Yes π No π

b) Could you please explain?

_____
_____
_____

4.20 a) Could you please provide us with the name of your main suppliers with regard to the turnover:

_____
_____
_____

b) Could you indicate which of your suppliers have the most significant environmental impacts:

_____
_____
_____

Customer-relations management

4.21 Did you contact your customers in the host country to provide them with information about your environmental performance?

Yes π No π

4.22 Did customers ask you about environmental risks or environmental management and risk management in your company?

Yes π No π

4.23 a) Is there demand for environmentally friendly products and production in the host country?

Yes π No π

b) Is there a supply of environmentally friendly products in the host country?

Yes π No π

4.24 Do you think you have influence through your Know-how and standards on the market?

Yes π No π

4.25 Do you think your technology know-how provides your customer with the competitive advantage?

Yes π No π

4.26 a) Could you please provide us with the name of your main customers with regard to the turnover:

_____
_____
_____

b) Could you indicate which of your customers have the most significant environmental impacts:

_____
_____
_____

Competitive strategy

4.27 a) Do you think your environmental performance and technology know-how provide you with a competitive advantage?

Yes π No π

b) Could you describe to what extend (e.g. costs, differentiation?)

_____
_____
_____

4.28 Do you make use of opportunities to exchange environmental technology and management know how with other companies?

Yes π No π

4.29 How do you assess the legal situation with respect to the protection of your technology know how? (Patents, Licenses)

_____
_____
_____

4.30 Do you think existing patent and licensing laws provide adequate protection?

_____
_____
_____

4.31 In your opinion does the existing patent and licensing law limit or facilitate the spread of technological know how?

_____
_____
_____

4.32 How do you think your competitive situation limits the spread of environmental technology?

_____
_____
_____

4.33 In your opinion how could the spread of environmental technology be improved and accelerated?

_____
_____
_____

4.34 a) Could you observe spill-over effects in the host country?

Yes π No π

b) Could you please provide us with details:

_____
_____
_____

4.35 a) In your opinion, what are the main factors improving spill-over effects?

_____
_____
_____

b) In your opinion, what are the main factors handicapping spill-over effects?

_____
_____
_____

4.36 Could you please provide us with the name of your main competitors:

_____
_____
_____

4.37 Which effects in the surroundings of the new location can be ascribed to FDI?

improvement of the environmental situation	π
deterioration of the environmental situation	π
effects on growth and employment	π
infrastructural improvements	π
other effects:	
_____	π

5. Environmental effects

The main focus of this section is on the environmental effects of your FDI. We are interested in the scale and nature of any environmental impacts, as well as the organizational measures which were taken to address these. This section is connected to Parts I.3 and I.4 which deal with the environment as a locational factor and with your organiztion's environmental performance.

5.1 Which main environmental effects are caused at the location in the host country concerned and how much relevance is ascribed to them?

given relevant		less relevant	
π	waste	π	π
π	sewage	π	π
π	waste heat	π	π
π	ground contamination	π	π
π	emissions	π	π
π	noise	π	π
π	energy consumption	π	π
π	surface requirements	π	π
π	handling of toxic / polluting agents	π	π
π	traffic	π	π

5.2 a) Which plants at your locations have these environmental effects?

_____
_____
_____
_____

b) Which safety precautions have been taken for these plants?

H&S management	π
risk management	π
plan for the prevention of accidents	π
safety audits	π
safety trainings	π
application of measurement techniques	π
other precautions:	π

_____

5.3 a) Do you know of possible damage to the environment or environmental risks caused by your production or products respe ctively?

climate change	π
ozone depletion	π
damage to eco-systems	π
damage to health	π

other effects:

_____ π

b) How have they been addressed?

_____

_____

5.4 Which of your company's processes / products / materials do you consider yourself a serious environmental problem?

_____

_____

5.5 a) Have you ever been served a notice from the State Pollution Control Boad for any environmental infringement?

Yes π No π

b) Has any public interest litigation ever been filed against you?

Yes π No π

c) Has the violation at issue been concerned with the environment?

Yes π No π

5.6 a) Have you in the last ten years ceased producing polluting products?

Yes π No π

b) Are you buying these products from the local suppliers?

Yes π No π

5.7 Does your company have to inform the authorities on caused environmental effects?

Yes π No π

5.8 a) Do the environmental effects caused at this location differ from those caused at comparable locations in this country due to your decision on technology to be applied in the host country?

Yes π Partly π No π

b) Can you tell us, why?

_____

_____

_____

5.9 a) How do you manage your waste?

_____

_____

_____

b) Do you

π contract it out or

π do you have your own facilities?

c) Do you lease at these facilities to local firms?

Yes π No π

Further comments

_____

Part II. Stakeholders' perspective

Part II of the "schedule for the interviews" deals with the stakeholders with which the company is involved in connection with its FDI (customers, suppliers, governments, environmental authorities, banks and insurance companies, NGO and employees). The aim of this section is to obtain further information on the environmental effects of the examined FDI, which can supplement the companies internal perspective. Furthermore the influence of stakeholder groups regarding the effects of FDI as well as potential spillover effects are to be determined.

A. Customers

1. Did you discuss qualification measures with your customers?

Yes π No π

2. a) Did you discuss possible environmental improvements with your customers?

Yes π No π

b) If yes, which?

_____
_____
_____

3. a) Did your customers impose any environmental requirements?

Yes π No π

b) If yes, which?

_____
_____
_____

c) Did he offer to assist you in the implementation of environmental standards?

Yes π No π

d) What type of assistance was provided:

π financial

π technology transfer

π training

π others:_____

4. In your opinion how could the spread of environmental technology be improved and accelerated?

_____
_____
_____

5. a) In your opinion, what are the main issues improving spill-over effects?

_____
_____
_____

b) In your opinion, what are the main issues handicapping spill-over effects?

_____
_____

_____

6. Further comments

_____
_____
_____

B. Suppliers/subsuppliers

1. Who is the owner of your company?

_____
_____
_____

2. With what do you or did you supply the company?

π with a plant

π with parts of a plant

π with components

π with operating supplies

π with others:_____

3. When did you take up business relations?

_____

4. Could you please characterize the impact of your production and your products on the environment?

_____
_____

5. Does your company have

π quality standards?

π environmental standards?

π an environmental management system?

π an environmental report?

π a range of “environmental products”?

π other things:_____

6. Did you inform your business partners of

π your quality standards?

π your environmental standards?

π your environmental management system?

π the environmental report?

π your range of “environmental products”?

π other things:_____

7. Did your business partners ask you about

π your quality standards?

π your environmental performance standards?

π your environmental management system?

π the environmental report?

π your range of "environmental products"?

π other things:_____

8. Did you discuss qualification measures with your business partner?

Yes π No π

9. a) Did you discuss possible environmental improvements with your business partner?

Yes π No π

b) If yes, which?

_____
_____
_____

10. a) Did your business partner impose any environmental requirements?

Yes π No π

b) If yes, which?

_____
_____
_____

c) Did he offer to assist you in the implementation of environmental standards?

Yes π No π

d) What type of assistance was provided:

π financial

π technology transfer

π training

π others:_____

11. a) Did you discuss qualification measures with the sub-supplier?

Yes π No π

b) Did you discuss possible environmental improvements with the sub-supplier?

Yes π No π

c) Did your business partner impose any environmental requirements?

Yes π No π

d) If yes, which?

_____
_____
_____

12. a) Do you think your environmental performance and technology know-how provide you with a competitive advantage?

Yes π No π

b) Could you describe to what extend (e.g. costs, differentiation?)

_____
_____
_____

13. Do you make use of opportunities to exchange environmental technology and management know how with other companies?

Yes π No π

14. How do you assess the legal situation with respect to the protection of your technology know how? (Patents, Licenses)

_____
_____
_____

15. Do you think existing patent and licensing laws provide adequate protection?

_____
_____
_____

16. In your opinion does the existing patent and licensing law limit or facilitate the spread of technological know how?

_____
_____
_____

17. How do you think your competitive situation limits the spread of environmental technology?

_____
_____
_____

18. In your opinion how could the spread of environmental technology be improved and accelerated?

_____
_____
_____

19. a) In your opinion, what are the main factors improving spill-over effects?

_____
_____
_____

b) In your opinion, what are the main factors handicapping spill-over effects?

_____
_____
_____

20. Further comments

_____
_____
_____

_____
_____

C. Government

1. a) Who initiated the contact between you and the company, you or they?

_____

b) When was the contact taken up?

_____

2. Did you inform the company of the economic and political situation, laws and standards to be complied with?

Yes π No π

3. a) Did you negotiate with the company about the corporate tax burden?

Yes π No π

b) Did you reach agreements and could you tell us these?

_____
_____

4. a) Did you negotiate with the company about funding schemes or investment grants?

Yes π No π

b) Did you reach agreements and could you tell us these?

_____
_____

5. a) Did the company contact you to discuss the relevant environmental legislation or environmental standards to be complied with?

Yes π No π

b) Did you agree upon special arrangements with the government in this respect?

Yes π No π

6. a) Are there conflicts between you and the company?

Yes π No π

b) Which different points of view can these conflicts be attributed to?

_____
_____
_____

7. a) Did you determine an increase in the number of Patents and Licenses in the last few years?

Yes π No π

b) Do you see a connection between amount of FDI and number of patents?

Yes π No π

8. Do you think that your countries technology development benefits from FDI?

Yes π No π

9. a) In your opinion, what are the main issues improving spill-over effects?

_____
_____

b) In your opinion, what are the main issues handicapping spill-over effects?

_____
_____

10. In your opinion how could the spread of environmental technology be improved and accelerated?

_____
_____

11. Further comments

_____
_____

D. Environmental authorities

1. a) Who initiated the contact between you and the company, you or they?

_____

b) When was the contact taken up?

_____

2. a) Did you inform the company of the local environmental situation and environmental law or standards to be complied with?

Yes π No π

b) Which environmental standards or regulations apply to the company?

_____
_____
_____

3. a) Did the company have to take measures to comply with environmental standards or regulations in your country?

Yes π No π

b) If yes, which?

_____
_____

c) What are or were the practical steps taken to implement these measures?

_____
_____

4. a) Are you cooperating permanently?

Yes π No π

b) Please give us concrete details.

_____
_____
_____

5. a) Are there conflicts between you and the company?

Yes π No π

b) Which different points of view can these conflicts be attributed to?

_____
_____

6. Did you agree upon special arrangements with regard to environmental legislation or standards to be complied with?

Yes π No π

7. a) In your opinion, what are the main issues improving spill-over effects?

_____
_____
_____

b) In your opinion, what are the main issues handicapping spill-over effects?

_____
_____
_____

8. In your opinion how could the spread of environmental technology be improved and accelerated?

_____
_____
_____

9. Further comments

_____
_____
_____
_____

E. Banks and insurance companies

1. a) Who initiated the contact between you and the company, you or they?

_____

b) When was the contact taken up?

_____

2. Did you inform the company about the economic and political situation, laws and standards to be complied with?

Yes π No π

3. a) Did you discuss insurance and funding schemes or investment grants with the company?

Yes π No π

b) Did you reach agreements and could you tell us these?

_____

_____

4. Did "environment" play a role in these discussions, e.g. as to

π the application of technology

π the application of environmental management practices

π how the compliance with environmental legislation is regulated in the company

π whether the company shows risk and accident potentials

π how the company acts against such risk potentials

π other aspects:_____

5. a) In your opinion, what are the main issues improving spill-over effects?

_____

_____

_____

b) In your opinion, what are the main issues handicapping spill-over effects?

_____

_____

_____

6. In your opinion how could the spread of environmental technology be improved and accelerated?

_____

_____

_____

7. Further comments

_____

_____

_____

_____

F. NGOs and the neighbourhood

1. a) Who initiated the contact between you and the company, you or they?

_____

b) When was the contact taken up?

_____

2. a) Are you cooperating permanently?

Yes π No π

b) Please give us concrete details.

_____

_____

3. Are there conflicts between you and the company?

Yes π No π

4. a) Are environmental effects caused by the company?

Yes π No π

b) Which?

_____
_____

5. How would you describe the environmental performance of the company in comparison with other similar enterprises you know ?

_____
_____

6. Which impact does FDI have on the environment in your opinion?

_____
_____

7. Further comments

_____
_____

G. Employees

1. Are you informed about the environmental impact and possible environmental risks of the plants and the products?

Yes π No π

2. Are you being continuously informed about the environmental effects?

Yes π No π

3. a) Does the company train you with regard to environmentally friendly behaviour?

Yes π No π

b) If yes, how do they train you?

_____
_____

4. Which environmental measures does the company particularly stress?

π waste reduction

π waste sorting

π reduction of energy consumption

π reduction of water consumption

π sewage reduction

π sewage treatment

π air pollution control

π reduction of resource consumption

π other measures:_____

5. How would you describe the environmental standards of your company in comparison with other similar locations you know?

_____
_____
_____ _____

_____

6. Further comments

_____

_____

_____