ENVIRONMENTAL PRACTICES OF TRANSNATIONAL CORPORATIONS IN BRAZIL: CASES IN THE CHEMICAL AND PHARMACEUTICAL SECTORS

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Abstract

Following the case study research strategy, this thesis has investigated the implementation of corporate environmental policies in subsidiaries of transnational corporations in Brazil. More specifically, it investigated six subsidiaries from three countries of origin - the United Kingdom, the United States and Germany - operating in the chemical and pharmaceutical sectors.

This comparative study has resulted in a theoretical framework to explain transnational corporations' environmental practices. This framework follows an interdisciplinary approach, consisting of four levels. First, at the international level, an overview of the constraints regarding transnational corporations and environmental issues is addressed. The second level is represented by the environmental regulatory policies in the home and host countries. The third level accessed the influences from the industry's structure (in both international and Brazilian contexts). Finally, the fourth level is centred on the companies, which specifically discusses the home-host dilemma in the management of transnational corporations.

The most important conclusion is that the main source of pressure over subsidiaries' practices is the environmental regulation of the host country. Nevertheless, there are cases of non-compliance and cases of overcompliance regarding Brazilian environmental legislation. However, these contradictory results are explained by the headquarters-subsidiary relationship. That is, poor environmental performance was explained by lack of control from the headquarters. Otherwise, good performance was explained by tight control from headquarters over subsidiaries' practices in Brazil.

Additionally, there is indication that regulation is the main driving force in the home countries. However, attempts at self-regulation are in progress in the chemical industry in order to balance these external pressures for environmental improvements. Finally, there is evidence that the nationality of the selected companies is a relevant aspect of their environmental policies and practices. This is mainly because the legal requirements and management approach of the home countries are incorporated into their environmental management.

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Abbreviations

ABIFARMA	Associação Brasileira das Indústrias Farmacêuticas (Brazilian Pharmaceutical Industry Association)
ABSPA	Associação Brasileira de Segurança e Prevenção de Acidentes (Brazilian Association of Safety and Accident Prevention)
ABIQUIM	Associação Brasileira das Indústrias Químicas (Brazilian Chemical Industry Association)
AEASP	Associação de Engenheiros Agrícolas do Estado de São Paulo (Agricultural Engineers Association of the São Paulo state)
AMDA	Associação Mineira de Defesa Ambiental (Environmental Protection Association of the Minas Gerais state)
ANDEF	Associação Nacional dos Produtores de Defensivos Agrícolas (National Association of the Producers of Agrochemical)
BAT	Best Available Technology
B.A.T	British American Tobacco
BCSD	Business Council for Sustainable Development
BNDES	Banco Nacional de Desenvolvimento Econômico e Social (National Development Bank)
BS	British Standard
CAP	Common Agricultural Policy
CBI	Confederation of British Industry
CEDAE	Companhia Estadual de Águas e Esgotos (State Company of Water and Sewage - Rio de Janeiro)
CEFIC	European Chemical Industry Council
CEO	Chief Executive Officer
CEPAL	Commission Economica para America Latina y Caribe
CETESB	Companhia Estadual de Tecnologia de Saneamento Básico (State Company for Technology of Basic Sanitation and Pollution Control)
CFCs	Chlorofluorocarbons

CIA	Chemical Industries Association (UK)
CIPA	Comissão Interna de Prevenção de Acidentes (Internal Commission for Accidents Prevention)
CMA	Chemical Manufacturers Association (US)
CNI	Confederação Nacional das Indústrias (Confederation of Brazilian Industries)
CONAMA	Conselho Nacional de Meio Ambiente (National Commission for the Environment)
CRQ	Conselho Regional de Química (Regional Commission of Chemistry Professionals)
DDT	Chlorinated hydrocarbon (insecticide)
DNARH	Departamento National de Água e Recursos Hídricos (National Department for Water Resources)
EC	European Commission
ECU	European Currency Unit
EH&S	Environment, Health and Safety
EIA(s)	Environmental Impact Assessment
EMS	Environmental Management System
EPA	Environmental Protection Agency (US)
EU	European Union
FDA	Food and Drugs Administration (US)
FDI	Foreign Direct Investment
FIESP	Federação das Indústrias do Estado de São Paulo (Federation of Industries of the São Paulo state)
FINEP	Financiadora de Estudos e Projetos (Foment agency, Ministry of Science and Technology)
FEEMA	Fundação Estadual de Engenharia do Meio Ambiente (State Foundation of Environmental Engineering)

FOE	Friends of the Earth
GDP	Gross Domestic Product
GKSS	Forschungszentrum Geesthastcht Gmbh
GMP	Good Manufacturing Practice
GNP	Gross National Product
GRM	Group Risk Management
GTZ	Geesthacht sur Technish Zusanmermabel
HMR	Hoechst Marion Roussel
HS&E	Health, Safety and Environment
IBAMA	Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Brazilian Institute for Environment and Natural Renewable Resources)
ICCA	International Council of Chemicals Associations
ICC	International Chamber of Commerce
ICI	Imperial Chemical Industries
IGO	Inter-Governmental Organization
ILO	International Labour Organization
IMF	International Monetary Fund
ISO	International Standard Organization
LIGHT	Companhia de Eletricidade do Estado do Rio de Janeiro (State Company of Electricity)
MNC(s)	Multinational Corporation(s)
MNE(s)	Multinational Enterprise(s)
NAFTA	North America Free Trade Agreement
NGO(s)	Non-Governmental Organization(s)
OECD	Organisation for Economic Co-operation and Development

OSHA	Occupational Safety and Health Association (US)
OTC	Over The Counter
PET	Polyethylene terephthalate
PNUMA	Programa de las Naciones Unidas para el Medio Ambiente
PVC	Polyvinyl chloride
RC	Responsible Care
R&D	Research and Development
RIMA(s)	Relatório de Impacto no Meio Ambiente (report of environmental impact)
SABESP	Companhia de Saneamento Básico do Estado de São Paulo (State Company for Basic Sanitation)
S&E	Safety and Environment
SEMA	Secretaria Especial de Meio Ambiente (Special Secretariat for the Environment)
SHE	Safety, Health and Environment
SMA	Secretaria de Estado do Meio Ambiente - São Paulo (State Secretariat of the Environment)
TNC(s)	Transnational Corporation(s)
TQM	Total Quality Management
TRI	Toxic Release Inventory
UN	United Nations
UNICAMP	Universidade de Campinas (University of Campinas - state of São Paulo)
UNCED	United Nations Conference on Environment and Development, Brazil, 1992
UNCHE	United Nations Conference on the Human Environment, Stockholm, 1972
UNCTC	United Nations Center for Transnational Corporations

UNEP-IE	United Nations Environment Programme - Industry and Environment
UNTCMD	United Nations Transnational Corporations Management Division
VCI	Verband der Chemischen Industrie
WBCSD	World Business Council for Sustainable Development
WCED	World Commission on Environment and Development (the Brundtland Commission)
WHO	World Health Organization
WICE	World Industry Council for the Environment
WRI	World Resources Institute, Washington, DC
WWF	World Wide Fund for Nature (former World Wildlife Fund)

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Any remaining errors in this thesis are, of course, my entire responsibility.

Chapter I - Introduction

1.1 - Objective of the study

The aim of this thesis is to investigate, with the aid of an interdisciplinary perspective, why and how transnational corporations[1] adopt and implement environmental policies[2] in their subsidiaries in a developing country. In addition, the question concerning the main factors determining subsidiaries behaviour is addressed.

The unit of analysis is 'corporate environmental policy and practices', because the focus of analysis is the process of implementation of a 'corporate policy' through formalised 'practices'. Consequently, this unit of analysis is of an embedded type. That is, the subsidiary is the main unit of analysis because the empirical investigation is centred on transnational corporations' (TNCs) practices in a host country. However, the headquarters usually define the corporate environmental policy; therefore the headquarters is the subunit of analysis (Rappaport and Flaherty, 1992; Brown et al., 1993; and UNEP, 1994).

More specifically, corporate environmental policies are understood as broad guidelines declaring companies' strategic decisions regarding the management of their environmental impacts. The UNTCMD (1993, p. 14) states that environmental policy statements "consist primarily of corporate principles that express in fairly general terms the fundamental attitudes and activities of the corporation with regard to the environment". Likewise, Rappaport and Flaherty (1992, p. 27) affirm that corporate policy statements are an effective means for communicating the company's intentions for environmental, health and safety (EH&S) issues. As well as this, the most common feature of these written policies is the explicit statement of compliance with existing

[1] The choice of the concept of 'transnational' instead of 'multinational companies' follows UNCTC (1983) and Strange (1994, p. 76). The latter states that TNC is more accurate because as a corporation it is neither in character nor in control, multi-national. In fact the majority of them are national corporations operating transnationally. Despite this choice some studies that will be addressed here assume the term 'multinational', therefore such cases shall be restricted to authors' citations.

[2] For prescriptive definitions of corporate environmental policy see CBI (1992; 1995b), UNEP (1994) and Bennett et al. (1993). Descriptive examples of this concept are in Brown et al. (1993), Buzzelli (1991) and van Bergeijk (1991). Moreover, empirical evidence of these policies may be found in corporate environmental reports. Finally, Smart (1992), Willums and Goluke (1992) and Schmidheiny (1992) have compiled some of the 'most successful' cases of corporate environmental policies and practices.

regulations and laws as well as a certain standard that the corporation seeks to meet (UNTCMD, 1993, p. 16).

Gladwin (in Pearson, 1987, pp. 13-19) indicates prototypical patterns of environmental management associated with pollution-intensive multinational corporations (MNCs). The author enumerates five areas (performance objective and measurements, organization staffing, project and product planning, technology transfer, occupational health and safety), in which environmental performance was investigated inside the broad set of MNCs' activities. Although he states that the information available leaves much to be desired, his study must be mentioned as a relevant data source on environmental policies and practices of TNCs.

Gladwin's findings (from surveys completed in the 70s) suggest that MNCs had developed formal written statements of objectives and policies concerning pollution control that appeared to be in a continual state of evolution and were intended mainly for home-country operations. Consequently, MNCs had no system of pollution-control for worldwide operations; therefore, affiliate reports to headquarters tended to be informal or irregular. According to Gladwin, a large number of MNCs "have corporate-level, top management environmental committees that are charged with policy formulation and progress review". However, their dominant orientation "has tended to be toward home-country operations, and they are typically composed only of home-country executives" (in Pearson, 1987, p. 14). Nevertheless, this emphasis on the home country's operations has not yet been fully explored by the literature.

The UNTCMD (1993) goes one step further in the investigation of TNCs' environmental management[3]. The most interesting conclusions from this survey are: (1) there is a close relationship between the environmental issues that have received much regulatory attention in recent years and the issues that have high priority on the corporate agenda. Most corporate environmental activities can be related to local or national regulatory initiatives, but international regulation (e.g., the Montreal Protocol banning the use of chlorofluorocarbons) also seems to influence the TNCs' activities; (2) corporate conduct in specific areas (such as logging and oil industries) is also influenced

[3] The 'Benchmark Corporate Environmental Survey' includes data from 210 TNCs (of the 794 firms targeted by the survey). Among the respondents 169 filled out the questionnaire (including four companies investigated by this thesis - BASF, Hoechst, Eli Lilly and Glaxo Wellcome), whereas 41 TNCs preferred to send solely informative material (UNTCMD, 1993).

by international public opinion (UNTCMD, 1993, pp. 161-162); (3) international guidelines[4] were rarely observed, even though most corporations found international harmonization of environmental standards important; (4) only a few TNCs had specific accounts of their responsibilities in developing countries, such as policies pledging to employ the same EH&S standards globally or special training programmes for employees; (5) management practices vary significantly among corporations due to factors such as leadership and involvement from the board of directors, corporate line of business (i.e., industry sector), size of the company (roughly defined by annual sales), and finally home country (Ibid., pp. 91-93).

Two of these factors determining corporate EH&S management are of particular interest. First, the suggestion that corporate environmental practices vary significantly among countries. Moreover, "it was found that EH&S practices in developing nations depend on the home region of the corporation". These variances may "indicate that particular cultural factors affect the way in which corporations organize EH&S management". More specifically, it is stated that "the nature of the regulatory environment in the home country of the corporation" (Ibid., p. 93) explains those variations.

Second, the indication that industry sector is an important factor. It is suggested that companies from the extractive-based sector (including chemical and oil industries) have more advanced environmental policies and programmes probably as a consequence of extremely costly accidents. On the contrary, companies in the computer and pharmaceutical industries have been more innovative than those in other industries. This is mainly because "new and more dynamic industries often will have the resources to invest in long-term environmental programmes" (Ibid., p. 92). Overall, the UNTCMD's (1993) survey, characterized essentially as an exploratory study, has identified key factors that are supposed to influence TNCs' environmental management. Consequently, the survey's findings will be included in the discussion aiming to build the framework of analysis (in chapter two).

Additionally, Gladwin affirms that MNCs' subsidiaries, "unlike their domestic rivals, tend to be more vulnerable to demands and pressure emanating from home and host countries with respect to social responsibility" (in Pearson, 1987, p. 7), which

[4] From organizations such as International Chamber of Commerce, International Standard Organization, International Labour Organization and United Nations for Environmental Protection.

includes EH&S concern. But Levy (1995, p. 45) states that "large companies, which are the most progressive in terms of environmental policies and procedures, are found to have poorer environmental performances in terms of reduction in hazardous emissions" Thus, Gladwin's (in Pearson, 1987) and UNTCMD's (1993) suggestions that TNCs are more advanced in EH&S management have been refuted by Levy's (1995) results, and the merely rhetorical character of TNCs' environmental policies is given evidence (Greenpeace, 1992).

Following an international business perspective, Levy (1995, p. 46) concludes that regulatory and organizational factors influence corporate environmental practice (defined as policies and procedures) and performance (in terms of toxic emissions); however, "there is surprisingly little relationship between practice and performance". In this regard, Gleckman (1995) indicates how TNCs have been addressing environmental issues aiming to answer the pressures they face for sustainable development. More specifically, TNCs have been acting collectively (through organization such as the ICC) in the attempt to avoid responsibility for their environmental impacts[5] and to influence the definition of sustainable development by international institutions (a similar argument is made by Eden, 1994).

In conclusion, these authors stated above have touched upon some aspects of interest to this thesis. However, none of them have clearly answered the causal relations in the implementation of corporate environmental policies in developing countries. It could be explicitly recognized that the lack of explanatory studies (in epistemological terms) is in contrast to the abundance of descriptive and prescriptive studies (mainly from the field of business management and the business community itself). This lack makes clear that the task is not complete; and this is precisely what motivated and justified the purpose of this thesis. Taking into account the literature review, this thesis will focus on TNCs' environmental policies and practices in a selected host country.

[5] The definition of environmental impact followed throughout the thesis is quite broad, based on what Roberts (1995, p. 22) calls environmental problems. According to the author, the business and environment relationship includes the likelihood "that the activities of an individual company will have both a direct impact upon the local environment through its everyday operations - such as the disposal of solid waste materials to landfill - and an indirect impact on regional, national or global environments through its consumption of resources such as energy and raw materials".

Due to the fact that a case study was selected as the research strategy to be followed, the case findings have produced an analytic generalization[6] of the theoretical framework developed. Such a framework (presented in chapter two) is based on a set of selected variables, which are organised in four levels of analysis[7]. First, at the international level, an overview of main constraints regarding TNCs and environmental issues is addressed. At the second level is the home and host countries contexts represented by their environmental regulatory policies. The third level accesses the influences from the industry's structure (at both the international and Brazilian contexts). Finally, the fourth level is centred on the companies (including headquarters' strategic decisions and subsidiaries' management), which specifically discusses the home-host dilemma in TNCs' management.

Briefly, this thesis is organized in six chapters. Chapter one introduces the research design and the importance of the study. Chapter two discusses the literature in order to build the framework of analysis. The empirical results are distributed in the subsequent chapters. More specifically, chapter three provides the description and analysis of the contextual conditions in the host country. Chapters four and five address the selected industrial sectors aiming to describe and analyse the economic and regulatory aspects that have affected the implementation of corporate environmental policies in the subsidiaries. Finally, chapter six complements the theoretical explanations from the previous chapters by addressing the influences of the home countries and corporate management on the subsidiaries' practices.

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[6] The present research is a case-oriented study with a causal-analytic purpose, that is, to produce limited generalizations concerning the causes of theoretically defined categories of empirical phenomena common to a set of cases (Ragin, 1989, p.35).

[7] In broad terms these levels are strictly related to the concept of international and national contexts, as the selected variables are elements of them. National context represents the nation-state and involves not only the idea of a distinct governmental jurisdiction, but also that of a distinct sense of nationality, which is closely related to ethnic and cultural factors. Accordingly, international context is a concept from the political science field, and results from the concept of national political boundaries that divide the world into theoretically sovereign and independent nation-states (Apter and Goodman, 1976).

1.2 - Empirical focus

Brazil (as a developing country[8]) was selected as the host country in order to analyse the implementation of corporate environmental policies. The first point to justify such selection is the reasonable number of TNCs (from the selected countries of origin) operating in manufacturing industries (which are pollution-intensive). This aspect has allowed a margin of manoeuvre in the selection of the companies. Additionally, the focus on TNCs' subsidiaries and not on domestic firms is based on the literature specifically related to Brazil. There is indication that domestic firms are either reactive towards legislation or lack environmental management. Besides this, it is strongly suggested that TNCs will lead the incorporation of environmental management into the Brazilian context (Maimon, 1992b; Neder, 1992; Zulauf, 1994; Gutberlet, 1996).

The second point concerns the United Nations Conference on Environment and Development (UNCED) which occurred in Brazil in 1992. Despite the view that it has not achieved any practical results (Thomas, 1993), or that it has been captured by the TNCs (Sklair, 1995; Bruno, 1992); this event is considered a turning point in matters related to environmental issues. In the Brazilian context (Leis, 1996; Viola, in Ferreira and Viola, 1996; Zulauf, 1994; and Hurrell, in Hurrell and Kingsbury, 1992), this Conference has been able to change the perception of the society regarding environmental issues. According to Keck (1995, p. 418), the preparatory process for the 1992 UNCED "was also an important space for exchange between environmental organizations and other kinds of social movements in Brazil".

Finally, the selection of Brazil is also justified, according to Oyen, "by the fact that the researcher had easy access to data and familiarity" with this country. It derives from the fact that "familiarity with a country provides additional information, increasing the value of the explanatory statements" (1992, p.11).

The criteria followed to select the TNCs' countries of origin may be summarised, as follows: (a) to be among the major countries with foreign direct investment in Brazil (see table 1.1 below); and (b) to have "western patterns" of social-

[8] Some authors (e.g., OECD, 1992a) may classify Brazil as one of the 'newly industrialized countries'. The choice of developing country is specifically to maintain coherence with the literature on TNCs and environmental issues (such as Miller, 1995 and UNTCMD, 1993).

political and economic organization, since some similarity is preferred in order to cope with one of the pitfalls of doing comparative studies, that is, equivalence of concepts. At this point, one comment shall be made, concerning the fact that countries are neither the object of the study nor its units of analysis (Oyen, 1992, p.6). On the contrary, countries are considered as contexts which may have distinct influence on the implementation of corporate environmental policies and practices.

Initially the US and the UK were selected as the TNCs' home countries. Later, during the fieldwork activities in Brazil, Germany was included as the third country of origin. There are specifically two reasons for this decision: (a) former work by the researcher with American and German companies in Brazil (Guedes, 1993) had produced some directions for further research; and (b) German FDI is representative in the chemical and pharmaceutical sectors; the same sectors in which access to American and British companies was secured. In sum, the inclusion of German TNCs could reinforce even further the cross-country scope of this thesis, at the same time that it added more differentiation among the already selected countries which share the same language and historical background.

Considering that most countries are too different to be compared fruitfully, Teune suggests "that selecting of countries ... should be theoretically justified" (in Oyen, 1992, p. 44). This aspect has been looked at more deeply in chapter two (section 2.3 of this thesis). However, the US is the single major foreign investor in Brazil (illustrated in table 1.1). Thus, the behaviour of American TNCs' subsidiaries represents a source of leadership and attention (positive or negative) for society, government and competitors (BNDES, 1988). Nevertheless, Germany and Britain are respectively in second and third position in the ranking of FDI in Brazil per country of origin.

Table 1.1 - Brazil - foreign direct investment stock - 1995* (US$ million)

Country of origin	Total**	Investments	Reinvestments
United States	**18,983 (32.7)**	**15,996**	**2,987**
Germany	**7,054 (12.1)**	**4,779**	**2,275**
United Kingdom	**5,216 (9.0)**	**4,371**	**845**
Japan	**4,475 (7.7)**	**3,581**	**894**
Switzerland	**3,637 (6.3)**	**2,265**	**1,373**
Total* **	**58,083**	**45,504**	**12,579**

Source: Banco Central do Brasil, *Boletim,* 'Investimentos e Reinvestimentos Estrangeiros no Brasil', April 1996. Notes: * position on 30 June 1995, figures in current-cost basis; ** numbers in parentheses indicate percentage of total FDI stock in Brazil; *** total includes all countries with foreign investments in Brazil.

Finally, the contextual variances among the UK, the US and Germany, which point out significant differences in behaviour (as suggested by Hampden-Turner and Trompenaars, 1993) are useful in testing the theoretical framework. These countries are three contexts or examples of empirical data in which to examine the research propositions. In addition to this, Stopford et al. (1991, p. 232) state that the nationality of the firm is an important question for further research in the realm of international relations (rather than in international business). Moreover, the authors affirm that "however great the global reach of their operations, the national firm does, psychologically and sociologically, 'belong' to its home base" (Ibid., p. 233).

The selection of the industrial sectors was initially constrained by the existence of TNC subsidiaries with origin in the US and the UK, as well as by the existence of German subsidiaries later on. Consequently, the choice of the chemical sector was immediately justified by the existence of subsidiaries from the fifteen largest TNCs (in the world chemical industry) in Brazil. These TNCs represent a main source of technology transfer to domestic companies because of their lack of capital to finance the development of technologies (BNDES, 1988).

Another interesting point regarding the chemical sector is the existence of environmental guidelines managed by the industry association. Willums and Goluke (1992) state that the chemical sector has shown itself to be proactive in the adoption of guidelines for environmental improvements (EC, 1997; Smart, 1992). Nevertheless, it must be clear that the chemical sector makes products and employs processes that have major environmental impacts; furthermore some of these impacts have global consequences.

Additionally, there is the chemical industry's dependence on a non-renewable resource (petroleum), although there is no consensus about the limits of the world reserve. Nevertheless, it is also recognized that a more rational use of such resources (aiming to reduce consumption and emission of pollutants) has been adopted by TNCs since the early 70s (EC, 1997; Willums and Goluke, 1992). The structural characteristics and environmental implications of the chemical sector will be further analysed in chapter four.

The selection of the pharmaceutical sector was much more the result of efforts to secure access to TNCs' subsidiaries than a decision taken at random. However it deserves some justification. First, TNCs dominate the Brazilian pharmaceutical sector[9] (Evans, 1974). Consequently, all major world producers have subsidiaries in Brazil (CRQ, 1996). Secondly, this is a sector with potential to cause accidents with environmental consequences (Yves, 1985), mainly due to its involvement with chemical manufacturing and the existence of final consumers. The structure and environmental implications of the pharmaceutical industry will be addressed in chapter five.

It may be argued that the selection of other industrial sectors (e.g., extractive-based industries) could produce more interesting comparisons. As far as any eventual criticism is concerned, it must be noted that the lack of companies (from the selected countries of origin) in the automobile, pulp and paper, mining and petrochemicals sectors in Brazil excluded them. The priority in the selection of case studies was initially placed on countries of origin, secondly on industrial sectors, and finally on companies themselves. It is therefore not feasible to expect this thesis to compare the 'ideal set' of companies. The stratified sample is constituted by a reasonable set of companies, operating in two interesting industrial sectors, but representing the countries of origin responsible for the largest amount of FDI in Brazil.

Nevertheless, the selection of companies (in both industrial sectors) was guided by the following set of conditions: (a) companies producing similar products, that is, operating in the same market segment; (b) companies with production for both domestic and export markets; and (c) companies located in the same Brazilian state. The last condition means that companies are subject to the same state environmental regulation. Consequently, the São Paulo state was selected because it has the strongest environmental agency (Gutberlet, 1996; Zulauf, 1994), and the largest number of private companies in Brazil (table 1.2 illustrates this geographical concentration).

[9] In 1996, foreign companies achieved a participation of 73% in the total sales (based on the 20 biggest companies) of the pharmaceutical sector (Exame, 'Melhores e Maiores', July 1997, p. 11).

Table 1.2 - The location of the private-owned enterprises* in Brazil

(%)

Brazilian states	1973	1995	1996
São Paulo	63.4	52.6	51.2
Rio de Janeiro	20.2	11.8	12.6
Rio Grande do Sul	4.4	7.8	7.8
Minas Gerais	3.2	6.4	7.4
Paraná	2.6	3.8	4.2
Santa Catarina	1.6	4.0	3.8
Bahia	1.6	4.6	3.6
Espírito Santo	0.2	2.2	3.0
Amazonas	0.4	2.6	2.2
Ceará	0.1	0.8	0.8
Other	2.3	3.4	3.4

Source: Exame, 'Melhores e Maiores', July 1997, p. 25.
Note: * sample of the 500 biggest companies, including domestic and foreign.

Apart from concern in selecting the companies, nothing could change the constraints in the empirical reality. Therefore, the final stratified sample differs in some aspects from the criteria previously defined. First, the production from the selected companies is basically destined for the domestic market. Thus, exports from Brazilian subsidiaries (in both industrial sectors) are only a low percentage (less than 10 percent) of total production. Consequently, the assumption[10] that export-oriented companies (mainly domestic) have been facing environmental pressures in industrialized countries will not be investigated regarding TNC subsidiaries. Secondly, the British company (in the pharmaceutical sector) is located in the Rio de Janeiro state. This aspect brought some complexity to the comparison of pharmaceutical cases, due to some specific requirements and characteristics of the state environmental agency.

Additionally, two other conditions were included as stratified sampling procedures (Miles and Huberman, 1994, pp. 27-28). First, is the fact that the selected companies in the chemical sector must be participants of the Responsible Care programme[11]. Secondly, the selected companies (from both industrial sectors) must have

[10] Regarding the Brazilian context, Warhurst (1994) indicates pressures from machinery suppliers in the mining industry; Gutberlet (1996) reports pressures for environmental improvement of the manufacturing process and substitution of chlorine in the paper industry, and for environmental certification (the German *Okotex*) in the textile industry.

[11] The Brazilian chemical industry association (ABIQUIM) adopted this international initiative in 1992 with the name of 'Atuação Responsável' (which is presented in section 4.3.1.3).

a formal statement (similar to a corporate environmental policy) showing their commitment towards environmental issues. This is a practice not widespread among Brazilian (including foreign and domestic) companies (Neder, 1992; Zulauf, 1994 and Gutberlet, 1996). The table below shows all companies that have secured access to their Brazilian subsidiaries (see Appendices - section A.2.1 - for a list of companies that have been contacted).

Table 1.3 - Stratified sample

Industry sectors	Home country - United Kingdom	Home country - United States	Home country - Germany
Tobacco	B.A.T./Souza Cruz	(negative answer*)	(not available***)
Chemical	Zeneca	DuPont	BASF
Pharmaceutical	Glaxo Wellcome	Eli Lilly	Hoechst Marion Roussel
Household & Toiletry	Reckitt & Colman	(negative answer**)	(not available***)

Notes: * Philip Morris was contacted but refused to participate; ** Colgate-Palmolive and Johnson & Johnson have been contacted but refused to participate; *** there was no German company to be contacted in this industrial sector.

1.3 - Importance of the study - a review of the literature on corporate environmental policies and practices

The importance of the study owes much to the fact that TNCs are considered a fundamental actor in the international relations field when the focus is on environmental issues. This position arises from a variety of factors[12] including: (a) their pollution-intensive activities as a consequence of their size and predominance on pollution-intensive industries (UN, 1992a, b; UNCTC, 1985), (b) their economic power in the

[12] Similarly, Andersson (in Folke and Kaberger, 1991, p.239) states that there are at least three arguments for paying special attention to multinationals with regard to pollution in developing countries. They are: (1) "the broad scope of these firms' activities in pollution-intensive industries results in an impact on the environment", (2) "their dominance in technology influences industrial processes, including environmental impacts", and (3) "multinational enterprises function across the boundaries of nation states and are in a position to bargain with individual countries, on issues such as pollution, to an extent which domestic firms are not".

world economy (Ghoshal and Westney[13], 1993; Keohane and Nye, 1981); (c) the political power they represent in the international system (Keohane and Nye, 1981, 1989; Boddewyn, 1988); (d) the potential contribution in solving environmental problems through their capability (on account of high expenditure in R&D) to develop and establish the main technological patterns (WCED, 1987; Caldwell, 1990; Choucri, 1993); and finally (e) their "global reach" (i.e., transnational nature) since TNCs are expected to differ from purely national firms, subject to regulations and practices that vary across countries and because they are forced to make choices between worldwide standardization or national adaptation. Moreover, TNCs are subject to international conventions but are more powerful and less subject to control by national governments and agencies than national firms (Ives, 1985; Levy, 1995).

The investigation of TNCs from industrialized countries in a developing country can be even more interesting because of the often widespread criticisms against their practices in such countries. This is particularly the case in those countries where, according to international NGOs (Greenpeace, 1992; Friends of the Earth, 1992) the TNCs' activities are defined by exploitation of resources and pollution, and, according to Haas et al. (1993), the local authorities are typically characterized by a low pattern of control and regulation. For example, Sklair (in Main and Williams, 1994, p. 97) stresses that some American manufacturers have established *maquilas* (which are responsible for environmental impacts along the Mexican-US border) in order to escape strict environmental regulations (including toxic-wastes regulations) in the US.

The importance of this study may be highlighted by pointing to the lack of studies within the literature concerning the relationship between TNCs and environmental issues as indicated by the authors below. These authors especially advocate the necessity of conducting research to fulfill such gaps in developing countries, in order to assess: (a) the so-called "double-standards", that is, dissimilar practices for environmental protection among home and host countries' production units within the same TNC. A relevant point is that sometimes the 'double-standard' means 'low-standard', not only equitably distinct ones (Pearson, 1985; Ives, 1985; Gladwin, in

[13] Ghoshal and Westney (1993, p. 21) point out that collectively "multinational corporations account for over 40% of the world's manufacturing output and almost a quarter of world trade. About 85% of the world's vehicles, 70% of computers, 35% of toothpaste and 65% of soft drinks are produced and marketed by multinational corporations. A major source of research and development resources, they are an important vehicle worldwide for technological innovation and its diffusion".

Pearson 1987; Castleman, in Pearson 1987; Rappaport and Flaherty, 1992); (b) how local regulations have been evolving and/or how TNCs have responded to them (UNCTC, 1985, 1990); (c) the TNCs' environmental policies and performance (Levy, 1995; Pearson, 1987; UNCTC, 1985), and also; (d) the effectiveness of different forms of international co-operation, that is, the way TNCs respond to codes of conduct, conventions, general guidelines and social campaigns (Gleckman, 1995; Eden, 1994; Frederick et al., 1992; Pearson, 1985; UNCTC, 1985).

Other points on the discussion on TNCs and environment have also been addressed (showing great variance in perspectives). Among the literature closely related to the subject of this thesis is a study such as Pearson's (1985). The author stresses the relevance of environmental degradation in developing countries, and how TNCs can play an important role (positive or negative) through the standards and practices they follow in such countries. The regulatory polices that have been established in host countries, and how they are enforced was also investigated. In summary, Pearson submits a broad picture, where corporations, host governments and international organizations have all taken modest steps to address this question. He argues that some modest advantages could emerge from the adoption of environmental codes at the international level.

In a later study, Pearson (1987) provides case studies that address environmental issues related to TNCs in developing countries. More specifically, Gladwin (in Pearson, 1987, pp. 3-31) has suggested issues that should be considered worthy of further research, as follows: (a) the necessity to investigate TNCs' investments in forestry and agriculture or industries producing polluting products (e.g., motor vehicles, tobacco, pharmaceutical, food, etc.); and (b) the necessity to investigate whether TNCs are truly taking into account environmental concerns when formulating their strategies, projects and products.

In practical terms, the most radical criticism on environmental impacts generated by TNCs are usually from NGOs. Friends of the Earth (1992) examines the lack of TNCs' environmental disclosure and the public right-to-know, mainly comparing the TNCs behaviour in the US and Europe. Greenpeace (1992) stresses the rhetorical character of corporate environmental policies when contrasted with their practices. Nevertheless, there is plenty of literature which strongly criticizes TNCs for their

negligence towards the environment, community and employees. A radical criticism on the "greening" of business comes from Plant and Plant's (1991) work claiming the need for a deeper change in the behaviour of society. Likewise, Sklair (1995, p. 83) states that UNCED (held in Rio in 1992) was captured by TNCs[14] which "successfully blocked any threat to the interests of global capitalism" (an argument originally made by Bruno, 1992). The central point was to avoid any challenge to the assumption that the capitalism system "will ensure unlimited replacement or substitution of resources" (which are considered virtually infinite based on scientific and technological solutions) as they are consumed (Sklair, 1995, p. 82). Accordingly, evidence of their success is that since then waste management has been one of the fasting growing industries.

In broad terms, International Organizations (including their agencies) have looked at the issue of industrial pollution quite differently. First, UNCTC (1985) is focused on the effects of TNCs' activities on the environment in host countries (mainly developing countries), though it is based predominantly on the literature and sources from the US (that is, Gladwin, 1977 and Gladwin and Walter, 1980b). Later, WCED (1987) did undertake a relevant study of the relation between environment and development including multiple-actors' roles, which result in the concept of sustainable development (disseminated worldwide and claimed to be followed by business associations in industrialized countries).

The UN (1994b, pp. 313-314) report has stressed that the liberalization of policies regarding FDI has given enterprises more freedom, which also means more responsibility, including social responsibility. More specifically, this concept implies responsibilities that go beyond meeting minimum legal requirements. However, CEPAL (1991) affirms that the solution for industrial environmental impact implies the transformation of industrial efficiency and changes in the governmental agencies responsible for industrial regulatory policy.

PNUMA (1991) provides an overview of industrial environmental impacts and explains the role of UNEP and its special area of work on industry and environment. Additionally, UNEP (1994) published a technical report[15] on 'company environmental

[14] A group of TNCs was represented by the Business Council of Sustainable Development, which was created in 1990 in Geneva to provide business inputs to this conference.

[15] This is a series from UNEP's industry and environment office which provides information on the issues and methods of environmental management relevant to various industrial sectors.

reporting' to encourage companies to release their environmental records annually (as recommended by the Chapter 30, Agenda 21; that is, the UNCED plan of action on sustainable development). Among the cases reported, three companies (BASF, DuPont and Hoechst) investigated in this thesis are considered pioneers in environmental disclosure.

Additionally, of special interest for this thesis is the discussion that has emerged from institutions representing the international business community, such as the BCSD (Schmidheiny, 1992)[16]. In this study a free trade and self-regulation prescription to environmental issues is addressed, providing a long-term strategy to senior corporate executives on how to incorporate environmental issues into business. ICC (Willums and Goluke, 1992) shows case studies of 'good practices' from a variety of industrial sectors to illustrate the implementation of principles of the 'Business Charter for Sustainable Development'[17]. More recently, DeSimone and Popoff (1997) develop further (in collaboration with the World Business Council for Sustainable Development[18]) the concept of 'eco-efficiency', which has been previously introduced by Schmidheiny (1992). Such a term aims to describe 'business activities that create economic value while continuously reducing ecological impact and the use of resources'.

Sklair (1995, p. 83) goes one step further accusing Schmidheiny of being a 'critical optimist' for his assumption that it is possible to keep 'ever-improving standards of living' if some effort is put into it. Another group is called 'cynical optimists' for their view that sustainable development represents business opportunities. This latter argument is called a 'win-win approach' in the business literature which has been criticized by Walley and Whitehead (1994).

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[16] Walley and Whitehead (1994, pp. 49-50) criticized this work precisely because of the lack of prescription for managers, as it has not answered how environmental protection will be incorporated into everyday business decisions.

[17] This Charter was prepared by the ICC and launched at the Second World Industry Conference on Environmental Management in April 1991. It provides a basic framework of reference for action by individual corporations and business organizations throughout the world (ICC, 1995).

[18] The WBCSD resulted from a merger between the Business Council for Sustainable Development (created by the Swiss industrialist Stephan Schmidheiny to represent business interest in the UNCED) and the World Industry Council for the Environment (a post-UNCED initiative from the ICC, based in Paris, to motivate business towards the implementation of the principles from the Agenda 21). The WBCSD has over 120 individual members and aims to develop closer cooperation between business, government and other organizations concerned with the environment and sustainable development. Besides, it encourages business in the achievement of high environmental management standards (DeSimone and Popoff, 1997, pp. xxii-xxiii).

In reality, the business field has contributed with a profuse variety of studies. It basically started with Gladwin's (1977) investigation about how MNCs incorporate environmental protection into their project planning. Later, Gladwin and Walter (1980b) focused on conflicts related to MNCs and how they respond to external demands from environmental regulation and trends in environmental policy. More recently, Brown et al. (1993, pp. 7-8) have provided a very useful overview of earlier studies regarding hazardous manufacturing facilities in developing countries. This study is focused on three American multinationals establishing industrial facilities in India and Thailand in the 80s.

Additionally, Schot and Fischer (1993) recognize four distinct sets of pressures upon industrial firms. In brief, the authors state that: (1) regulations are becoming more stringent; (2) actions taken by companies have not produced adequate results, thus the public expects improvements in environmental performance; (3) consumers are willing to buy environmentally sound products, and industrial consumers are pressurizing suppliers to enforce environmental requirements; and (4) investors and insurance companies are closely monitoring environmental risk and reputation. It is worth mentioning that this pattern of consumers' behaviour is not widespread. Wong et al. (1995) refuted such an assumption through the investigation of four environmentally sound products in the British market.

In general terms, the business management literature has addressed every single aspect of the "greening" of companies' activities (e.g., Ottman, 1992; Winsemius and Goluke, 1992 and Davis, 1991). Besides, business practitioners (such as CEOs, consultants and EH&S corporate managers) have been sharing their experience on environmental issues (e.g., Monsanto's case, by Stroup, 1988; Union Carbide's case, by Smith, 1990; Dow Chemical's case, by Buzzelli, 1991 and Shell's case, by van Engelshoven, 1991).

Taking an industry perspective, Leonard (1988) explains how and why environmental regulation would alter the prevailing allocation of comparative advantage in the US industrial production, thus investigating the "industrial-flight and pollution-haven" hypotheses to conclude that there is no clear evidence of industrial relocation (an earlier study was made on this subject, that is Castleman, in Pearson, 1987). However, Leonard (1988) is criticized by Eskeland and Harrison (1997) for the lack of effort "to

assess statistically the relationship between the distribution of US foreign investment and pollution intensity". Briefly, Eskeland and Harrison (1997, p. 29) "have found almost no evidence of pollution havens". Otherwise, the authors found that "foreign firms are less polluting than their peers in developing countries". Finally, Sorsa (1994) investigates environmental expenditures and industrial comparative advantages, concluding that such expenditures will not cause changes in comparative advantages.

In a more technological vein, Choucri (1991, 1993) discusses the environmental implications of TNCs' activities, mainly focusing on environmental investments (in oil, chemical and construction industries). The driving forces for environmentally responsible behaviour of companies were identified by Choucri as: (1) the increased acceptance of the "pollution pays principle" in international forums; (2) marketing challenge - including a broader set of companies' activities (not limited to product, but also dealing with public relations due to hostile public, positive image, etc.); and (3) emergence of new opportunities to firms, through the creation of new markets for environmentally sensitive products, technology and services.

Likewise, Cairncross (1995), whose section on the role of industry is illustrative of some driving forces for environmental change, places too much expectation on technological solutions. This assumption leaves companies with more power to define their own sustainable behaviour, and almost no expectation to change behaviour (that could be the counter force to industry power, in economic and technological terms, as suggested by Smith, 1993). According to Commoner (1990, p. 35) the "market is a useful means of facilitating the flow of goods from producer to consumer; but it becomes a social evil when allowed to govern the technology of productions".

Nevertheless, Cairncross (1995) recognizes that some firms can cope alone, without intervention, as they 'genuinely' want to pursue sound environmental policies. Her study is also relevant because of the discussion whether environmental regulations are needed. A counter argument on this issue was made by Porter (1991) and, Porter and van der Linde (1995). Briefly, Porter (1991) has indicated that the core discussion must be concentrated on the kind of environmental regulation not in its existence, suggesting that environmental expenditures can result in higher competitiveness.

Taking into account that Brazil is the selected developing country under investigation, it must be mentioned that few studies have been done there which

explicitly relate to the subject of this research (Pimenta, in Pearson, 1987; Rappaport and Flaherty, 1992; Maimon, 1992b; Neder 1992; Guedes, 1993; Donaire, 1994 and Gutberlet, 1996).

Briefly, Pimenta (in Pearson, 1987) is particularly focused on the evolution of pollution control and legal compliance in the São Paulo state in Brazil (addressed in section 2.4.1 of this thesis). More recent and closely related to this thesis is the study by Rappaport and Flaherty (1992). The authors analyse corporate policies and management systems for implementing EH&S issues in the international facilities of American companies[19]. They provide an overview of Brazilian regulations and the findings for a subsidiary (oil and gas industry) located in Cubatão, São Paulo state (addressed later in section 2.6).

Maimon (1992b) suggests that a case study is the best research strategy to investigate companies' environmental policies in Brazil. This is because the rhetorical character of these policies would be better investigated by in-depth methods, in which the whole process of definition, implementation and evaluation could be checked. In such a case, she suggests investigating TNCs' policies and practices by reason of their insertion in the international system (or transnational mobility according to Levy, 1995), which will result in best environmental protection performance (mainly if compared with domestic firms).

Following some of these assumptions, a study (Guedes, 1993) was made in Brazil[20]. Briefly, its findings suggested that the implementation of environmental programmes in TNCs' subsidiaries are basically accomplished in the long-term, because of the compliance with the Brazilian environmental legislation and the scarcity of financial resources. Additionally, there was no evidence of similar programmes among

[19] According to Rappaport and Flaherty (1992, p.17), "five in-depth case studies of US-based multinational corporations were conducted to understand the complex forces both inside and outside the corporation that help shape the EH&S programmes in different locations around the world". Additionally, a survey of 98 American companies was conducted to gain supplementary information on EH&S practices (see Flaherty and Rappaport, 1991, for details of this survey).

[20] This exploratory study, with American and German subsidiaries operating in the chemical sector, has confirmed the existence of environmental policies and practices in early stages of implementation in Brazil. One American company showed evidence of proactive environmental programmes, though its products were commercialized in the Brazilian domestic market (where environmental awareness was not high, see Carvalho et al., 1995, for details of this case). The German company had more realistic goals, suggesting that environmental improvements will come in the long-term. Finally, another American case assumed a quite reactive posture towards Brazilian regulation. However its products were exported without facing environmental pressures, which can be superficially explained by the fact that this company produces intermediary products (basic chemicals) for other industries (Guedes, 1993).

the subsidiaries. This latter finding led to the argument that the incorporation of environmental issues by these TNCs' subsidiaries was related to: (a) environmental concern (that is, regulatory and public pressures) in the country of origin; (b) environmental awareness in the Brazilian context (that is, regulatory and media pressures); and (c) strategic decisions of individual TNCs when facing new demands from society. It is specifically on these items above that this thesis is investigating causal relationships.

Furthermore, Donaire (1994) investigates the links between environmental concern and social responsibility[21] in the Brazilian context. Similar to the findings of Neder (1992) and Guedes (1993) the author concludes that the incorporation of environmental issues is a consequence of external influences (basically legislation and public pressure). Additionally, he suggests that the line of business (i.e., industrial sector) will influence the degree of environmental commitment.

In many cases, as Maimon (1992a) states, environmental protection is linked to health and safety practices in industries with dangerous processes or inputs (e.g., oil and chemical sectors). Such an assumption was confirmed by Guedes (1993) but has been refuted by Neder (1992). According to Neder (1992) there are few cases[22] (that is, 13 cases among 48 foreign and domestic firms) with EH&S management in Brazil. The common characteristic among these firms is the existence (and attempts towards implementation) of environmental policies in which pollution control integrates the hygiene and safety practices.

Additionally, Neder states that industrial pollution control is due to requirements from the Brazilian legislation (in 58.24 percent of cases from a total of 48 companies). Consequently, it will not produce any improvement in the quality and safety of the work place (that is, environmental control has not improved hygiene and safety aspects in 72.91 percent of cases). In conclusion, Neder (1992) reinforces that federal and state legislation is the main factor prompting pollution control in companies (the secondary

[21] In six case studies, which include three foreign and three domestic firms, operating in chemical, mining, paper, automobile, petrochemical, and food sectors (Donaire, 1994).

[22] Based on an exploratory survey aiming to identify if corporate environmental policies among Brazilian companies were improving workers health and safety. Briefly, the data came from interviews with managers responsible for pollution control in a selected group of forty eight manufacturing companies, operating in nine different industrial sectors (that is, automobiles, spare parts and transport material; petrochemical, chemical, pharmaceutical and hygiene; metal industry and industrial equipment; food and drinks; steel; textile; glass; cellulose and paper; sugar and alcohol).

factors are managerial and technological improvements, pressures from employees, community and headquarters). However, the author has neither explored the potential explanations related to country of origin (in the case of foreign firms), nor those related to industrial sectors.

Similarly, Zulauf (1994, p. 76) says that there are distinct patterns of behaviour among the economic agents in Brazil. First, there are companies with an 'old culture' of exploitation in which environmental concern is an exotic element. In this category the author includes some foreign, domestic and state companies. However, the assumption that MNCs are more environmentally responsible (as a consequence of headquarters' audits) than domestic firms is once again assumed (as it was by Maimon, 1992b).

Second, there are companies with a 'modern culture' which have been incorporating environmental management and the concepts of sustainable development. They usually negotiate with governmental authorities deadlines and technological adaptation or changes in the process. Third, there are companies located in the urban areas with behaviour similar to the 'old culture' category. These companies usually claim that they were initially not installed in urban areas, as a counter argument to complaints from the nearby communities. Lack of space is their major problem, which makes the installation of effluent treatment systems impossible. The environmental agencies' requirements are constantly attenuated by the threat of closure and unemployment. In sum, the solution for these cases has been relocation to industrial areas financed by the high value of their estates in urban areas (Zulauf, 1994, p. 77).

More recently, Gutberlet (1996) has made a comprehensive investigation[23] into industrial production and environmental regulatory policy in Brazil. This study provides an interesting overview to the current situation in the selected states, including the legal requirements and instruments available to enforce them. Additionally, it emphasizes voluntary schemes, environmental certification and the instruments available for environmental management at industry and company levels. The author concluded that the industrial centres in São Paulo are constituted by companies with serious

[23] This study is focused on the states of São Paulo and Minas Gerais and based on primary data from trade unions. Its initial aim was partially fulfilled, therefore eight case studies were added to the data on environmental management (including mining, steel, paper and pulp, chemical companies). Finally, Hoechst and Carbono-Oxypar - a Brazilian-American joint venture - represented the chemical sector.

environmental impacts. Moreover, there are only a few large domestic and foreign firms incorporating environmental management in their production lines.

In conclusion, there are common aspects among these studies regarding environmental management in Brazil. First, the differentiation between domestic and foreign firms is based on the argument that the latter have more advanced practices due to their links with the headquarters. There is generally no empirical evidence of what 'more advanced' represents in operational terms; moreover, the repercussion of such connection with the headquarters is never discussed.

Second, there is a complete lack of explanation grounded in the institutional context of the country of origin when dealing with TNCs' subsidiaries. However, the international context is constantly mentioned as responsible for the "greening" of business. This is mainly because the competitiveness of Brazilian export products is threatened by environmental certification (and consumer pressures) in Europe and the US. In reality, such 'eco-protectionism' is constraining specific export-oriented sectors (e.g., textiles, footwear, and paper). Additionally, the extractive-based sectors are subject to international pressures from NGOs; particularly mining and logging in the Amazon region. In sum, the assumption of international pressure does not identify the sources of pressure or the industrial sectors most subject to these constraints.

Third, the studies rely extensively on secondary data from industrialized countries (basically Western Europe and the US). However, they usually fail to question the applicability of imported concepts regarding environmental management. As well as this, there is some indication that much of the corporate rhetoric launched during the UNCED was incorporated into local business language.

Altogether, the importance of investigating the implementation of corporate environmental policies can be justified by the need to examine the environmental performance of TNCs' subsidiaries[24]. That is, how environmental commitment is turned into environmental practices, which may result in social (e.g., community participation in accident prevention, Frederick et al., 1992) and economic benefits (e.g., rational use of resources, Smart, 1992).

[24] Levy (1995, p. 45) states "despite the evidence that some TNCs are becoming more responsive to environmental issues, there are few systematic data on improved environmental performance" (measured in terms of toxic emissions).

Because it assumes that potential explanations for the adoption and implementation of corporate environmental policies are not only grounded in the economic context (at firm and industry sector levels), but also at the social, cultural and political contexts of home and host countries, this thesis goes further in the development of this subject-area. In the broad sense its scope is very complex, including opposite forces and multiple levels of analysis (Giddens, 1984).

1.4 - The need for interdisciplinarity

The complexity of such discussion is based on the fact that environmental issues are strictly related to local conditions (including ecological, social, political and economic) at the same time that they can generate broader implications (at national, international or global levels). These questions are not easy to investigate (mainly if the purpose is to 'think theoretically' about the causal relations among them, Rosenau and Durfee, 1995). Consequently, the use of multiple levels of analysis (as an analytical tool) is justified by the fact that single level investigation may result in dysfunctional explanations and policy implications. This approach is an adaptation from Strauss and Gorbin's (1990, p. 163) conditional matrix, which means "a complex web of interrelated conditions, action/interaction, and consequences that pertains to given phenomenon" (Ibid., p. 161).

As far as the literature is concerned, it is vital to mention that early studies (such as Gladwin, 1977 and Pearson, 1987) assumed multiple levels of analysis. Consequently, the concern with the external context, when investigating the implementation of corporate environmental policies, implies that environmentally sound behavior on the part of TNCs seems to result largely from external pressures (at the international and national levels). More specifically, environmental practices result from governmental (from home and host countries) coercion rather than from voluntary action (at industry and company levels).

In other words, Gladwin (in Pearson, 1987, p. 22) re-affirms that "environmentally oriented behaviour, is often motivated by external (that is, public policy) rather than internal pressures". Thus, he implicitly recognizes two points: (a) the

limits of unilateral action by TNCs, and (b) the TNCs' responsible behaviour in one regulatory context does not guarantee the same pattern in another. Although Gladwin explicitly included international and national driving forces to analyze TNCs' environmental practices, this point was not extrapolated to explain causal relations in a country specific context.

The research design assumes that both cross-national and cross-industrial stratification is necessary in order to explore the influence of different contextual conditions, as suggested by Gladwin (1977), on the implementation of corporate environmental policies. This thesis has postulated previously that external influences should be considered in the implementation of corporate environmental policy. Therefore, no specific organizational internal variables (apart from the environmental policy itself, and the potential influence from headquarters' strategic decisions) related to TNCs' operations will be under investigation.

More specifically, Rappaport and Flaherty (1992, pp. 131-137) stress that some beliefs and commonsense related to effective EH&S in TNCs are not confirmed by their findings. Among the most obvious are company size and profitability. Internal variables will be investigated in an exploratory and ad hoc way in this thesis. If a particular variable seems to explain the phenomenon it will be further developed. The justification is that such a focus on external pressures was to a certain extent dictated by the current literature.

The literature previously reviewed is evidence of the diversity of approaches towards TNCs and environmental issues. However, only a few of them have been particularly helpful in order to define (and refine) the research question. Altogether, the literature review was a wide-ranging representation of distinct fields (such as international relations, international business, business management and industrial organization to name the most relevant), which rarely share their understanding of either TNCs or environmental issues.

The decision to undertake an investigation with multiple levels of analysis leads to the need for an interdisciplinary approach. The limits of disciplines impose a strong constraint on studies following an interdisciplinary approach. One approach is too narrow to include all variables under investigation, another is broader but not sufficiently developed to include all the explanations for specific cases. Therefore, it is a

difficult task, since the boundaries separating disciplines have been kept for so many different reasons (Kuhn, 1970; Redclift, 1987, p. 7-11) out of the scope of this thesis.

In reality the need for an interdisciplinary approach to investigate TNCs is part of the current debate in international business. Due to the complexity of such organizations, it is difficult to keep the boundaries of discussion within a few perspectives (Sundaram and Black, 1992; Grosse and Behram, 1992). However, the main issue under investigation among the variety of questions related to TNCs' operations - that is, environmental policies and practices - has also justified an interdisciplinary approach. For example, Hurrell and Kingsbury (1992, p. 3) stress that "it is not longer possible to treat ecology and international political economy as separate spheres". And Redclift (1987, p. 3) argues "that political economy and environmentalism each stood to gain from sharing an analytical perspective". This is mainly because the environmental crisis is intrinsically an outcome of an economic crisis.

More specifically, Choucri (in Choucri, 1993, p. 215) states that theoretical perspectives investigating MNCs "can be viewed roughly through three disciplinary lenses ...: (1) international relations analyses in political science, (2) market analyses in economics, and (3) organizational theory in business and management"[25]. But all of them "reflect inherent biases, and none effectively address environment-investment linkages" (the main issues discussed by Choucri, 1993). Additionally, Smith (1993, pp. 4-5) recognizes that the complexity and multidisciplinary nature of environmental problems have conspired for this subject to be neglected by the academics from the business field. In his opinion, environmental concern, like the issue of corporate responsibility, run counter to the dominant business (financial-based) paradigm.

Finally, Rowlands (1995, p. 265) suggests that issues of global environmental politics challenge traditional academic divisions, which seem to require a "multidisciplinary approach". He also argues about the complexity and unexpected results that the adoption of multidisciplinary approach might imply, "even within international relations - a subject that would seem to be a natural home to interdisciplinary efforts". In accordance with this, the elaboration of the framework

[25] Gladwin (in Fischer and Schot, 1993) made a relevant contribution to the explanation of environmental behaviour in industrial firms grounded in organizational theory.

(throughout chapter two) to analyse corporate environmental policies and practices will clarify the need for interdisciplinarity.

1.5 - Limitations of the method

This thesis has no aim to test any pre-existent model because this subject-area has not been developed enough (in terms of explanatory theory-building). Apart from any criticism about the building of general theories from case studies (as suggested by Vaughan, in Ragin and Becker, 1992, p. 175), the propositions of this thesis are related to specific cases, and their limitations must be carefully addressed. As a general result the conclusions will provide some direction for further research, including some assumptions to be tested through the use of other research methods. Consequently, a major contribution of this thesis is that, by attempting to build a theoretical framework to investigate the selected case studies, it will advance the literature concerned with TNCs and environmental issues.

Although case study - as a research strategy - has a set of positive aspects that justifies its use, this strategy is not without critics. According to Yin (1994, p. 1) great care must be exercised "in designing and doing case studies to overcome the traditional criticisms of the method". More specifically the usual criticisms about this method are, as follows: (a) the researcher "has allowed equivocal evidence or biased views to influence the direction of the findings and conclusions"; (b) case studies "provide little basis for scientific generalization"; and (c) case studies "take too long, and they result in massive, unreadable documents" (1994, pp. 9-10).

In Yin's (1994) opinion, these concerns can be overcome if a whole set of techniques are taken into account. For example, the criticism in item (a) - related to the subjective judgments of data analysis - was avoided by concern with the construction of validity. In other words, by the use of multiple sources of evidence as a way to test the quality of empirical data during the data collection process[26]. Miles and Huberman (1994, p. 266) explicitly name it "triangulation". This method is basically used "to

[26] See Appendices (sections A.1.1 and A.1.2) for further explanation on the construction of validity; additionally, see section A.2.2 for a summary of the data sources used.

support a finding by showing that independent measures of it agree with it or, at least, do not contradict it".

Additionally, the patterns of analysis chosen by this thesis are indicated respectively in the data analysis chapters. This point is especially important for explanatory case studies, because of the broader problem of making inferences. That is, the researcher infers that "a particular event resulted from some earlier occurrence, based on interview and documentary evidence collected as part of the case study" (Yin, 1994, p. 35).

However, the more frequent criticism against case studies is directed to this aspect, which is the problem of generalization (as stated in item (b) above) from a study's finding beyond the single case study. The simplest way to solve this is through the use of multiple-case studies because of the "replication logic" (which was adopted by this thesis as part of the research design). In other words, case studies rely on analytic generalization; consequently, it is possible to generalise a particular set of results to some broader theoretical debate, which is not the same as 'generalise' in other case studies (Yin, 1994, p. 36).

The criticism in item (c) can be avoided during the data interpretation, according to Strauss (1990). The author states that all those classical requirements for case study reports (such as, the actors' viewpoint, credence to the author's theoretical argument and reader comprehension) can be achieved by the use of illustrative data, but there should be a careful selection of data. In Strauss's words, the construction of the cases "is relatively simple, since it consists mainly of highly selected descriptive detail put together as a more or less coherent whole, to illustrate one or more theoretical points" (1990, pp. 216-219).

It is relevant to stress that prior knowledge is a relevant aspect in this kind of research design. For some authors this knowledge is required in the data analysis phase (Strauss, 1990, p. 219). For others, it is useful in the selection of suitable cases, and in searching for other sources of evidence through specialised interviews (Hakim, 1992, pp. 64-73). Moreover, Yin states that this prior knowledge is important in defining the components of a research design, in developing the theoretical framework, and for organising the data collection (1994, p. 28).

Another relevant point, in terms of the limits of the study, is the time boundaries that define the beginning and end of the cases. This question was considered because it assists in the definition of the unit of analysis, and in determining the limits of the data collection and analysis (Yin, 1994, pp. 24-25). In this thesis, the data obtained through interviews and direct observations were originated during fieldwork in Brazil (from August to December 1996). Secondary data collection has included documents (published in late 80s and 90s) from the selected companies. Altogether, these data were interpreted as evidence of corporate environmental policies and practices, which is a contemporary phenomenon.

Chapter II - An interdisciplinary framework for the study of corporate environmental policies and practices

In brief, this thesis is clearly under the scope of the pluralist perspective[1] (Hollis and Smith, 1991, pp. 38-39) by way of its focus on TNCs and environmental issues (as both are examples of the transnational relations in world politics, Keohane and Nye, 1981). According to Hollis and Smith, TNCs "are among the rival candidates which seem to be growing in importance and which have no place in the rarefied dispute between systems and states" (1991, p. 199). Besides, corporations are usually treated as units ("black boxes") and their internal organization is not taken into account (an approach that is shared with economic theories).

However, this thesis assumes that the state remains a significant actor despite its vulnerabilities in the face of specific issues and/or non-state actors. This is another claim made by the pluralists (according to Little and Smith, 1991, pp. 6-8); a perspective which rests on a positivist epistemological and methodological foundation (Little, in Smith et al., 1996, p. 83).

In other words, Rosenau (1990) argues that it is necessary to accept that contemporary world politics is bifurcated into the familiar state-centric world described by realists and the less familiar multi-centric world exposed by pluralists. This thesis is following the latter paradigm assuming that is the most useful in the light of what it aims to accomplish. However, one specific issue calls for an inter-paradigm approach as no single perspective has satisfactory addressed it, that is the 'nationality of the firm' (Stopford et al., 1991, p. 232). Besides, it is argued that any consideration of TNCs' environmental practices in a developing country may benefit from a critical theory[2]

[1] Little and Smith (1991, p. 11) have identified three perspectives by imposing a structure on the diverse and conflicting literature on international relations. First, politics of power and security focused on states action and responses in an anarchical international system. Second, politics of interdependence and transnational relations disaggregating both states and foreign policy to reveal interests and coalition within and across states boundaries. And third, politics of dominance and dependence stressing global inequality in face of an international system structured by centre (constituted of rich countries) and the periphery (poor countries).

[2] Brown (in Groom and Light, 1994, p. 58) emphasizes that the "aim of critical theory is the restructuring of social and political theory which involves both challenging positivist approaches to social science and proposing alternatives".

approach, because it represents the North-South interdependence[3]. Altogether, an inter-paradigm perspective is a consequence of the alliance of theory, method and data.

This chapter presents the building of an interdisciplinary framework to investigate corporate environmental policies and practices in Brazil. As mentioned in chapter one, the decision for multiple level analysis justifies the interdisciplinary approach. Accordingly, the first section introduces the theoretical framework to be used in the empirical phase. This framework is further developed in the subsequent five sections, which represent respectively the international, home and host countries, industry and company contexts.

2.1 - Theoretical framework

2.1.1 - Research question and propositions

The research question is:

"Why and how TNCs adopt and implement environmental policies in their subsidiaries in a developing country? In doing so, which are the main factors determining their behaviour?"

The main assumption of this thesis is that the implementation of corporate environmental policies in TNCs' subsidiaries located in a developing country is mainly explained by external variables (UNTCMD, 1993; Rappaport and Flaherty, 1992; and Gladwin, 1977). However, a better understanding of the main assumption may be achieved by the following secondary assumptions:

(1) The implementation of corporate environmental policies in a developing country is expected to be a result of regulation and self-regulation combined. However, the major driving force will have a regulatory nature, in which TNCs' subsidiaries from home countries with strict environmental regulatory policy will have stronger environmental policies. For this reason the TNCs' nationality is regarded as a relevant

[3] Hurrell (1992, p. 136) stresses that environmental issues are important to Latin American countries for a set of reasons. The most important aspect for this thesis, is the question that "global environment is the one area where North-South interdependence is based on solid reality rather than empty rhetoric".

aspect to be investigated. Additionally, the regulatory context of the host country will constrain, in a complementary way, the subsidiaries' practices.

(2) The attempts at self-regulation by TNCs is highly dependent on their affiliation to industrial associations. Such voluntary initiatives are also a result of the industry's characteristics, that is, they depend strongly on whether the TNC is in an environmentally sensitive sector or not. Environmental commitment from industry associations is expected to be stronger in sensitive sectors.

(3) In order to better explain strong corporate environmental policies it may be necessary to add an element of discretion, through headquarters' strategic decisions towards environmental issues. This variable helps to explain why companies may have strong environmental policies, though they are not generating major environmental impacts. In such a case they are neither subject to strict environmental regulatory policy nor industrial attempts at self-regulation on environmental issues. Finally, such discretion will also provide explanations for subsidiaries which present examples of overcompliance towards the host country regulatory policy.

Altogether, the final explanations of the causality in the adoption and implementation of corporate environmental policies in TNCs' subsidiaries are expected to be based on a set of driving forces from the home and host countries, industry and company contexts. This overall purpose will be tentatively accomplished by the articulation of some propositions[4] presented below:

(P1) ***The home country's environmental regulatory policy is the main source of pressure for the implementation of corporate environmental policies in TNCs' subsidiaries.***

(P2) ***The implementation of TNCs' environmental policies includes compliance with the host country's environmental regulatory policy as a minimum requirement.***

(P3) ***If industry associations have environmental guidelines, TNCs' subsidiaries have stricter implementation of corporate environmental policies.***

[4] The propositions (which are applied to all case studies) are the equivalent of the hypothesis in the survey research. They represent plausible explanations for the research question and they direct the attention to elements which should be studied and analysed within the scope of this thesis.

(P4) ***The corporate environmental policies of TNCs' subsidiaries is defined by the headquarters, following a strategy of centralization.***

2.1.2 - Overview of the analytical framework

This chapter encompasses the main theoretical explanations for the adoption and implementation of corporate environmental policies in TNCs' subsidiaries. The framework is based on selected variables, that will be analysed in different contextual conditions by the use of cross-country and cross-industry stratification. Moreover, it is postulated that the assumptions based on industrial sector and country of origin may result in complementary explanations for corporate environmental policies.

According to the literature available, the selected variables are able to explain the implementation of corporate environmental policies. However, such selection has not included all variables that may potentially explain corporate environmental policies. The focus of this thesis is basically on variables that represent the regulatory and self-regulatory aspects of TNCs' environmental policies and practices.

The framework comprises four levels of analysis: international, home and host countries, industry and company-specific explanations. The first level is represented by the pressures from the international context over corporate environmental policies. More specifically, it is represented by pressures from international organizations, environmental NGOs and international business associations (such as the ICC and BCSD). Overall, this is the recognition of the influence that international forces have on the implementation of corporate environmental policies in the host country (though it has not resulted in a formal proposition to be verified in the empirical phase).

The second level is concentrated on the influence that may be exerted by the national context of the home and host countries. The research design, including TNCs' subsidiaries from distinct origin is suggestive that the nationality of the firm is part of the explanation. Such an assumption is basically grounded on the fact that TNCs' headquarters are home-based, which makes them susceptible to influences and pressures from the contexts of the countries of origin. It is therefore expected that environmental

regulatory policy will be the major source of pressure on TNCs' practices. In addition to this, TNCs' subsidiaries are faced with similar pressures in the host country context, where the implementation of corporate environmental policies takes place. For that reason, compliance with the environmental regulation is a key aspect under investigation.

The industry sector represents the third level of analysis, which has two contexts - the international and the Brazilian. At this stage the most relevant aspects to be investigated have an economic nature. That is, this study considers whether the structural characteristics of each industrial sector shape the corporate environmental policies. Furthermore, attempts at self-regulation by industry association (such as in the chemical industry) may represent a strong source of influence on TNCs' practices.

Finally, the fourth level of analysis is concerned with the discretion that TNCs (at both headquarters and subsidiary levels) may exercise by the adoption and implementation of corporate environmental policies. This analysis investigates whether headquarters and subsidiaries have room for manoeuvre in choosing which environmental management approach to be incorporated, or if they are mostly constrained by external pressures (which are represented by the previous levels of analysis).

2.2 - International context

The present section will concentrate on two main perspectives within international relations theory. First it will address issues from international politics of the environment aiming to demonstrate increasing concern about environmental issues in the last decades and its effects on TNCs' activities. Secondly, it will discuss the relationship between states and firms grounded in international political economy. From such a perspective the collective action from TNCs as well as the lack of environmental concern in the literature will become clear.

2.2.1 - International politics of the environment

This item will address the emergence of the environment in the international agenda, including a summary of major perspectives which are related to the main issues under investigation (i.e., corporate environmental policies and practices in a developing country). By way of conclusion, it will provide an overview of the increased public concern with environmental issues in the international context and its consequences on TNCs' policies and practices.

The development of international environmental politics has taken place under the auspices of the United Nations (UN) in the postwar period (Miller, 1995, p. 5). Until the 1960s the focus was on nature protection and to a lesser extent on the conservation of natural resources. Environmentalism[5] first caught the public imagination in the 1960s and early 70s. According to Miller (1995, p. 6) the "environment moved from being the concern of a few scientists, administrators, and conservation groups to being the focus of a mass movement that affected much of the industrialized world". Since then it has been investigated as both a 'new' social movement (Yearley, in Redclift and Benton, 1994) and as a political ideology (Dryzek, 1997).

It is at this stage that "the public began to pressure governments to address issues of pollution and resource mismanagement" (Miller, 1995, p. 6). At the international level the main event was the United Nations Conference on Human Environment (or Stockholm Conference) in 1972, as a result of efforts to place the protection of the biosphere on the international agenda (based on increased scientific knowledge on human impacts on the environment).

It is relevant to note the absence of the international business community and NGOs among the participants of the Stockholm Conference. However, at this event developing countries began to play a role in determining the international environmental agenda by pushing for changes in the conference focus (from environmental problems that characterize the affluence of developed countries to issues of interest to developing countries, Miller, 1995, p. 8).

In the 80s, a number of accidents (such as Bhopal in India, the Chernobyl explosion and the Exxon Valdez oil spill) generated a strong response in terms of

[5] See McCormick, 1989, for an interesting account of the history of the environmental movement from its emergence until late 80s.

environmental concern. Miller (1995, p. 37) says that "criticism of the environmental consequences of the corporate culture grew during the 1970s and the 1980s" until TNCs could no longer deny their connection to environmental degradation. Accordingly, TNCs "launched a public relations campaign that adopted the language of the environmental movement". However most striking was that they claimed to be helping developing countries to achieve sustainable development. Miller (1995, pp. 35-36) stresses that TNCs are major environmental actors; therefore, they may influence the adoption and enforcement of environmental regulation in developing countries as a result of negotiations to attract more foreign investments.

Over the same period, more scientific evidence supported the existence of global environmental issues (such as ozone depletion and climate change). In this regard the report from the Brudtland commission (WCED, 1987) is considered a turning point for its analysis and conclusions linking environment and development. Moreover, it stressed the necessity of economic growth in the developing world in order to solve the degradation generated by poverty. Hurrell and Kingsbury (1992, p.3) state that sustainable development[6] "has become a global issue both because of the high levels of economic interdependence that exist within many parts of the global economy and because it raises fundamental questions concerning the distribution of wealth, power, and resources between North and South".

In this context, the UNCED was held in Brazil in 1992; however the different agendas for industrialized (e.g., focused on ozone depletion, global warming, acid rain and deforestation) and developing countries (stressing the links between environmental protection and economic development) persisted. What was new was the presence of large number of representatives from NGOs, a number of world business representatives[7] and full media coverage (Miller, 1995, p. 9). However, the conference resulted in new international treaties on climate and biodiversity, a statement on forests (Rio Declaration) and an action plan on sustainable development (Agenda 21).

It is possible to identify the involvement of multiple actors (e.g., international institutions, nation-states, NGOs, and TNCs) in international environmental politics in the late 90s. However, the importance of multidimensional economic, social and

[6] See Redclift (1987) for a critical analysis on the concept of sustainable development.
[7] See Bruno (1992) for a critical view on the role played by business association (such as ICC and BCSD) in the UNCED.

ecological interdependence was stressed by Keohane and Nye (1989, p. 4) in the mid-1970s. These authors also argued for international policy coordination on ecological issues, but suggested that cooperation on such issues would be difficult (Ibid., pp. 33-35). One of the conditions of complex interdependence stated by Keohane and Nye (1989) is the multiple channels of contact among societies; in such a group the TNCs are significant both as independent actors and as instruments manipulated by governments.

Hurrell and Kingsbury point out that global environmental management demands high levels of cooperation and policy-coordination among states. Therefore, it poses a politically sensitive challenge "because it involves the creation of rules and institutions that embody notions of shared responsibilities and shared duties" (1992, p. 6). As well as this, it has implications at both domestic and individual levels. The solution, in the authors' opinion, is based on both international negotiations and agreements, and reform at the domestic level.

However, states are not alone, as companies play a relevant role "in determining how environmental problems are defined and dealt with by governments" (Ibid., p. 10). Additionally, it is stressed that the diffusion of "green thinking" through the global media, which is informed by environmental NGOs, is an aspect of environmental politics insufficiently studied. Nevertheless, the inter-state agreements remain the 'centrepiece' of international efforts to deal with global environmental issues (the table below illustrates some of these international agreements).

Table 2.1 - Selected multilateral agreements

Year		Agreement	US	Germany	UK
1985	Vienna	Convention - Protection of the ozone layer	R	R	R
1987	Montreal	Protocol on substances that deplete the ozone layer*	R	R	R
1989	Basel	Convention - Control of transboundary movements of hazardous wastes and their disposal	S	R	S
1992	Rio de Janeiro	Convention - Biological diversity	S	R	R
1992	New York	Framework convention on climate change	R	R	R
1997	Kyoto	Convention - Climate change	S	S	S

Source: Adapted from OECD, 1996, pp. 258-261. Notes: S = signed and R = ratified; * this protocol was amended in 1990 and 1992.

Consequently, there are many studies which concentrate on international environmental regimes (e.g., Young, 1989 and Young and Osherenko, 1993). Other approaches to global environmental politics have also focused on the formation and evolution of environmental regimes (Porter and Brown, 1996; Haas et al., 1993; and Rowlands, 1995). However some have included other aspects of the discussion, such as Miller (1995) who investigates the role of the 'Third World' in environmental politics and how these countries have attempted to modify environmental regimes[8].

Additionally, a recurrent issue in the discussion of international politics of the environment is the weakness of states to cope with international agreements that aim to solve global issues. Nye (1990) identifies this state weakness as one of the most important barriers to find solutions to such so-called new security issues such as drugs or the environment. Additionally, Hurrell (1991, p. 205) suggests that the capacity of the state will remain as one of the most important aspects of environmental management (specifically making reference to the Brazilian case). Accordingly, "there is at least an argument that better environmental policy means more rather than less state involvement" (Ibid., p. 214).

Haas et al. (1993) have analysed the effectiveness of international environmental institutions[9]. Their findings are relevant due to their recognition that multiple-actors' involvement in environmental problems is essential when searching for solutions. The authors explicitly state that nation-states are part of any solution, as well as environmental NGOs and private corporations. In principle, they seem to be optimistic about the results achieved through cooperation among states. At the end they recognized failure in the cases[10] of pesticides, population, and fisheries. It is relevant to emphasize that the failure on pesticides and population have major implications for developing countries.

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[8] According to Miller (1995, p. 10) the realist paradigm (based on conflict and competition among states, when pursuing their self-interests and power) assumes that industrialized countries hold the preponderance of power, and consequently developing countries have little or no influence on the formation of environmental regimes.

[9] See Hurrell and Kingsbury (1992) for an analysis of the role of major international institutions (e.g., UN, World Bank and European Community) in the management of environmental issues.

[10] The seven issues covered by Haas et al. (1993, p. 6) are: oil pollution from tankers, acid rain, stratospheric ozone depletion, pollution of the Baltic and North seas, mismanagement of fisheries, overpopulation, and misuse of agrochemicals.

More specifically, Haas et al. (1993, p. 7) affirm that environmental actions in developing countries are guided by international institutional pressures. However, the effectiveness of international environmental institutions is based not only on the traditional abilities of governments to make and enforce law and regulations, but "also on the ability of actors in the civil society to play an effective role in policy making and implementation" (Ibid., p. 20).

It is exactly these aspects that explain the lack of effectiveness in environmental protection in developing countries. According to Haas et al. (1993) this happens because "governments have often been unable either to understand or to regulate the impact of their citizens and industrial enterprises on the natural environment". Besides this, civil society in these countries is not organised by groups that could generate information and criticism on environmental degradation.

Contrary to Haas et al.'s (1993) assumption above, Miller (1995) has indicated that though the majority of environmental NGOs were based in industrialized countries, the number of such NGOs based in developing countries has been growing. Despite the fact that these NGOs have not acquired the international influence of industrialized countries-based NGOs, they have been able to influence domestic policies and their governments' decisions on international environmental politics. Likewise, Princen and Finger's (1994) study is illustrative of how NGOs have been spreading in developing countries since the early 1980s, including a broad set of interests from environmental to human and women's rights.

The Amazon deforestation is a good example (as well as the case of rubber tappers in the Acre state in Brazil, Keck, 1995, p. 411) of the relevant role played by transnational groups of ecologists and campaigners in the international pressure exerted on the Brazilian government. It is recognized that deforestation became an international political issue only because of the campaigning from these groups. However, it must be said that systematic study on environmental NGOs and their influence in Latin America is rare (Hurrell, 1991, p. 211).

Miller (1995, p.38) has identified that the influence of environmental pressure groups comes from their ability to call upon a strong core of public support, as they attempt to affect national and global environmental politics. Although their strategies vary from traditional lobbying to confrontational tactics, two other factors contribute to

the strength of pressure groups: (a) their constitution in network forums for data gathering and dissemination, and (b) the fact that they act independently of nation-states, which enhances their credibility.

Additionally, Miller (1995, p. 11) says that due to increasing economic and ecological interdependence (the former acts as a constraint on developing countries' influence on international environmental politics, but the latter can provide room for manoeuvre in some contexts), IGOs and NGOs have been crucial in integrating the developing countries into the world system. Nevertheless, the interests of IGOs and NGOs are likely to be more consistent with those of the industrialized countries than they are with those of the developing countries (Ibid., p. 47). Regarding environmental NGOs, Princen and Finger (1994) state that their activities are usually focused on specific environmental problems (e.g., based on selective environmental issues - the use of pesticides, ecosystems - tropical forests, or geographic areas - the Antarctic and North Sea), which has kept their activities within feasible limits.

2.2.2 - Nation-states and transnational corporations - from individual to collective actions

This section will discuss the relationship between states and TNCs from the perspective of international political economy (IPE). It aims to address the collective action engineered by firms in order to face pressures from national governments. The IPE perspective seems to be appropriate to address TNCs practices, as it is impossible to separate political issues from economic issues, or to consider only the relationship between nation-states[11]. Strange (1994, p. 80) states that the "nature of the global production structure has become increasingly dominated by international business", which is the "combined result of state policies and of market trends, of management strategies and changing technology".

Additionally, Hurrell and Kingsbury (1992, pp. 3-4) state that environmental politics must be incorporated into the IPE discussion, because the "institutions that matter most are not specifically 'environmental', but rather are the core institutions that

[11] See Stubbs and Underhill (1994, pp. 18-38) for a overview of the central questions and premises of the discipline of international political economy and its distinct theoretical perspectives - realism, liberal, neo-realism and Marxist.

govern (or at least seek to govern) the workings of the world economy" (such as the World Bank, the IMF, the WTO, and to some extent the OECD).

In this regard, Redclift (1987, p.78) examines the dimensions of the global environmental crisis from the perspective of IPE, arguing that the process of development cannot be divorced from the historical evolution of the international economic system. The author argues that the structure of the international economy is partly responsible for the worsening condition of local environments in many parts of the South. The pressure to achieve more economic growth, orientated to external demands in a period of indebtedness, had served to deepen the crisis afflicting the local economy in many areas (see Newfarmer, 1983).

Moreover, Glover (in Stubbs and Underhill, 1994, p. 285) stressed that "the difficulties encountered in introducing environmental concerns into international forums highlight the lack of congruence between existing institutions and the problems with which they must deal". Nevertheless, such attempts[12] reflects "a growing awareness of ecological interdependence and the global ramifications of national environmental practices".

Overall, there are some limitations to applying IPE to investigate environmental issues. First, there is precisely the lack of explanations for environmental issues. Second, the core focus of IPE on market-related issues has meant that sociological implications of states-firms relationships are not often included. However, Stubbs and Underhill (1994) have made progress on the political, social and environmental aspects of IPE. So far, Strange (1994, p. 18) has defined IPE as "it concerns the social, political and economic arrangements affecting the global system of production, exchange and distribution, and the mix of values reflect therein".

In sum, it is argued here that corporate environmental polices and practices are not fully explained by economic and political arguments (which are certainly state-centric). Sally (1994, p. 163) is quite clear on this aspect arguing that "political economy continues to be 'state-centric', overwhelmingly concentrating on the role of 'government' in both domestic nation-state and international economic affairs".

[12] Mainly on a rhetorical level, as the Final Act of the GATT accord of December 1993, creating the WTO, made reference to the objective of sustainable development; the International Tropical Timber Organization has a mandate to promote sustainable production methods; and finally the BCSD, which 'proved to be a useful forum' during UNCED, should have a role to play (Glover in Stubbs and Underhill, 1994, p. 286).

Consequently, "one of the fundamental defects of contemporary political economy is the neglect of the individual enterprise in national and international affairs".

Additionally, this thesis assumes some discretion from the host country's government and TNCs' subsidiaries in developing countries, which requires the structural approach to be supplemented. Besides, most IPE approaches (with the exception of Stopford et al., 1991) consider corporations as "black boxes" (Sally, 1994, p. 164), excluded from the investigation of organizational related variables. Consequently, research aiming to explain relationships that take place within country and organization levels will necessarily require additional perspectives. Finally, IPE lacks investigation on either the nationality of the firm (as suggested by Stopford et al., 1991, p. 232) or social and cultural issues that could explain the behaviour of states and TNCs in the 'transnational market economy'.

Stopford et al. (1991, p. 211) states that TNCs, though indispensable allies for governments, are "competing for world market shares as a means to wealth and survival" (which may result in both cooperation and conflict). The theoretical framework (based on the so-called 'triangular diplomacy') elaborated by Stopford et al. (1991) is useful for this thesis by way of its focus on the interdependence between states and firms, emphasizing that states have to negotiate with foreign firms, firms with firms, and more traditionally states with states. Such an approach is quite interesting and unusual through its combination of IPE and international business literature. Furthermore, it recognizes the importance of TNCs in host countries, especially developing countries (Ibid., p. 204).

Regarding TNCs in developing countries other contributions were made on what is called the political economy of North-South[13] relations. Miljan (1987) stresses that the "TNCs' command over economic resources and their enviable possession of managerial skills and technology provide them with a unique opportunity not only to influence the process of socio-economic development in host-countries, but also to imprint patterns of international relationships on host economies" (Ibid., p. 252).

[13] Marchand (in Stubbs and Underhill, 1994, p. 296) has addressed the North-South relation providing an historical account and questioning the future usage of this concept.

Although Stopford et al. (1991) did not focus on environmental issues[14], two references are made which may produce some insights for future explanations of corporate environmental policies. The first reference is focused on the environmental impact of new projects and how both firms and governments measure the benefits from projects. In the authors' opinion, "the firm makes calculations in terms of the global return; the government looks only at the local effects" (Ibid., p. 151). In the end, the firms' environmentally concerned decisions[15] are not considered as "philanthropy, but good commercial sense". However, neither the meaning of commercial sense, nor other factors (such as pressures from environmental groups) that could explain firms' decisions are clear.

Stopford et al. (1991) illustrate state's decisions with the Brazilian case. Brazil is mentioned as a country that has accepted "less than the best international standards for pollution control" due to the rush to industrialize[16] (in reference to the petrochemical complex of Cubatão[17], São Paulo state). The authors conclude that "good practice can only be established in partnership between firms, governments and international regulatory bodies ... Both firms and governments thus have a strong incentive to work together to find solutions" (Ibid., p. 154).

The issues that demand such partnership vary in content and context, and also seem to be dependent on other variables (outside firm's and government's scope of actions). Consequently, what Stopford et al. (1991, p. 154) called "firms' responses to pressure" could justify an investigation on corporate environmental policies that is

[14] A more radical criticism is made by Choucri (in Choucri, 1993, p. 220), when she states that "to date *all* theories of the MNCs ignore the impacts of corporate activities on the natural environment and on ecological balances. Indeed, the term 'natural environment' is never cited in the indexes of volumes on the multinational corporations or international political economy".

[15] Two interesting examples are provided, as follows: (a) Shell's experience in developing an oil field in partnership with the Gabonese government assuming an environmental impact study, and (b) B.A.T's Kenyan subsidiary supports to tobacco suppliers that maintain the reforestation process to produce the timber to cure the tobacco (Stopford et al., 1991, p. 153).

[16] A valid discussion on development styles and an alternative development model for Latin America is made by Redclift (1987, pp. 96-102), in which two main trends have been identified. First, is the promotion of industrialization for the internal market, and second, the attempt to achieve development through the export of primary goods, resulting in the depletion of natural resources and maintenance of the dependence on the world system.

[17] In early 1980s the Brazilian federal government intervened with an emergency plan that obligated all companies in this area to adopt pollution control activities; since then the local authorities have been using their power and resources to reduce pollution. According to the Financial Times (6 June 1996, p. 5) Cubatão (which concentrates 16 percent of Brazilian heavy industry) accomplished a clean up programme backed by US$ 400 million on loans from the Inter-American Development Bank and the Brazilian Development Bank.

focused on 'external pressures', and not only on 'firms' commercial sense'. Moreover, this thesis works on the assumption that companies are not incorporating environmental protection voluntarily (Gladwin, 1977; Neder, 1992; Gladwin, in Pearson, 1987; UNTCMD, 1993).

The second reference to environmental issues comes from the discussion that governments, as a group, have lost bargaining power to TNCs as a consequence of the intense competition for wealth among states. More specifically, TNCs, as a group, can exercise considerable influence over government choices, and their collective action may produce or influence some international standards. Stopford et al. (1991, p. 216) state that "through such representative bodies as the ICC, firms also play a central role in shaping international standards on a wide range of issues, from bilateral tax treaties to environmental standards". In the specific case of ICC (which has observer status at the UN, where it lobbies on behalf of international business[18]) the issue of whether the principles for sustainable development established in 1992 with the support of major TNCs have been implemented and/or evaluated deserves investigation.

Gleckman (1995) argues that TNCs had never acted as a group on environmental and development issues before the UNCED in 1992. They have no institutional history, no established leadership or methods to reach consensus. Gleckman states, calling attention to business associations (such as BCSD, ICC and trade associations), that since UNCED, some principles were defined to incorporate environmental concerns into companies' activities. In contrast there is no organization that is the legitimate representative of TNCs on any subject. In other words, business associations cannot make agreements on behalf of TNCs, but they can try to influence governments and international forums. In the author's opinion, TNCs play two conflicting roles: at the same time as publicizing their "global reach", they deny that their collective action could have negative consequences or power to influence events.

In conclusion, Gleckman (1995) stressed that national governments are crucial for the control of environmental activities of TNCs. Accordingly, environmental laws

[18] Eden (1994) has stressed the manipulation by ICC on the definition of the concept of sustainable development. It is clear, by the author's statement, that ICC's debate on sustainable development emphasizes growth with shallow environmental concern (based on technical and market-responses). Thus, there is no tension with the dominant business paradigm (finance-based). Eden calls attention to the power of business lobbying internationally, and consequences of this lobby at United Nations Commission for Sustainable Development. It somewhat answers the question set up by Gleckman (1995) about who will define the sustainable behaviour of TNCs.

and regulations in the home country are the single motivating factor for the establishment of a global environmental policy by TNCs. While on the contrary, in the international arena, the battle for the definition of an acceptable international corporate behaviour (including standards for environmental disclosure) has not finished (though the attempts to establish codes of conduct for TNCs by the OECD and the UN[19] have failed according to UNCTC, 1985, p. 82).

2.3 - Home country context and its implications

2.3.1 - Nationality of the firm

Considering everything that has been discussed in the previous section, it is appropriate to stress two points: (a) the notion that TNCs have a political element (Boddewyn, 1988) that may be dichotomized into collective (through business associations without legitimacy to take decisions for them) and individual actions; and (b) the TNCs' embeddedness in their external context in relations with other actors (Sally, 1995). According to Sally (1995, p. 206) "it is precisely this area of interaction between multinational enterprises and other actors, which affect both the competitive advantage of the firms, the competitiveness of the economies in which they do business, and variables of relative power and policy choice".

Following such a pattern of analysis on government-firm relationships, another important question arises: how does such interaction take place for environmental issues? It is usually through a regulatory policy that governments define the standards for industrial pollution control. In fact, one of the assumptions of this research is that governments (even in developing countries) have the capabilities (power, interests, and other resources) to intervene into other actors' activities. At the same time, these actors will try to influence governments' decisions.

[19] Miljan (1987, p. 252) states that the apprehension on the part of Asian, African and Latin American members of the UN on the capacity of TNCs "to influence political decisions, pattern of consumption, changes in culture, the direction of production and trade" resulted in the establishment of the United Nations Centre on Transnational Corporations. This centre was maintained from 1975 to 1992 and became the Transnational Corporations Management Division of the UN Department of Social Development (from 1992 to 1993). Now it is the Programme on TNCs at the UNCTAD. Finally, a critical discussion of the political, social and cultural impacts of TNCs in developing countries is made by Sklair (1995).

The UNTCMD (1993) has indicated that "the nature of the regulatory environment in the home country of the corporation explains variations between regions [in this case among Europe, North-America and Asia] in the nature of environmental, health and safety management practices". However, it must be clear that the regulatory policy has a national sphere of influence. This means that environmental regulatory policies from the home countries are not expected to have any kind of coercive effect in the host country context. Gladwin (in Pearson, 1987, p. 23) states that the likelihood of any attempt by TNCs' home countries to extend their environmental regulations extraterritorially is rather low in view of diplomatic matters. On the other hand, criticism has been made regarding the mimicked behaviour of developing countries[20], which formulate their environmental regulatory policy[21] based on industrialized countries' experiences.

Nevertheless, the regulatory policies of TNCs' home countries may be indirectly present in host countries. The UNTCMD's (1993, p. 93) survey has found that the EH&S practices of TNCs in developing nations reflect the home region of the corporation. Birdsall and Wheeler (1993, p. 137) state that the combination of trade liberalization and increased foreign investment in Latin America have not been associated with pollution-intensive industrial development. However, the extraterritoriality of standards will take place, because for multinationals the cheapest way to meet the threat of future regulation is to adopt the standards prevailing in their home countries (Ibid., p. 142).

According to Stopford et al. (1991, p. 233-234) it is exactly over "the relation of national identity and corporate identity that conflict has arisen in international relations concerning the management of international trade and investment". Besides this, relation is closer in some states than in others, which affects the competition between states for market shares (at home and abroad).

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[20] For example, Monosowski (1989) criticizes the Brazilian environmental policy for the lack of prior studies to assess the characteristic of the local ecosystems, and the importation of American standards (for emissions of industrial pollutants) which were adopted in late 70s.

[21] The UNCTC report (1985, p. 23) affirms that few studies have gone much beyond the conceptual level in trying to define international differences in assimilative capabilities of the local environment. Therefore, the assumption that developing countries may enjoy a greater supply of assimilative capacity of pollution is controversial. Nevertheless, it is suggested that environmental quality levels, and corresponding policies to achieve them in any nation, will be a joint function of environmental assimilative capabilities and preferences of environmental quality expressed. Finally, the higher environmental awareness in industrialized countries, translated into environmental regulatory policies, was found to be correlated very strongly with per capita income.

More specifically, Buckley and Casson (1991, p. 101) have found evidence to support the hypothesis that the 'nationality of the firm' is a very significant influence on the behaviour of MNEs. In addition, Sally (1994, p. 170) indicates that the MNE is an institution embedded in an array of different institutional environments. Such a perspective implicitly recognizes that nations have "different models of institutional expression and capitalist operation".

The evidence to support the differences on the political culture of environmental politics[22], comes from O'Riordan's (1981) study. The author states that it will "vary with the traditions, customs, institutions, and other cultural attributes of a political community" (Ibid., p. 230). For example, there are differences in terms of the political culture of environmental politics between the UK and the US, notably in relation to political participation, administrative and/or authority's behaviour, decision making processes, and the role of environmental law. Likewise, Vogel (1986, p.21) says that apart from "common roots of their political and legal systems", American and British approaches to environmental regulation differ from each other (see tables 2.2 and 2.3 for selected legislation in the US and the UK).

Table 2.2 - Selected environmental legislation - United States

Year	Act
1947	Federal Insecticide, Fungicide and Rodenticide
1966	Freedom of Information
1969	National Environmental Policy
1970	Clear Air (amended in 1977 and 1990)
1972	Clean Water (amended in 1977 and 1981)
1975	Hazardous Materials Transportation (amended in 1976)
1976	Toxic Substances Control
1976	Resource Conservation and Recovery
1977	Soil and Water Resources Conservation
1980	Comprehensive Environmental Response, Compensation and Liability ("Superfund" - amended in 1986)
1986	Emergency Planning and Community Right-to-Know (Title III of 1986 Superfund amendments)
1990	Clear Air Act Amendments
1990	Pollution Prevention
1990	National Environmental Education

Source: OECD, 1996b, pp. 32-34.

[22] See Vogel (1986) for further details on the national styles of environmental regulation in the UK and the US.

Table 2.3 - Selected environmental legislation - United Kingdom

Year	Act
1956	Clean Air (consolidated in 1968 and 1993)
1974	Control of Pollution
1974	Health and Safety at Work
1985	Food and Environment Protection
1989	Water
1990	Environmental Protection
1991	Water Industry
1991	Water Resources
1992	The Genetically Modified Organisms (Deliberate Release) Regulations

Source: OECD, 1994, p. 27.

Additionally, Vogel (1986, p. 27) states that the American style of regulation represents a model to which environmentalists, consumer and trade union activists from industrialized countries would like their nations to follow. For example, the politics of pollution control and conservation in Germany are similar to the US (in the late 60s and early 70s). Moreover, the German government has enacted standards that are now the strictest in Europe (see table 2.4 below).

Table 2.4 - Selected environmental legislation - Germany

Year	Act and Ordinances
1957	Water Management Act
1972	Waste Disposal Act
1972	DDT Act
1974	Environmental Statistics Act
1976	Wastes Water Charges Act
1976	Energy Saving Act
1980	Chemical Act
1980	Hazardous Incidents Ordinance
1982	Sewage Sludge Ordinance
1986	Hazardous Substances Ordinance
1986	Waste Avoidance and Management Act
1987	Origin of Waste Water Ordinance
1990	Environmental Impact Assessment Act
1990	Environmental Liability Act
1991	Prohibition of CFCs Ordinance
1991	Packaging Waste Ordinance

Source: OECD, 1993b, p. 25.

In short, the US is considered to be a particularly advanced society in terms of environmental awareness. It is said to have created a complex environmental regulatory policy against industrial pollution (DiMento, 1986), and has encouraged widespread public participation through NGOs (Princen and Finger, 1994). O'Riordan's affirms that grass roots activism is part of the American political scene. Therefore the politicization of environmental activism is considered a normal outcome of American culture. The environmental pressure groups were numerous, and to be effective they usually had to adopt the politically successful tactics of the resource development agency (1981, p. 231).

The UK is said to have loose active participation, if compared with the US. Nevertheless, it is recognized as a country with high standard of environmental regulatory policy, consumer and public environmental concern. More specifically, Vogel (1986, p. 19) stresses the long history of British concerns for the quality of the physical environment and with air pollution. O'Riordan has indicated that amenity organizations have been present on the Britain scene since the last century. However, those organizations "are so embedded in the political fabric (and because many of them are patronized by leading public figures) that activism in the sense of grass roots participation is less common" (1981, p. 231).

The institutionalization[23] of environmentalism within the state apparatus started in early 1970s, when the Department of the Environment (in the UK) and the Environmental Protection Agency (in the US) were created as bodies responsible for the formulation and implementation of policy on environmental issues. Dryzek (1997, p. 138) recognized that in the 70s "most of the environmental policy innovations were made in the developed English-speaking countries, especially in the US, and then copied elsewhere".

Despite the pressure from public opinion and environmentalists to such institutionalization, the business community was quite responsive to the notion of national regulation. According to McGrew (in Smith, 1993, p. 15) "industrialists recognized that environmental policy could not be formulated without their expertise and that a uniform set of national regulations would provide a 'level playing field' for all businesses as opposed to a proliferation of local controls".

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[23] See McCormick (1989) for an overview of the emergence and institutionalization of environmental policies in the industrialized countries.

Over the same period, in Germany a governmental environmental programme was organized; however the responses during the 70s were regarded as poor, which motivated the emergence of a new Green Party (*Die Grunen* in 1979), which elected representatives to the *Bundestag* in 1983 (Ibid., p. 16). Dryzek (1997, p. 137) states that Germany has turned in the most successful environmental policy performance in the 1980s and 1990s (the other best cases are Japan, the Netherlands, Norway and Sweden). In Germany, the adoption of the precautionary principle (which became law in the 80s) for guiding the policy "specifies that scientific uncertainty is no excuse for inaction on an environmental problem".

The Green Party has played a key role in German policy development, "mostly by forcing other parties to adopt green positions and policies for fear of losing votes" (Ibid., p. 140). However, the uniqueness of the German context (when compared to the UK and the US) "is a political-economic system where consensual relationships among key actors prevail" (Ibid., p. 141). Nevertheless, it has taken some time for environmentalists to convince the corporatist state of the incorporation of environmental values and the promotion of ecological modernization.

Another crucial difference, between the US and Britain, is related to public access to information from the authorities. In Britain this is not an automatic right, where the regulatory policy making is executed by a selective consultation with particular interests. On the contrary, in the US information has been available to the public since 1966. The American model of "environmental decision making is based on bargaining and concession trading among political lobbies" (O'Riordan, 1991, pp. 233-235). Similarly, Friends of the Earth (1992) acknowledges that the public "right-to-know principle" is not part of environmental policies in Europe. This report goes one step further in suggesting that European companies follow such practice in their subsidiaries in the US (where disclosure is a legal requirement) but not in Europe.

The UNEP (1994, p. 24) states that geographical coverage of TNCs' environmental reports has been limited to their home country. This survey has found two distinct approaches of corporate environmental reporting (so-called Anglo-Saxon and Rhine styles). The Anglo-Saxon model, followed by most North-American and British companies, "has at its core a statement of environmental policy, description of management practices and an inventory of emissions". On the contrary, the Rhine

model, used by many Scandinavian and German companies, "is based on an eco-balance of environmental inputs and outputs across the life-cycle" of the company's operations (Ibid., p. 28).

The plausibility of future convergence of approaches is, nevertheless, constrained by management styles that reflect social-political and cultural aspects. The American case is very illustrative because "the introduction of statutory disclosure requirements" (such as the Toxic Release Inventory and those of the Securities and Exchange Commission), "has formed the context within which companies have developed their own voluntary environmental reporting programmes" (Ibid., p. 62). Likewise, the European Community has adopted (in 1993) a regulation on environmental management and auditing systems, "designed to encourage companies to voluntarily audit their operations on a site-by-site basis, and to release a summary report to the public" (Ibid.).

According to the UNCTC (1985, p. 23), variations in environmental policies may be a result of inter-country differences in levels of industrialization and living standards. Other differences in policies exist mainly because of variations in political and social philosophies. The British and American approaches to air and water pollution are taken to illustrate these aspects. The British "approach to environmental problems is consensual, specific, gradual and flexible, while the American approach tends to be control-oriented, general, and rigidly judicial". Both approaches seem to work sufficiently well within their national boundaries, but could not produce the same result in another country[24]. This is because, they reflect distinct traditions of business-government relations, philosophies of collective intervention and patterns of industry competition. The same argument applies for Germany, where environmental concern was incorporated in the corporatist state, though the precautionary principle has diffused beyond the German borders (Dryzek, 1997, p. 139).

Considering that cultural diversity is intrinsically related to the existence of nation-states, Hofstede (1994, pp. 43-45) explains that 'culture' at the national and organizational levels are two very different phenomena. The author claims that the understanding of such difference is the secret of the existence of MNCs that have employees with extremely distinct national cultural values. Thus, it is the corporate

[24] Milton (1996) has made some advances by linking cultural and environmental issues (grounded in anthropology).

culture based on common practices that keeps employees together (a similar argument is made by Hymer, in Little and Smith, 1991).

Although it is unusual, within the IPE perspective, to include sociological or cultural explanations for analysis of state-firm relations; it is impossible to ignore the fact that managers grew up in a particular society in a particular period[25]. For that reason, managers' ideas cannot but reflect the constraints of the environment they know (Hofstede, 1994, p. 28).

Strange (in Stubbs and Underhill, 1994, p. 112) indicates that the nationality of firms deserves much closer attention in the state-firm relationship. Apart from the evidence that US-based firms rarely recruit non-Americans as their top managers, the author adds that "the behaviour of firms and their vital interests cannot always be predicted from the country where they are registered and have their headquarters". As mentioned before, UNTCMD (1993) recognizes the home country influence on TNCs' environmental management, but Strange (in Stubbs and Underhill, 1994) suggests that this is not always the rule.

Overall, in effect it seems that the issue of 'nationality of firms' is quite contradictory suggesting that it should be taken into consideration when investigating corporate environmental policies. This thesis assumes that TNCs' headquarters are constrained by the regulatory policy when defining their corporate environmental policies. Thus, some elements of such legislation will be incorporated into formal statements, and will later be disseminated throughout the corporation. Such dissemination will happen simply because TNCs have to spread their strategic choice and assets (such as technology and environmental services) to maintain their competitiveness. In other words, the following proposition will be investigated:

> ***The home country's environmental regulatory policy is the main source of pressure for the implementation of corporate environmental policies in TNCs' subsidiaries.***

[25] Hickson (1997) organized a very impressive overview of distinctive managerial approaches which characterize different societies.

2.4 - Host country context and its implications

This section follows a bargaining approach (Grosse and Behrman, 1992; Nygaard and Dahlstrom, 1992; Kline, 1992 and Gladwin and Walter, 1980b), which is understood as an international business perspective including political science concepts to analyse the relationships between TNCs and governments. As previously mentioned (in section 2.2.2), IPE has neglected the investigation of individual firms in their relation with government and other actors at the national level. On the contrary, international business has been prone to abstract the firm from its national and international political economy contexts. Consequently, Sally (1994, pp. 162-166) has made an interesting account on these gaps in both approaches suggesting that an interdisciplinary fusion is required.

In short, the next chapter provides an overview of environmental politics as well as the evolution of environmentalism in Brazil. Such discussion is not made in the present section because the contextual analysis of the host country already includes empirical evidence from Brazil.

2.4.1 - Environmental regulatory policy

Grosse and Behrman (1992, p. 100) recognized the "triangular diplomacy model" (elaborated by Stopford et al., 1991, and already mentioned in section 2.2.2) as a useful framework to discuss the government-firm relationship. However, other social and political interactions in the host context justify the analysis of the relationships between host government and TNCs' subsidiaries through the bargaining approach. In other words, if the organization's survival is really explained by its ability to deal with external contingencies, then strategic relationships between TNCs and their host countries must be added into the core discussion of TNCs (Grosse and Behram, 1992; Nygaard and Dahlstrom, 1992).

It is exactly at the interface between organization and its external environment that the bargaining process starts. Grosse and Behrman (1992, p. 98) recognize international business as a distinct field of study, without a widely accepted explanatory theory on which to base its uniqueness. Consequently, they suggest the use of the

bargaining theory as a framework for constructing such a theory. The main justification for this selection is that governments are central to international business practice and analysis.

However, the current bargaining theory has not been extended to explain governmental interventions in TNCs' activities vis-à-vis TNCs' responses towards government, which are explained by the differences between their objectives. In Grosse and Behrman's opinion such constraints demonstrate that governments and TNCs "face pressure not only from each other, but also from other participants" (e.g., local firms, municipalities and state governments) "as well as other foreign firms and foreign governments" (1992, p. 100).

Environmental regulation is therefore justified because this issue has not been among TNCs' objectives[26]. Consequently, TNCs have increased their concern towards the environment due to external pressure (e.g., from the media and environmentalists) and governmental intervention. It has been recognized that TNCs have not voluntarily (i.e., in the absence of external pressure) incorporated environmental issues (UNTCMD, 1993). However, it is possible to suggest that by doing so they may legitimate their interests (Boddewyn, 1994; Pfeffer and Salancik, 1978). In other words, TNCs may use environmental concern either to improve their image or to exploit market opportunities in the new environmental management business.

Gladwin and Walter (1980b, p. 428) recognize that "the translation of existing or expected environmental problems into corrective or preventive environmental policy depends heavily on social and political factors". More specifically, social preferences are crucial in defining how an environmental problem is perceived, interpreted and given priority. The same social choices apply to environmental quality, as societies may differ on their views of what is an "acceptable level of environmental quality". The authors (1980b) state that regarding environmental issues, the main opponents of TNCs' practices are interest groups and regulatory actors.

Furthermore, the structures constraining TNCs are usually legal mechanisms (e.g., complaints and prosecution), administrative instruments (e.g., bans and regulatory probes) and communication (e.g., public speeches, publications, and advertisements). Gladwin and Walter (1980b) conclude that TNCs have been inadequately prepared for

[26] Among the TNCs' objectives are access to markets and inputs, reduction of risks, freedom of decision-making and operations (Grosse and Behrman, 1992, p. 100).

handling conflicts, particularly those associated with major crises and disasters, showing poor internal and external communications that have intensified and perpetuated conflicts.

In the case of industrial pollution the pressures come specifically from local interest groups (such as, workers' unions, consumers and NGOs). These groups will be the driving forces to compel government (which has the power to intervene in firms' activities) to formulate laws and regulations preserving the environment. Likewise, Grosse and Behrman (1992, p. 109) state that the rules for business operations are established by governments, which means "that firms whose operations cross national boundaries must necessarily assess and manage differences in legal, regulatory and institutional environments in each country" (similar to arguments from Pfeffer and Salancik, 1978 and Ghoshal and Westney, 1993, grounded in organization theory).

Nygaard and Dahlstrom (1992) have analysed the strategic alternatives (based on patterns of behaviour) of both TNC and host country. This study clearly considers corporate strategy as a function of contextual factors (which is consistent with the resource dependency perspective, Peffer and Salancik, 1978). The authors state that "governmental regulation and market policy are viewed as antecedent to TNC strategy". Indeed "TNC strategy and host country policy are co-determinants", because the "party with the power advantage is likely to exert influence that dictates the partner's behaviour" (1992, p. 9). In sum, the host country can assume an offensive or defensive policy that will influence the TNC's response. In the case of an offensive policy the TNC has a power disadvantage and is likely to adopt a cooperative strategy. On the contrary, in the case of a defensive policy the TNC has a power advantage and exerts influence over government regulation (Nygaard and Dahlstrom, 1992, p. 5).

The authors emphasize that "the globalization of industry sectors will accelerate the process of deregulation and change the strategic relationship between MNC and host countries" (Ibid., p.12). In such a case, TNCs will have to develop global strategies resulting in less impetus to promote exchange with each country, but TNCs will continue to compare the investment advantages for alternative countries. For example, in the case of a TNC that follows a global market strategy, each plant will be specialized in a set of operations, and the final product will depend on a different national context. In the beginning, the bargaining power of the host country will decrease. However, what

the TNCs gain in terms of competitiveness using the distinct comparative advantages in different countries, they lose in control after the relocation has been accomplished. Following a traditional strategy of production, with local production for domestic or export market in branch-plants, the bargain balance between government and TNCs will be the same. The instability in their relationships will happen in a traditional way, that is, in terms of intensive resources for TNCs and FDI and technological access for the host country. In conclusion, Nygaard and Dahlstrom (1992) stress that the changes in TNCs' operations and host country deregulation are inevitable; thus cooperation should be promoted among TNCs, domestic firms and governmental officials.

Kline (1992) calls attention to recent changes in political systems in developing countries, which are often reflected in TNCs-host countries' relations. The author has also indicated changes in the traditional strategic issues that have been demanded by host countries. The issues that are gaining in strategic importance are: technology, export market, capital mobilization, and TNCs' organizational structures (1992, p. 275). For example, technology is important not because of the location of research and development (which was the most usual request from host countries), but because it aims to improve: (a) standards of quality control; (b) managerial skills to develop and coordinate complex business activities; (c) technological processes to enhance plant safety and environmental protection, and (d) advanced computer and communication services.

However, the relationship between developing countries and foreign firms is more complex, including technical issues (such as taxes, regulation to export and import, etc.) on which firms based their decision to invest in developing countries (Kline, 1992). In general, some of those technical issues will increase and others will lessen the attractiveness of a developing country to receive FDI. At the same time, some issues are more important ante- rather than post-investment.

A similar argument was made by Nygaard and Dahlstram (1992). Nevertheless, this framework has limitations on its applicability in some host countries. For example, a developing country may not be able to fulfill the requirements to have offensive regulatory and market policies. However, the search for environmental solutions regarding TNCs in developing countries seems to be more probably obtained through

non traditional channels, such as public opinion, NGOs and consumer pressures[27]. Another relevant point is the locus where negotiation between government and TNCs takes place. Therefore, it is necessary to identify the idiosyncrasies of the governmental structure (e.g., centralized or decentralized), regarding environmental regulatory policy.

Additionally, the weakness of environmental agencies in developing countries, in relation to other local ministries dealing with foreign investors, is recognized by Pearson (1985). The explanation for such weakness is based on the fact that environmental agencies are often inadequately staffed and lack political power. There are also difficulties in translating law into regulation and to enforce it later. It is at this latter stage that problems with corruption will emerge (Pearson, 1985, p. 78). Overall, Brown et al. (1993a, p. 206) state that TNCs' facilities in developing countries "are likely to under perform in relation to the parent country counterparts, owing to the lax regulatory climate of such countries". Finally, Pimenta's (in Pearson, 1987, p. 220) findings illustrate the relationship between multinationals and the government in Brazil. Most interesting is that the author offers a comparative analysis of domestic- versus multinational-owned facilities, regarding industrial pollution control in the state of São Paulo.

Briefly, Pimenta concludes that: (a) there is no discrimination between foreign and domestic ownership from either legislation nor government; (b) multinationals tend to respond faster when asked to solve environmental problems, due to concern with public opinion (mainly from politicians and journalists); (c) MNCs' favourable responses are a consequence of corporate policies, environmentally concerned managers, technical capabilities, and financial resources; (d) since new pollution-control regulation was established in São Paulo, many domestic and foreign plants have been classified as "non-complying" with emission standards set by the state agency; (e) multinationals have a 'positive demonstration effect', because of constant comparison made by domestic firms when dealing with Brazilian state officials; (f) the officials complained about the newly arrived MNCs, as these firms have little knowledge of the country

[27] Gladwin and Walter's (1980) study illustrates the most usual social and political conflicts that MNCs face in their host countries. It shows the bargaining between government and MNCs: paths of change in negotiations and modes of conflict in management (depending on the emphasis placed on two factors: assertiveness and cooperativeness). Besides this, the authors recognize that both market and non-market forces produce tensions and contradictions for the MNCs. Another interesting study on the tensions between MNCs and host countries was made by Doz et al. (1981).

(specifically its legislation, control procedures and habits); (g) it is easier to discuss or negotiate with MNCs than with domestic firms, where managers are not so receptive and there is not a permanent environmental department; and (h) examples of community involvement in environmental protection have not been identified (among MNCs and domestic firms) in the state of São Paulo (in Pearson, 1987, pp. 216-219).

Overall, it is assumed here that the host country's regulation to control industrial pollution constrains the practices of TNCs' subsidiaries for two reasons. First, TNCs need to keep their operations running (and the environmental agency has the power to temporarily close the facilities that are sub-standard. Secondly, they aim to maintain their image intact (inasmuch as some pressure may emerge from journalists, politicians, NGOs and consumers).

Consequently, the implementation of corporate environmental policies will depend on external pressures, which may be regulatory and/or non-regulatory. Nevertheless, the major external constraint on corporate environmental policies will be posed by the host country's environmental regulatory policy, which has motivated the following proposition:

> ***The implementation of TNCs' environmental policies includes compliance with the host country's environmental regulatory policy as a minimum requirement.***

2.5 - Industry's structure versus environmental challenges

A complementary assumption of this thesis is that some explanations for corporate environmental policies derive from the industry's characteristics (as suggested by UNTCMD, 1993, p. 92). This is the recognition that each industrial sector (due to its structural character) is a key element in explaining the implementation of corporate environmental policies. Consequently, in this section industry competitiveness, structure and environmental commitment are discussed from an economic perspective (Porter and van der Linde, 1995a, b; Cairncross, 1995; Sorsa, 1994; Wally and Whitehead, 1994; Porter, 1991, 1990, 1980; Leonard, 1988). It should be noted that the selection of the industrial sectors was previously addressed (in section 1.2); the characteristics of the

industrial sectors (that is, chemical and pharmaceutical) will be introduced respectively in chapters four and five.

The discussion of some key concepts (regarding the industry structure) is justified by the fact that theoretical explanations grounded in differences across industries (and not only differences across firms) are considered more substantial. However, Nelson (1991, p. 61) stresses that economists should recognize firm differences explicitly. On the contrary, the argument in economics is that the differences are not discretionary[28], "but rather reflect differences in the contexts in which firms operate".

Additionally, Rumelt's (1991) findings "imply that the most important sources of economic rents are business-specific; industry membership is a much less important source and corporate parentage is quite unimportant". In sum, the author questioned the validity of industry-level analysis. Consequently, it is assumed here that while industry differences matter when investigating environmental issues, they are not all that matters. Thus, the company-level of analysis will be addressed in the next section.

More recently, McGahan and Porter (1997, p. 16) have investigated the influence of industry on the profitability of American companies, concluding that "industry proves to have a powerful direct and indirect influence on profitability". Overall, the results "do not support the assertion that rapid change in the economy has diminished the influence of industry". Therefore, influences from the industry organization and competitive contexts remain as valid.

Based on industrial organization perspectives, the industry structure "is a central determinant of firm performance, and firm differences are considered against an industry" (McGahan and Porter, 1997, p. 15). As such Porter (1980) defines global industries as "one in which the strategic positions of competitors in major geographic or national markets are fundamentally affected by their overall global positions". Thus, firms in global industries have "to compete on a worldwide, coordinated basis or face strategic disadvantages" (1980, p. 275).

Porter (1980, p. 277) has indicated that an industry becomes global because firms competing in a coordinated way in many national markets result in economic advantages. The author makes one further point by identifying the sources of global

[28] That is, a certain looseness of constraints without meaning that firms are under the tight control of their top decision makers (Nelson, 1991).

competitive advantage (such as economies of scale, product differentiation, mobility of production), as well as the impediments to global competition (dividing them in economic, managerial and institutional categories).

As far as competitiveness and environmental standards are concerned, Sorsa's (1994) findings can clarify the current assertion that industry could not cope with environmental protection. The author has investigated the determinants of trade flows in environmentally sensitive products. In brief, Sorsa concludes that environmental spending: (a) has been a small share of total spending and it is unlikely to have caused shifts in comparative advantage in most industries; (b) seems to have minor variances among industrialized countries; (c) has been concentrated in a few basic industries under heavy pressure to adapt structurally in the international division of labour, and (d) is closely linked to energy use. Finally, he states that positive adjustment and increased comparative advantages in environmentally sensitive goods were more pronounced in countries where environmental regulatory policies have encouraged investment rather than current spending (1994, p. 29-30).

Two further points from Sorsa's study deserve to be mentioned, which are similar to Porter and van der Linde's (1995a) arguments[29]. First, the achievement of higher environmental standards is not a "zero-sum game". More specifically, investment in environmental protection technology can maintain or even create comparative advantage in environmentally sensitive industries. Second, it is suggested that "industries struggling with environmental expenditures should lobby for better environmental policies". Considering that poor performance is likely to be caused by other factors, "demands for protection due to different environmental expenditures are likely to be counter productive and retard adjustment to a new source of structured change" (1994, p. 30).

Altogether, these statements have several implications. First is the idea that performance could be better explained by other elements, probably in economic and

[29] In Porter and van der Linde's (1995a, p. 96) opinion, the myth of conflict between environmental protection and economic competitiveness is challenged by cases such as Germany. This country "has had the world's tightest regulation in stationary air-pollution, and German companies appear to hold a wide lead in patenting - and exporting - air-pollution and other environmental technologies". On the contrary, "as its environmental standards have lagged, Britain's ratio of exports to imports in environmental technology has fallen from 8:1 to 1:1 over the past decade". Finally, the US leadership in environmental technology is in "areas in which its regulations have been the strictest, such as pesticides and remediation of environmental damage".

managerial terms. Secondly, 'better environmental policies' will obligate competitors and suppliers to have the equivalent expenditures. In such a case, the companies that have been spending in environmental protection will not be punished in competitive terms.

Leonard (1988) makes one further point in the discussion of industrial competitiveness, by investigating how and why environmental regulations would alter the prevailing allocation of comparative advantage in industrial production. The author's analysis explores the hypotheses of "industrial-flight and pollution-havens". Both hypotheses are concerned with the impacts that differences in national pollution-control regulations would have on the distribution of international comparative advantage. The empirical work was focused on the transfer of industries from industrialized country (in such a case the US) to rapidly industrializing countries (specifically Spain, Mexico, Ireland and Romania) owing to environmental regulations.

Taking into account that capital-intensive industries are more flexible concerning location but more dependent on government decision, Leonard argues that "these industries - which produce goods ranging from automobiles to chemicals and electrical equipment - are not technically footloose: they need infrastructure, appropriately skilled labor, linkages with other industries, and numerous other specific provisions" (1988, p. 27). These industries depend more on the amenities offered by governments at various locations and less on natural resources. Despite the fact that capital-intensive industries "may be flexible in selecting a new location", they "cannot easily move existing production facilities". A similar argument was made by Pearson (1985, p. 35), who observes that "a substantial amount of foreign investment is not 'footloose' and able to shop around for unregulated locations".

According to Leonard, physical capital (represented by large plant) is generally immobile for a decade or more and will remain "in operation even though the rationale for the location is no longer compelling. Industrial inertia, as this phenomenon has been labeled, introduces significant short-term rigidity into the long-term context of flexibility for many capital-intensive industries" (1988, p. 27). In conclusion, Leonard states that "the costs and logistics of complying with environmental regulations are not the decisive factor in most industrial decisions about desirable plant locations" (1988, p. 231). In reality, the "industrial-flight and pollution-havens" hypotheses are not significant

phenomena to cause either a decrease in the comparative advantage of industrial countries or a complementary comparative advantage for countries with permissive environmental regulations.

Nevertheless, Birdsall and Wheeler (1993, p. 147) have found evidence "consistent with the possibility of displacement: pollution intensity grew more rapidly in Latin America as a whole after rather than before 1970 - as OECD environmental regulation became stricter". This displacement is not, however, associated with trade openness but with protected economies. Trade liberalization will result in competitive pressure that will consequently increase investment in the latest technology. However, if the cost of such technology is high the effectiveness of the 'economic rationality' will depend on regulatory pressure or penalties. The authors assume that new technologies tend to be cleaner because they are imported from countries with higher pollution standards (Ibid., p. 140).

In short, these studies are extremely important for this thesis, because they may elucidate the assumption of massive shift of pollution intensive industries to developing countries. Leonard (1988. p. 232) has indicated that there is still some possibility of such shifts in the case of backward integration for mineral-processing industries and worldwide sourcing of chemical intermediates (which seems to be the case for new plant investment for organochlorides[30]).

At this point, Walley and Whitehead (1994, p. 46) deserve to be cited because they maintain that the incorporation of environmental concerns will not produce unlimited profitable results for firms. Following a prescriptive approach, the authors emphasize that business must be aware of the cost associated with environmental challenges. More specifically, their criticism was directed to Porter (1991) and Gore (1992), who argue that strong environmental regulation may improve national competitiveness. However, Walley and Whitehead's assumption that high environmental expenditures have caused changes in the comparative advantage of industries was refuted by Sorsa (1994).

The fact that an environmental regulatory policy could result in a cleaner environment and more competitive economy (Porter, 1991) is subject to controversy. Cairncross (1995, p. 192) re-affirms such debate when suggesting that environmental

[30] According to Finaldi (1993), Greenpeace has identified fifty new chlorine-related facilities (in Brazil, India, Indonesia and Thailand) with startup dates ranging from 1993 to 1996.

regulation may benefit companies as a form of protectionism (creating new markets, reducing cost of inputs, driving companies out of the market or protecting from foreign competition). In reference to the Montreal Protocol (which banned the use of CFCs in 1987) and the major manufacturers of chlorofluorcarbon (e.g., DuPont and ICI), Cairncross concluded that environmental regulation may grant to "company or industry a lead over its rivals" (1995, p. 194).

Instead, Porter and van der Linde's (1995a) study is focused on how regulation should motivate companies to innovate. In brief, their main concern is not on the existence of regulation, but on the kind of regulation[31] that has been used to turn business into environmentally friendly activities. Thus, the case of companies that have been protected by environmental regulation, is neither related to Porter and van der Linde's (1995a, b) nor to Porter's (1991) arguments. Nevertheless, this is a polemical point, where traditional arguments (that companies cannot cope with more regulation) are contrasted with unusual arguments (environmental regulation would encourage companies to make profitable innovations). However, environmental regulation may produce protectionism and/or be used by companies or industrial lobbies to achieve their own interests. In addition, it seems that companies have been routinely missing profitable opportunities[32] because natural resources were cheap and abundant (Pearce and Turner, 1990, p. 13), at the same time that industrial pollution was regarded as an externality.

Moreover, if technological improvements cannot be forced (Cairncross, 1995, p. 198), then the assumption that technology will solve environmental problems faster is dubious. According to Smith (1993, p. 10) "the problem of environmental damage by business is a complex and multi-faced issue which requires more than a technological fix" to be solved. It requires also a long-term cultural change in industrial strategic approach and behaviour (confirming the argument made by Fischer and Schot, 1993).

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[31] Soderbaum (1994, p. 47) suggests a broad concept of environmental policy which includes other agents such as companies and public interest groups. This perspective aims to provide an alternative to Neoclassical textbooks which emphasize the "government as the main agent in environmental policy and classify policy instruments as either belonging to the command-and-control or the economic incentives category".

[32] For example, the amount of wastes, emissions and contamination, generated by manufacturing and extractive industries is reasonable proof of inefficient use of resources, which has even motivated the introduction of the concept of "eco-efficiency" by DeSimone and Popoff (1997).

Additionally, Porter (1980) suggests that industry's structure creates slack. More specifically, industries that are more concentrated (defined as a high percentage of market under the control of a firm and/or small number of firms) earn excess rents by the lack of competition. According to Beliveau et al. (1994) these rents will be redistributed to society as environmental protection practices.

Beliveau et al. (1994, p. 732), for instance, states that what becomes legitimate in one industry is not legitimate in another industry. Accordingly, the behaviour of "surviving firms" is mimicked by new entrants. This process results in a dominant and legitimate pattern of behaviour in the industry, that is, it becomes the industry standard. In such a case, environmental concern within the industry (most likely from the industry association and/or large companies) is considered relevant, as it may be a driving force for other companies.

The incorporation of environmental protection is constrained by the industry structure[33], as it poses some restrictions in terms of: (a) technological pattern (that is, pollution-intensiveness and/or development of new technology); (b) kind of product (e.g., hazardous, inflammable, etc.); (c) market demand (e.g., environmentally friendly products), and (d) cost of production and price of the output. This thesis will take into consideration market, product, costs and technology (though the latter is investigated in broad terms because of industrial secrecy regarding technology), when investigating the implementation of corporate environmental policies.

Furthermore, Pearson (1985, p.75) has stressed the importance of corporate relations with host government regulators, community and environmental groups. Such relations can be best managed by using industry association and other business organization, through the development of codes and guidelines for better practices (Ibid., p. 96). In fact, Gleckman (1995) confirms that some industrial sectors have launched their own programmes, though he argues that this trend among trade associations does not necessarily have practical results.

This latter aspect turned out to be a reasonable justification for the selection of the chemical sector (one of the industries at the forefront of green pressures) considering that trends within this industry may be relevant for other sectors. Moreover, it is

[33] Tombs (in Smith, 1993) in particular addresses the reasons why the chemical industry has received so much criticism. See also Choucri (in Choucri, 1993) for environmental and technological implications in the oil, chemical and construction industries.

assumed that in an industry sector where environmental protection is a norm, firms will exhibit strong corporate environmental policies. Altogether, the resulting proposition is:

If industry associations have environmental guidelines, TNCs' subsidiaries have stricter implementation of corporate environmental policies.

2.6 - Corporate strategic decisions and subsidiaries' environmental management

This section focuses on the company level of analysis, grounded on international business, organizational theory and business management literature. First, corporate strategic decisions have been selected to represent the discretionary character of TNCs, when dealing with environmental issues. Second, some aspects of the subsidiaries' environmental management are addressed.

Sundaram and Black (1992) have emphasized the need for a multidisciplinary approach to study MNEs; however, this task is not easy for two reasons. First, economists and political scientists "tend to use perspectives that focus on the environment of the MNE", assuming that the organization is not important or treating it as a "black box". Second, "organizational theories tend to use perspectives that focus on the internal workings of the MNE and pay less attention to the environment in which it operates" (Sundaram and Black, 1992, p. 730).

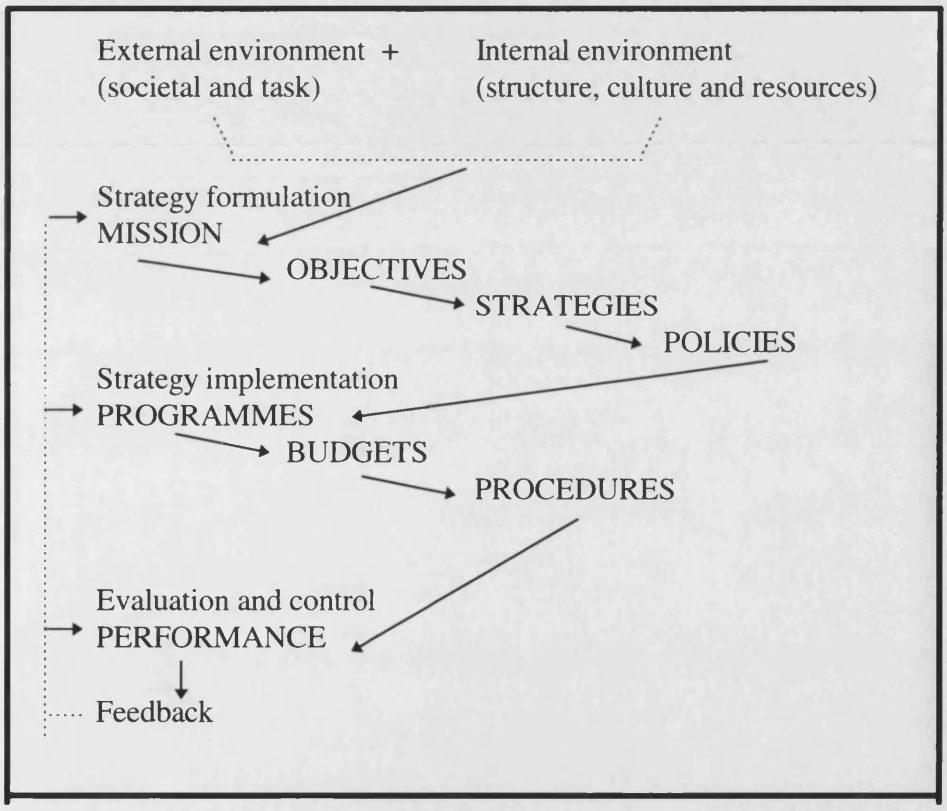
Despite the fact that this thesis focuses on 'external pressures over corporate environmental policies', the investigation of headquarters' strategic decision is justified by its critical role in defining subsidiaries' practices. As well as this, it is from the relationship with headquarters that subsidiaries can act as conduits, introducing changes (mainly through managerial practices) into the host country's context (Rosenzweig and Singh, 1991).

Influence from the headquarters is supported by the assumption that TNCs' subsidiaries face an environment that includes other subunits within the organization, which make them dependent on centralized strategic decisions (Rosenzweig and Singh, 1991). Moreover, national contexts are increasingly linked, and they affect each other though a variety of mechanisms. In this case, TNCs may be either agents of change

(linking different national contexts) or one mechanism by which distinct national contexts may come to affect each other.

The plurality in current debate in the field of strategic management (including differing and conflicting approaches) makes it necessary to clarify some concepts that will be used hereafter. The work of De Witt and Meyer (1994) offers a broader view of essential aspects of strategic management. According to the authors (Ibid., p. 47) the way managers are influenced by the organization's external and internal contexts will result in strategic factors, which will be evaluated by top managers when determining the corporate mission. The first step in the formulation of strategy, a statement of mission, leads to the determination of corporate objectives, strategies and policies. These strategies and policies are implemented through programmes, budgets, and procedures (this process is illustrated in the figure below).

Figure 2.1 - Strategy management model



Source: Adapted from Wheelen & Hunger, in De Witt and Meyer (1994, p. 46).

Additionally, the premise of "strategy context" indicates that strategies are developed to suit varying organizational and external contexts; this explicitly recognizes that each company has its own characteristics and operates in its own unique environment. Furthermore, De Witt and Meyer (1994) state that strategy process and content are heavily influenced by the context in which companies are situated, which applies to both national and international contexts. In contrast, some common characteristics (of the company and its context) are shared with other companies, and therefore could be grouped into categories (such as the industry).

Accordingly, the discussion on whether or not external contexts have impacts on strategy definition is illustrated by contrasting perspectives - so-called "free choice" and "compliance". The first, as the name indicates, considers that firms are completely free to select any strategy without any external constraint[34]. The second, based on "population ecology", accepts a deterministic view of strategy in which firms are completely constrained by the external environment[35].

Taking into account that corporate environmental policy is the dependent variable under investigation, the strategic approach based on "free choice" is not the most suitable. On the contrary, external constraints from both the societal and industrial contexts on firms' strategic choice are expected, at the same time that firms may have discretion. Consequently, an intermediate approach between these opposite perspectives seems to be more adequate.

For example, Porter (in De Witt and Meyer, 1994, p. 365) explains how the industry context has a very strong impact on the survival and profitability of firms. However, it assumes "that companies can also adapt to changes in the industry's structure", by understanding the drivers of change. As a result it is expected that the company has a certain degree of strategic freedom (or choice) "to determine its own fate", but the industry structure is still "crucially important" (Ibid., p. 366). This perspective has been developed by Porter (1990), in which external influences matter greatly but firms have a considerable range of freedom[36].

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[34] See Baden-Fuller and Stopford (1992) for further details.
[35] See Hannah and Freeman, in De Witt and Meyer (1994) for further details.
[36] Nelson (1991, p. 64) says that Porter has failed to provide an answer to the question of "why do firms differ and how does it matter?".

Additionally, Porter (in De Witt and Meyer, 1994, pp. 480-481) suggests that both - home country and industry context - are important in the definition of the firm's competitive advantage. As such, the significance of a company's home base[37] derives from the differences that exist between countries regarding infrastructure and industrial organization. Concurrently, a global strategy supplements and solidifies the competitive advantage created at the home base (Porter, 1986).

National boundaries are therefore an important force in defining organizational environment, at the same time that they are of varying importance for different elements of organizational structure and process. For example, technology and economic competition may be affected by global factors, but other elements are affected by distinct features of the nation.

Ghoshal and Westney affirm that the MNC consists of a number of national subsidiaries, which "might share some characteristics with other national environments because of interdependencies" on different aspects of organization-environment relations (1993, p. 12). More specifically, Westney (in Ghoshal and Westney, 1993, p. 54) argues that key issues of the management of MNCs can be illuminated by the institutionalization paradigm, which views the MNC as an organization whose subunits are subject to two potentially contradictory sets of "isomorphic pulls": those from the headquarters and those from the host country. In a diagrammatic form this could be stated as follows:

Figure 2.2 - Subsidiary's interfaces

Host country: pressure for local adaptation external to the firm	⟷ subsidiary ⟷	Headquarters and other subsidiaries: ask for consistency within the internal structure of the firm

Source: Adapted from Rosenzweig and Singh, 1991, p. 353.

Ghoshal and Westney (1993, p. 21) stress the lack of studies (outside international management field) that explicitly analyse the effect of multinationality on organizational behaviour. At this point, the sociological embeddedness of the MNC could be better explained by Kogut (in Ghoshal and Westney, 1993), as it is necessary to

[37] Chandler (1990) describes how the different economic conditions, institutions and cultures of the US, Britain and Germany, molded the nature of the modern manufacturing firms that grew up in these countries in the first decade of this century.

go back to the stage before their internationalization, when firms develop out the "socio-economic conditions of their home environment and, even as they internationalize, they remain imprinted by their early development in their domestic markets". Kogut has also questioned "the extent to which growing intercountry linkages and the growing internationalization of firms will erode country differences in organization and management".

Doz (1986) has recognized the needs of MNCs with regard of strategic issues (which are simplified into integration versus national responsiveness). Based on this perspective is possible to understand how contradictory forces must be managed together, that is, international integration due to international competition, and national responsiveness in face of demands from host countries. More recently, Sally (1994, p. 165) states that the transnational phenomenon necessitates "highly complex combinations of centralization and decentralization within the MNE management organization" (which is found basically on technology-intensive industries characterized by oligopolistic competition).

First, the strategy of integration, adopted by TNCs aiming to reduce their manufacturing costs (that is, lower costs and better efficiencies to fend off global competition), results in uniformization among subsidiaries (Doz, 1986). Such a strategy produces standardization of procedures (including for environmental issues). On the contrary, if TNCs adopt a strategy of national responsiveness, meaning that some autonomy and local adaptation are allowed in subsidiaries, it results in differentiated policies and procedures. In this case, the incorporation of environmental issues will be based on local standards. However, it is important to note that no ideal strategy type is to be found in reality; firms always follow a combination of both or adaptations of these types (Doz, 1986).

Nevertheless, environmental issues became a strategic aspect of TNCs' activities (Smith, 1993; Fischer and Schot, 1993). Their impact on companies is high enough either to put core elements of the business at risk or to fundamentally alter a company's cost structure. Additionally, managers have considerable discretion about how to respond to environmental challenges. UNTCMD (1993, p. 168) has identified at least four different management approaches that are being utilized by TNCs (such as

compliance-oriented, preventive, environmental and sustainable development management).

Indeed, Gleckman (1995) states that there is some recent recognition from TNCs of their environmental impacts. Nevertheless, environmental awareness on the part of TNCs is not yet matched by actions, or by the full integration of "green issues" into business strategy. In other words, higher environmental awareness (through rhetorical statement or even the establishment of corporate environmental policies) is not followed by actions (or change of behaviour by implementing companies' policies). In conclusion, this discussion on TNCs' strategic decisions has lead to the following proposition:

The corporate environmental policies of TNCs' subsidiaries is defined by the headquarters, following a strategy of centralization.

In addition to this, UNTCMD (1993, p. 60) has found that only 45 percent of the firms investigated "had formal arrangements between headquarters and overseas affiliates and subsidiaries for coordinating EH&S efforts". Moreover, this survey shows there was still a large concentration of formalization of EH&S in home countries in early 90s. Consequently, the importance of this thesis is enhanced by its focus on subsidiaries in a developing country. Gladwin (in Fischer and Schot, 1993, p. 55) states that the focus of the vast majority of research on "industrial greening" is on rich nations. However, environmental management in such nations "may not be enough to ensure an environmentally and socially secure world" (Ibid., p.56). There is the need to "shift economic opportunity, technology, capital, and primary social-service provision" towards the poor countries. Therefore, TNCs' subsidiaries become a 'potential agent of change' by their global reach.

However, Rosenzweig and Singh (1991, p. 357) recognize the interaction of MNEs and national environments as somewhat dynamic. And this poses an important question, as MNEs "may be able to resist pressures for isomorphism with institutional environments", just as, national environments "vary in their acceptance of or resistance to newly introduced structures and processes". Therefore, practices introduced by MNEs' subsidiaries will vary in extension of adoption, the speed of adoption and the degree to which they are modified in the new country. These practices, in turn, are

influenced by competitive pressure, cultural distance, and the relative importance of the subsidiary. Besides, it seems impossible for the parent firm to force all subsidiaries to implement centrally made decisions that run counter to pressures in the host country (Sundaram and Black, 1992, p. 743).

Rappaport and Flaherty (1992, p. 34) suggest that there is a "real tension in corporate management between headquarters and facilities". However, it "generally is at headquarters where the overall strategy for the corporation is developed". Additionally, solutions to environmental problems may prove particularly challenging to the traditional headquarters-subsidiary relationship. Because pollution-control activities require extensive process-specific knowledge to be effectively applied. In sum, decentralization is better for environmental issues because solutions are site-specific, that is, they require the facility personnel's intimate knowledge of the production process.

At the organization level the most relevant determinants of environmental practices and performance (according to Levy, 1995) are managerial commitment and motivation. This entails including environmental issues in strategic planning, personal incentives and formal allocation of environmental responsibilities to affiliates. Finally, Flaherty and Rappaport (1991, p. 13) have indicated the factors preventing better EH&S in US-based companies, as follows: (a) focus on short-term profitability; (b) management structure; (c) lack of staff, and (d) lack of incentives. Surprisingly, the findings suggest that institutional and managerial barriers are greater than technological barriers.

Chapter III - Business and environmental issues in Brazil

Considering that the main focus of this thesis is on corporate environmental practices in Brazil, it is appropriate to offer a summary of the regulatory and non-regulatory contexts in which TNCs' subsidiaries are operating. More specifically, there is a focus on the states - São Paulo and Rio de Janeiro - where the selected subsidiaries are located within Brazil. Additionally, this outline of the Brazilian context will assist in the data analysis of the case studies. It will do so by defining the main contingencies influencing the implementation of corporate environmental policies.

This chapter is mainly grounded in primary and secondary data from the empirical work[1] accomplished in Brazil. The first section is focused on main issues regarding FDI in Brazil, such as the origin of capital and its concentration throughout industrial sectors. The second section provides an overview of international pressures and environmental concerns in the Brazilian context. The third section aims to introduce the regulatory context faced by companies regarding environmental issues. The last section aims to address the major non-regulatory initiatives launched by the government and business community in order to motivate the incorporation of environmental concern into economic activity.

3.1 - Overview of foreign direct investment[2]

In 1995, Brazil was the target of direct investment totalling approximately US$ 325 billions, which represented an increase of 50 percent over 1994 (UNCTAD, 1996). In 1996, FDI reached the sum of US$ 7,5 billion (an increase of 100 percent over 1995, as shown in table 3.1 below). The main factor that lures such investments is the economic plan ('Real Plan'[3] launched in 1995), which has stabilized the economy and increased the consumer market by ten million people. In such a context, TNCs have been following a business strategy of acquiring Brazilian companies (via

[1] The fieldwork in Brazil was carried out between August and December 1996.
[2] FDI is defined by the Brazilian Central Bank as ownership of shares in the stock of private and/or public companies located in the country, with participation of non-residents in at least 10 percent of voting share or participation which amounts to 20 percent or more of the nominal capital (Banco Central do Brasil, 'Censo de Capitais Estrangeiros 1996', 1996, pp. 3-5).
[3] Estado de S.Paulo, 18 August 1996, p. B1.

privatization or not) in order to gain immediate return on investment. The industrial sectors that have been receiving FDI (as reinvestment) are food, beverages, automobile, chemical and banking. The sectors receiving new FDI are specifically automobile, electronics, and communications.

Table 3.1 - Participation of Brazil as recipient of FDI worldwide

Year	*(%)*
1994	1.15
1995	1.06
1996	2.5

Source: UNCTAD (1996).

More specifically, the table below reflects the decrease in foreign investments during the 80s, which was called the 'lost decade'. The Brazilian economy faced a period of recession as a result of the oil crisis, external debt crisis and insufficiency of new international loans. The amount of FDI corresponded to 1.16 percent of the GNP as recently as 1996, however, it is still below the percentages reached in the 70s.

Table 3.2 - Brazil - FDI stock as percentage of GNP (1970-1996)*

Year	(%)	Year	(%)	Year	(%)
1970	0.97	1980	0.95	1990	0.27
1971	1.00	1981	1.19	1991	(0.25)
1972	0.95	1982	1.25	1992	0.36
1973	1.59	1983	0.70	1993	0.30
1974	1.40	1984	0.63	1994	0.46
1975	1.24	1985	0.53	1995	0.65
1976	1.18	1986	(0.35)	**1996**	**1.16**
1977	1.35	1987	0.42	-	-
1978	1.48	1988	0.66	-	-
1979	1.54	1989	0.43	-	-

Source: Estado de S.Paulo, 18 August 1996, p. B1.
Note: * Data from 'Banco Central do Brasil and IBGE'.

According to Baer (1995, p. 237) multinationals represent only 10 percent of total investments in Brazil, but their importance is much greater due to their dominance in some of the most dynamic sectors. However, there is no indication that this relationship has been favorable to TNCs' world strategy but harmful to Brazilian interests. In fact, TNCs "have collaborated with the government's policies of export

diversification". Moreover, "the recession in industrialized countries has not led multinationals to decrease their Brazilian operations", though "multinationals continue to shy away from basic R & D in Brazil".

Evans (1979, p. 113) has listed the Brazilian industrial sectors according to a combination of FDI and domestic ownership. Foreign capital was dominant in transportation equipment, rubber products, pharmaceuticals and tobacco industries. The industries in which FDI was predominant but local capital play a significant role were chemicals, machinery and electrical machinery. The industries where local capital held the predominant position were leather products, printing and publishing, apparel and footwear, wood products, paper products and non-metallic metals. Finally, the industries where local capital accounted for the majority of sales and assets among the largest firms, but where FDI played a major role, were food and beverages, textiles and metal fabrication.

Apart from the recent privatization of state-owned companies in the 90s, the predominance of FDI in some sectors (pharmaceuticals, automotive, household, information technology, plastic and rubber, food and tobacco, respectively) has remained the same (see table 3.3 below for an updated overview).

Table 3.3 - Participation of state, foreign and domestic owned enterprises per industrial sector* in Brazil

Industrial sectors	*Domestic*	*%*	*Foreign*	*%*	*State*	*%*
Domestic predominance	1995	1996	1995	1996	1995	1996
Building construction	100	100	-	-	-	-
Transport services	75	96	2	4	23	-
Clothing	92	92	8	8	-	-
Mining	34	86	7	7	59	7
Textile	88	85	12	15	-	-
Paper and cellulose	81	84	16	16	3	-
Wholesale	75	79	25	21	-	-
Retailing	82	77	18	23	-	-
Building materials	69	71	31	29	-	-
Steel & metallurgical	75	70	21	26	4	4
Electrical & electronics	55	60	45	40	-	-
Metal processing	56	55	44	45	-	-
Beverage & tobacco	51	52	49	48	-	-
Foreign predominance						
Automotive & spare parts	7	2	93	98	-	-
Household & toiletry	11	13	89	87	-	-
Information technology	20	22	78	76	2	2
Pharmaceutical	37	27	63	73	-	-
Food	50	44	50	56	-	-
Plastics & rubber	51	49	49	51	-	-
State predominance						
Public services	-	-	-	5	-	95
Petrochemical & chemical**	14	16	22	17	64	67

Source: Exame, 'Melhores e Maiores', July 1997, p. 11. Notes: * share based on total sales of the 20 biggest companies in each industrial sector; ** oil exploration is a state monopoly.

In conclusion, this thesis focuses on sectors where foreign capital is traditionally predominant (that is, chemicals) or dominant (that is, pharmaceutical). Although, state companies (manufacturing fertilizers, petrochemicals, synthetic rubber and estirene) were sold to major domestic groups, FDI is still predominant in the chemical sector; mainly in the diversified and technologically intensive segments of the industry (Baer, 1995, p. 266). Nevertheless, it is important to note that there was an increase in the economic power and income of private groups in the sector of basic chemicals as well as in other industrial sectors (such as the steel industry).

Baer concludes that "there is some evidence that Brazil's authorities have learned how to police multinationals more effectively than in the past without scaring

them away" (Ibid.). More specifically, the sophistication of Brazilian officials "in dealing more effectively with multinationals is also helped by the fact that there is a greater geographical diversification in their origin, which adds some leverage to their bargaining position" (the table below shows the origin of FDI in Brazil).

Table 3.4 - Origin of foreign capital in Brazil - selected years (%)

Country of origin	1951	1980	1986	1991
United States	**43.9**	**30**	**30**	**30**
Canada	30.3	4	5	6
United Kingdom	**12.1**	**6**	**6**	**7**
France	3.3	4	4	5
Uruguay	3.1	0.1	-	1
Panama	2.3	3	4	2
Germany	**-**	**13**	**15**	**14**
Switzerland	-	10	8	8
Sweden	-	2	2	2
Netherlands	-	2	2	2
Japan	-	10	9	10
Italy	-	3	4	3
Luxembourg	-	2	2	2
Other	5.0	10.9	9	8
Total	100	100	100	100

Source: Adapted from Baer (1995, p. 222) with data from 'Banco Central do Brasil'.

Based on the table above it is evident that the US represents the largest foreign investor in Brazil. Most relevant is its dominant position over the decades, which reflects its influence on managerial and technological trends within the Brazilian economy. Nevertheless, the following tables show that the relative position of Brazil, as recipient of FDI from the selected countries of origin, is only representative for Germany (see tables 3.5, 3.6 and 3.7 below).

In other words, Brazil receives the largest amount of German investment (approximately 65 percent) relative to total German investment in the Latin America-Caribbean area (though it represents only 3.5 percent of total German investment abroad). The same figures for the US are 19.5 percent of the total to the Latin America-Caribbean area and 3.03 percent of total direct investment abroad; for the UK the figures are respectively 13.6 percent and 1.15 percent. Finally, what is also evident

is the decrease of British investment (illustrated in table 3.4) in Brazil from the 50s, though it levels off in subsequent decades[4].

Table 3.5 - United States - direct investment[5] abroad* (US$ million)

Year	Latin America-Caribbean	of which Brazil	Total
1985	23,210	8,893	230,287
1986	32,262	9,268	259,834
1987	42,667	10,591	314,336
1988	47,816	12,609	335,915
1989	53,898	14,025	381,781
1990	61,100	14,384	430,521
1991	65,176	14,997	467,844
1992	77,577	16,313	502,063
1993	85,261	16,772	564,283
1994	96,512	18,798	621,044

Source: OECD (1996, p. 285). Note: * stock data, position at year-end by country.

Table 3.6 - Germany - direct investment[6] abroad* (DM million)

Year	Latin America-Caribbean	of which Brazil	Total
1985	13,455	8,201	146,124
1986	12,377	8,424	149,996
1987	12,423	8,531	154,944
1988	13,599	8,993	183,041
1989	13,043	9,670	205,214
1990	10,965	6,638	224,002
1991	12,894	7,734	262,671
1992	14,751	9,217	287,863
1993	14,614	8,269	308,399
1994	17,657	11,439	329,757

Source: OECD (1996, p. 115). Note: * stock data, position at year-end by country, including primary and secondary direct investment abroad.

[4] Reasons for the decreasing interest from the UK in Latin America is found in Miller (1993).

[5] The definition of direct investment implies that "a person in one country has a lasting interest in, and a degree of influence over, the management of a business enterprise in another country". In the US the International Investment and Trade in Services Survey Act sets "ownership or control of 10 percent or more of an enterprise's voting securities as a considered evidence of a lasting interest in or a degree of influence over management" (OECD, 1996b, p. 341).

[6] In Germany, direct investment, provided that it amounts more than 20 percent of the nominal capital, is defined "when an enterprise (parent company) or an investor or a group of associated enterprises or investors can exert a marked influence on the business policies of another enterprise (subsidiary)" (OECD, 1996b, p. 307).

Table 3.7 - United Kingdom - direct investment[7] abroad* (£ million)

Year	Latin America-Caribbean	of which Brazil	Total
1985	n.a.	n.a.	n.a.
1986	n.a.	n.a.	n.a.
1987	6,416	1,202	81,544
1988	7,084	1,289	102,215
1989	8,753	1,452	120,947
1990	10,225	1,250	118,941
1991	10,892	1,345	124,093
1992	12,910	1,880	146,613
1993	11,964	1,963	165,832
1994	14,897	2,023	176,342

Source: OECD (1996, p. 270). Notes: * stock data, position at year-end by country, n.a. = not available.

The import-substitution policy adopted by the Brazilian government from the 60s gave various incentives to attract FDI. Later, this policy was complemented by an export promotion policy. However, foreign companies did not contribute with these governmental policies (when left to the market forces). This happens because foreign companies have been installed in Brazil basically to assemble or manufacture products that were formerly imported (Carvalho, 1982, pp. 5-6). Therefore, their basic interest was to guarantee a market in which they already had control through exports (this interest reflects the maintenance of economic advantages and profits from their oligopolistic position). Additionally, some foreign firms have also benefited from cheap labour and natural resources (in less capital and technological-intensive sectors).

Consequently, the Brazilian government "has taken many actions to control their behaviour and influence". Baer (1995, pp. 236-237) states that the countervailing governmental measures are: (a) control of remittances: the Central Bank and other governmental agencies have become increasingly sophisticated in monitoring profit remittances and payments for technology. However, this does not mean that transfer pricing practices are totally under control; (b) credit system at the BNDES: foreign firms were excluded from this system, because it was used to expand the domestic industry in the 70s. The requirement that firms should be over 50 percent owned by domestic capital to have access to governmental credit was used as a bargaining tool to

[7] In Britain, the minimum qualifying as direct investment is fixed at 20 percent of the capital. It "refers to investment that adds to, deducts from or acquires a lasting interest in an enterprise operating in an economy other than that of the investor". The investor aims to have an effective voice in the management of the enterprise (OECD, 1996b, p. 337-338).

set up joint ventures with MNCs; (c) state companies: in key sectors (such as steel, mining and petrochemicals) acted as a countervailing measure. However, this is no longer the case with the privatization of most of them and the impending termination of the monopoly on petroleum exploration; and (d) market control: the use of a protected market policy gave an incentive to local firms to enter new technologically advanced fields. For example, the restriction of the minicomputers market to domestic firms resulted in a joint venture between American-based IBM and a local firm.

According to Baer (1995, pp. 268-269) since the 1930s "it became obvious in Brazil's mixed economy that access to government institutions for special favors (e.g., special credits) by the private sector was not evenly distributed"; because the "regulatory powers were used as instruments of macroeconomics policies". In the 90s the Brazilian state became less of a player in the economy, where market forces were allowed to determine the allocation of resources to a greater extent than before.

According to the *Ecologist* (1992, p. 160) there is a historical link between FDI and environmental degradation in Brazil, encouraged by the military regime (in power from 1964 to 1985) which opened the door to foreign industry, initiating the 'Operation Amazon'. This was a plan to 'occupy and develop' Brazil's interior. All sorts of incentives, including support from the World Bank were offered to big companies. In sum, "from 1973, car, steel and food-packaging magnates were encouraged, by means of credit and tax holidays, to diversify and invest, especially in cattle ranching".

In broad terms, Evans (1979, p. 9) states that "international capital is an integral part of the domestic Brazilian economy, and the representatives of international capital are integral parts of the Brazilian political and social order". In other words, the foreign capital shares with local capital, both private and state-controlled, an interest in the further development of local industry. There are conflicts of interests amongst them, but not on the issue of industrialization. On this latter issue there is consensus among the "triple alliance" that they will benefit from the accumulation of industrial capital in Brazil. Finally, Sklair (in Redcliff and Benton, 1994) emphasizes that transnational capitalism, TNCs, and consumerism colluded with the elite in developing countries in bringing about environmental degradation.

At present, there is no evidence in Brazil of special restrictions on FDI due to environmental issues[8]. The installation of news plants must follow the legal requirements of project and licensing submissions to the state and local authorities. The only current evidence of conflict between FDI and the Brazilian authorities was related to the timber industry operating in the Amazon area. In 1996, Brazil received approximately US$ 500 million of investments from Malaysian timber industries, but environmentalists were concerned that they might produce the same condition of unsustainable exploitation left in the southeast of Asia. Therefore, the Minister of the Environment emphasized through the media that FDI was welcome but only in compliance with the norms defined for the timber industry in that area[9].

More specifically, the BNDES's official[10] has provided evidence of the environmental performance of TNCs' subsidiaries in Brazil. For example, White Martins (subsidiary of American Praxair - ex-Union Carbide) is said to be a good example of TNCs' environmental management. Likewise, Ciba-Geigy (Swiss pharmaceutical company) and Hoechst (German chemical and pharmaceutical company) were both mentioned as cases of positive environmental management in Brazil.

In contrast to this, Rhodia (French chemical company) is said to be an interesting case of an environmental liability (for its site contamination in Cubatão). Despite the long dispute between company and environmental agency - CETESB - over the site closure[11], the judicial decision (after legal action against Rhodia) is quite interesting. CETESB is receiving the payment of the overdue fines in new equipment. The BNDES's official adds that it is harder to control what is done by environmental agencies with such cash payment of fines (mainly wasted in administrative dysfunction and corruption). Therefore, this was a creative and more effective way of law enforcement. Finally, Bayer (German chemical company) was mentioned as an

[8] See Muchlinski (1995) for laws, bills and regulations that MNCs are subject to in Brazil. In May 1996 the Brazilian government approved a patent bill according to recommendations from the WTO (Economist, 18 May 1996), under the assumption that it would attract more FDI. Another relevant source on constraints faced by FDI in Brazil is Braga (in Baer and Due, 1987).

[9] Folha de S.Paulo, 4 December 1996, p. 4.

[10] Interview with official in the Environmental Department of BNDES (on 29/08/96).

[11] Rhodia's case reverberates among public agencies and TNCs' subsidiaries in Brazil, as it is often used as an example of misconduct of both company and environmental agency. Zulauf (1994, p. 78) stresses that Rhodia is removing and treating the contaminated wastes that were left by the former owner of the site. The company has spent US$ 75 million and more US$ 30 million was planned to achieve the clean up. However, this specific site has a revenue ranging from US$ 4 to 6 million per year.

example of poor management. Because the environmental practices in the Belford Roxo site (Rio de Janeiro state) were not in accordance with the headquarters rhetoric[12].

In general, TNCs are more advanced than domestic firms in environmental management as a consequence of headquarters guidelines, which includes environmental audits, access to resources and technological structure. Moreover, there are cases in which environmental practices developed locally have been incorporated by the corporation, such as in Alcoa (aluminum industry located in São Luís, Maranhão). Some years ago, this subsidiary was pressurized to change and has already achieved half of the targets stipulated in the eleven year programme it signed.

Finally, the most interesting example among Brazilian companies is Aracruz[13] (paper and pulp company), which contracted a consultancy firm to investigate the international standards for air emissions and effluents in order to improve its performance. Surprisingly, it was found that the standards defined unilaterally by the state government were stricter than those in Finland and Sweden (the countries of origin of major world competitors). More specifically, the strict regulatory control over Aracruz was a consequence of its high visibility locally (i.e., in a state with few industries). Consequently, it is a major polluter facing pressure from society and government, though Aracruz is a major source of tax and employment (which did not result in lax regulation).

3.2 - Environmental politics

This section will briefly discuss the major aspects of Brazilian environmental politics. Consequently it comprises the pressures faced by the Brazilian government in the international arena, and the evolution of environmental awareness in Brazilian society.

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[12] It confirms the statement from the GTZ's (German agency for technical cooperation) consultant at FEEMA about double-standards at subsidiaries of German chemical companies in Brazil (Informativo do CRQIII, December/January, 1996, p. 5).

[13] Aracruz Celulose is a company member of the Business Council Sustainable Development and the first Brazilian company to subscribe to the ICC's Business Charter for Sustainable Development (Schmidheiny, 1992; Willums and Goluke, 1992).

3.2.1 - International environmental pressures

Brazil has been mentioned in the literature in connection with serious environmental and occupational problems. Although none of them have been completely solved, the situation seems to have improved since the 80s. However, the most fundamental problems (such as a lack of clean water and sanitation) which have both environmental and human repercussions on those most vulnerable remain unsolved.

For example, Ives said that Cubatão, in Brazil is "one of Latin America's largest petrochemical centers and one of the most polluted communities on earth", which is "intersected by four lifeless rivers and under a venomous mist polluted by 1,000 tons of toxic gases daily" (in Ives, 1985, p. 173). Additionally, Castleman (in Ives, 1985, p. 76) stated that "the careless and uninformed use of pesticides" accounts for a large number of death and disease in developing countries. In the São Paulo state in Brazil "an estimated 2,000 people die each year from pesticide poisoning". Likewise, Margulis (1988) concludes that economic pressures for greater agricultural output are in principle antagonistic to strict environmental policies to control pesticide pollution in Brazil.

Michaels et al. (in Ives, 1985, p. 96) states that "much of Latin America's industrial growth has occurred in industries in which workers are exposed to significant health hazards". More specifically, Latin American countries "have developed their own 'heavy' industrial concentrations, producing steel, automobiles, tyres, chemicals and other durable goods". In the Brazilian case, the São Paulo state accounts for approximately 40 percent of the Brazilian GNP, incorporating one of the largest cities in the world - the city of São Paulo[14].

Rappaport and Flaherty (1992, p. 114) have provided a short but very critical overview of environmental degradation in Brazil (such as deforestation in the north, urban degradation in the south, lack of water and sewage treatment in major cities and food poisoning by agrochemical). Nevertheless, a more recent study (Lemos, 1995) has indicated that some good results were achieved in terms of pollution control in Cubatão. This study stresses the role played by a temporary alliance formed between

[14] UNEP, Industry and Environment, July-September, 1996, p. 60.

state technocrats and popular movements to pressure the local pollution-intensive industry to comply with state environmental legislation. In conclusion, it demonstrates that state and society can work together in Brazil, avoiding both co-optation and confrontation.

Hurrell (in Hurrell and Kingsbury, 1992, p. 419) has made a very interesting connection between the feeling of marginalization at Latin America during the 80s and the extent to which the international environmental pressures[15] were disturbing other pivotal issues on the local agenda. Moreover, Hurrell states that "the combination of deforestation and the country's actual and potential industrial development make Brazil a major actor in the international politics of the environment" (Ibid., p. 401).

However, the Amazon deforestation (there is a vast literature on this subject, such as Hall, 1989; Bunker, 1985; Mahar, 1989; Goodman and Hall, 1990; Hurrell, 1991) has diminished the importance of other environmental issues in Brazil. This is exactly the case for industrial pollution. Therefore, this thesis emphasizes the seriousness of industrial pollution and the fact that it represents a 'problem of a predominantly urban and industrial society'[16].

Additionally, the UNCED (in 1992) played an important role by increasing the awareness of Brazilian society towards environmental issues. Despite former international pressures on deforestation and demarcation of Indians' land in the Amazon region, the conference materialized these pressures for a larger segment of the Brazilian society. At the same time it has intensified local pressure on the business community and local authorities.

To summarize, Brazil has been criticized internationally for the environmental degradation that resulted from its development policies. According to Viola (in Ferreira and Viola, 1996, p. 41), Brazilian diplomacy remained (during the 70s and 80s) close to the nationalistic position presented at the Stockholm Conference, in

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[15] During the America Summit on Sustainable Development (held in Bolivia in December 1996) the Brazilian president stated that 'Brazil rejects the role of environmental villain'. He stressed that international pressures are jeopardizing national policies which aim to reduce the social inequalities (Gazeta Mercantil, 9 December 1996, p. A-11).

[16] Hurrell (1992, p. 122) has stressed that regionalism (as a result of structural change in the world economy) is a relevant trend in Latin America, which has practical consequences within the business community (mainly amongst multinationals). For example, since Mercosur was launched in 1991 many companies have been restructuring their business among the four country members. Mercosur, from the Spanish 'Mercado Comun del Sur', is a process of economic integration ratified by the Treaty of Asuncion in March 1991 between Argentina, Brazil, Paraguay and Uruguay, which resulted in a common market in 1995.

which the notion of incompatibility between development and environmental protection was a key principle (a perspective shared by the Brazilian Army). However, in early 90s the Brazilian government assumed an environmental commitment as part of its foreign policy[17].

More specifically, Brazil has recently been more cooperative towards environmental issues in the international arena. The country takes part in relevant international initiatives (at the multilateral and regional levels) aiming to protect the global ecosystem[18]. As well as this, the government claims to be integrating environmental considerations into development programmes[19].

Another major international influence on Brazilian environmental politics comes through NGOs. Based on the data from the Central Bank, the Brazilian NGOs received approximately US$ 400 million in 1994 from abroad. Nevertheless, donations sent by mail are not included in this amount, and the government lacks legal control over NGOs' funds thereby making an accurate estimate impossible.

In the opinion of a Brazilian environmentalist[20], legislation is an obstacle to making local NGOs more professional. Indeed, the major impediment for NGOs to obtain resources is lack of specific and transparent regulations. In reality, it has burdened the ability of NGOs to maintain membership as a major financing source. Consequently, they have become financially dependent on aid from international NGOs. It is said that up to eighty percent of the budget of the main Brazilian environmental groups comes through donations (such as project associations, campaigning for global issues, and aid to local projects) from international NGOs. In

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[17] A document from the Foreign Relations Ministry states that protecting the natural resources, "while successfully achieving economic growth, is one of the most important challenges that Brazil currently faces". Consequently, "a series of policies have been put into place over the last ten years that ensure maximum protection for the country's environmental resources" (Brazilian Embassy, 'Brazil and the Environment'. Washington: 1993).

[18] Brazil is a 'state party' in the following agreements: (a) the 1975 Convention on the International Trade of Endangered Species, (b) the 1978 Amazon Cooperation Treaty, and its 1989 Special Commission on the Environment, (c) the 1982 United Nations Convention on the Law of the Sea, (d) the 1985 Vienna Convention on the Protection of the Ozone Layer, (e) the 1987 Montreal Protocol on Substances that Depletes the Ozone layer, and its 1990 London Amendments (PNUMA, 1989b), and (f) the 1988 Basel Convention on the Transboundary Movements of Toxic and Dangerous Wastes (PNUMA, 1989a). Accordingly, Brazil is a signatory in the following agreements: (a) the 1991 Environmental Protocol to the 1961 Antarctic Treaty, (b) the 1992 United Nations Framework Convention on Climate Change, and (c) the 1992 United Nations Convention on Biological Diversity (Ibid.).

[19] Ibid.

[20] Mary Alegretti - consultant of the Inter-American Development Bank and president of the Institute for Amazon Studies (Estado de S. Paulo, 20 November 1994, p. A-30).

sum, this results in a situation which is misconceived and politically dangerous. The big international NGOs are locating offices in Brazil not only to cooperate in projects defined by national institutions, but to establish their space and to influence the public policy's discussion in the country[21]. A similar argument was made by Miller (1995). That is, the NGOs from industrialized countries influence the public policy of developing countries according to their interests, which are closer to the interests of their government and society and lack consideration for local interests, experiences and culture. The virtual lack of environmental NGOs[22] (international and local) with interests in industrial pollution in Brazil may be evidence of such phenomenon. The majority of local NGOs are focused on the same issues of international NGOs[23].

3.2.2 - National environmental awareness

Hurrell (1992, pp. 411-412) states that the "Brazilian environmental movement has grown steadily since the early 1970s and has gradually helped to increase national awareness of environmental issues". However, the political weakness of the environment movement has prevented it from becoming a major domestic political issue.

Grass-root organizations have been growing in Brazil since the 70s, focusing on the poverty and inequality that resulted from the development policies. They are located in urban areas and have links with the Church and community associations. Most importantly, they are not concerned with ecology but their demands are strictly related to environmental degradation in urban areas. Apart from this, environmental groups emerged from a distinct social background. They are formed by middle-class members and concentrated in the most developed regions of the country (that is, the south and southeast).

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[21] Ibid.

[22] The exceptions are 'SOS Mata Atlântica' (São Paulo state) and AMDA (Minas Gerais state), in which only the latter is exclusively devoted to industrial pollution within the state. The former has interfaces with industrial pollution (mainly air and water) by its projects to recover the coastal forest and the Tiête river. This is the only Brazilian NGO to publicly accept donations from companies (interviewed on 26/09/96).

[23] The Brazilian office of WWF and Greenpeace confirmed that their agenda did not include industrial pollution (so-called brown issues). WWF is concerned with protection of the natural environment and Indians (interviewed on 22/08/96), and Greenpeace is focuses on Amazon deforestation and nuclear energy (interviewed on 27/09/96).

Viola (in Goldenberg, 1992) has indicated two distinct phases in the Brazilian environmental movement[24]. The first phase (from 1971 to 1986) is characterized by much denunciation of social and environmental problems, raising a public consciousness. The second phase (from 1987 to 1991) is characterized by the existence of 'multiple actors', institutionalization of environmental groups and the integration of environmental protection with development.

The emergence of environmentalism in the south and southeast of Brazil[25] in the early 80s has similarities with the equivalent process in Europe, North America, Australia and Japan (that is, the emergence of post-materialist values among the most affluent members of the society). However, the scope and timing of this process are different in the Brazilian case. In other words, the size of the affluent group is smaller and it emerged at least one decade later than in industrialized countries (Ibid., pp. 57-58).

Most relevant is the recognition that two issues are crucial for the development of environmentalism in developing countries, that is social justice and economic development (Ibid., p. 60). Consequently, in the mid-80s a bond was forged between Brazilian environmentalists and less privileged people facing the consequences of environmental degradation in industrial centers (such as Cubatão).

In the late 80s some environmental groups became professional institutions expanding their scope of activities[26] (from the former concentration in the south and southeast) to the national and regional level into the west midlands, north and northeast of the country (Ibid., p. 61). Another relevant change in this period was made by professional groups[27] that changed their approach from condemnation to the proposal of feasible alternatives for conservation or recovery of the environment. Moreover, these groups influenced other social movements, ranging from the victims of hydra-electrical projects, the rubber tappers and Indians in the Amazon region to rural workers and consumers (Ibid., p. 63).

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[24] See Pádua (in Leis, 1991) for a historical perspective of environmental politics in Brazil.

[25] The number of environmental groups grew from 40 to 400 in the period 1980 to 1985, though on average their activities lasted only one year (Viola, in Goldenberg, 1992).

[26] The number of environmental groups increased from 400 in 1985 to 700 in 1989 (Ibid.).

[27] Examples of this type of NGOs are: SOS Mata Atlântica, Funatura, Ecotrópica, Instituto de Estudos Amazônicos, Fundação Mata Virgem, Amigos da Terra, Fundação Biodiversitas and Greenpeace Brasil (Ibid.).

Finally, from 1988 Brazilian environmentalism started to consider sustainable development more seriously. Viola (Ibid., p. 66) stresses the economic crisis affecting public resources, international influences (such as from the Brundtland report in 1987 and international NGOs) and pressures (caused by deforestation and Chico Mendes - a rubber tapper - murdered in the Amazon region, Keck, 1995) as the reasons for such radical change towards sustainable development.

More specifically, Guimarães (1992, p. 77) states that the idiosyncrasies of Brazilian natural resources enhanced the traditional problem Brazil faces as a developing country. The abundance of natural resources in a large territory turned Brazilian environmental problems into global issues, which pressurized the country into participating in multilateral efforts.

Later in 1989, Brazil became the host for the UNCED, stimulating environmental activities and the interest for the concept of sustainable development. Consequently, for the first time environmental issues were officially recognized (at least at a rhetorical level from 1990 onwards) as relevant within Brazilian society. At this point, two other sectors of Brazilian society - apart from professional NGOs and socio-environmental institutions - became active participants in the environmental movement. More specifically, scientists and institutions devoted to research on environmental issues, and a small number of representatives from the business community started to evaluate the production process and investments by sustainability criteria (Viola, in Goldenberg, 1992).

The business community was particularly interested in the opportunities that resulted from increased environmental concern. These opportunities were specifically: waste management and end-of-the-pipe technology, renewable energy, basic sanitation, organic products, and recycling of industrial material. Furthermore, some industrial sectors with exports to industrialized countries were facing strict norms on product and process quality. Additionally, the inclusion of business representatives in the environmental movement generated donations to environmental projects by professional NGOs, and the creation in 1991 of the Brazilian Society for Sustainable Development[28] by companies that pledge to follow this concept.

[28] This institution develops projects and research on environmental preservation and motivates business to incorporate environmental management. It comprises twenty - large domestic and foreign companies, but the founders are: Companhia Vale do Rio Doce, Caemi, Varig, Mannesmam, Papel Simão, Ripasa, Aracruz, Acesita, Suzano and Shell (Souza, 1993, p. 50).

More specifically, the US Department of Commerce[29] estimated that the Brazilian market for environmental technology services has a potential of US$ 1 billion (including the privatization of sewage services, acquisition of end-of-the-pipe equipment and waste treatment). Therefore, the US aims to enhance its commercial relationship with Brazil in order to introduce their technology (Gutberlet, 1996, p. 107). A similar interest has been expressed by the German government[30], which emphasises not only the sale of equipment but also joint ventures with medium and small companies. More recently, German companies specializing in environmental technology, explicitly stated their interest in the Brazilian market, because it represents a potential market estimated at US$ 30 billion per year. However, German companies will have a substantial share as they are the world leaders in technology for waste treatment[31].

To summarize, the key question for Brazilian environmentalism since the early 90s centres on the type of sustainable development that should be followed, given the conflicting positions of all those actors involved. Nevertheless, there is still a gap between discourse and practice within Brazilian society. For example, the lack of environmental concern from consumers in Brazilian and other South American markets delays environmental improvements in industrial operations[32].

Nevertheless, signs of a progressive perspective towards sustainability from political, social and economics aspects of Brazilian society in the 90s are recognized by Viola (in Ferreira and Viola, 1996, p. 49). For example, the first democratically elected president (Fernando Collor, 1990-1992) incorporated environmental concern into the public administration mainly as a result of international pressure over the Amazon region and as part of preparation for the UNCED. A second aspect is that energy sources are based on renewable resources (i.e., hydra-electricity and biomass). Therefore, Brazil is at the vanguard of sustainable energy matrices. Finally, the

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[29] Based on a statement from American official at the Trade and the Environmental Seminar, held in São Paulo in October 1996. This event was sponsored by the Secretary of State for the Environment and Ernest & Young consultancy.

[30] For example, a German technology fair was organized in São Paulo in 1995 ('Química and Derivados', October, 1995, pp. 30-34).

[31] Folha de S. Paulo, 1 June 1997, C-2, p. 4.

[32] Despite rare governmental initiatives (such as the SMA programme on the consumer and the environment) to motivate industry and consumers environmental consciousness, the reality is that Brazilian consumers are not prepared to exercise pressure based on their buying power (Folha de S.Paulo, 29 October 1995, p. 3).

growing awareness of society towards environmental issues and its connection with development constitutes another contributory factor.

This last aspect changed dramatically after the UNCED. According to Viola (in Ferreira and Viola, 1996, p. 52) interest from public opinion on environmental issues has decreased since the Conference. Furthermore, the creation of the Ministry of the Environment did not increase the importance of this issue for the government, because of resistance to restructure the governmental agencies.

The international pressure from NGOs and more particularly from the American government over the Amazon area have persisted after UNCED. Despite such pressures, the presidential elections of 1994 had no implications on environmental issues, as candidates did not address related issues. Consequently, the elected president (Fernando Henrique Cardoso, 1995-1998) kept the low profile of the former government. The lack of media interest also contributed to major impacts on the Brazilian environmental movement. For example, environmental groups experienced a phase of stagnation as a consequence of financial problems from 1993 to 1995. Nevertheless, the discussion of environmental issues among governmental, business and academic communities remained at a constant pace throughout the 90s (Ibid., pp. 53-55).

More recently, the Ministry of the Environment judged that five years after UNCED the most concrete achievement was increased public awareness about environmental issues[33]. Therefore, there was plenty of evidence during the 'Rio + 5' meeting of the gap between discourse and reality in the Brazilian context. Later on, at the special UN summit (held in New York in June 1997), the Brazilian government was criticized for its public relations approach[34] during the UNCED. Accordingly, Brazilian environmentalists[35] criticized the speech from the Brazilian President at the summit because the current government had neglected environmental issues.

[33] The 'Rio + 5' was a preparatory meeting (held in Brazil in March 1997) for the UN special summit in 1997; it evaluated the adoption of environmental protection measures defined by UNCED in 1992 (Estado de S.Paulo, 13 March 1997, p. A24).

[34] This criticism came specifically from the Environmental Defense Fund (American NGO) in reference to the Amazon deforestation (Estado de S. Paulo, 22 June 1997, p. A29).

[35] More specifically the representatives of the 'Instituto Sociambiental' and the Brazilian office of WWF (Estado de S.Paulo, 25 June 1997, p. A16).

3.3 - Environmental regulatory policy

This section focuses on regulatory aspects, that is, the Brazilian environmental regulatory policy at federal and state levels. In essence, it will introduce the structure and scope of the regulation that affects industrial activities in Brazil.

3.3.1 - Federal level

Brazilian society experienced an increased concern with environmental issues throughout the 1980's. This process actually began in the early 70s, as a result of the Stockholm Conference[36] in 1972. And in 1973, it was institutionalized with the expansion of environmental legislation and through the creation of the federal Secretary of the Environment (SEMA). It was endowed with the basic task of elaborating rules and regulations for environmental conservation and monitoring their enforcement (directly or in coordination with other governmental agencies).

Later, another turning-point in environmental issues came in 1981. The Law 6938 (from 31/08/81) established the objectives and basic instruments[37] for a national environmental policy. For the first time, internal legislation stressed the necessity of integrating development and environmental considerations. In addition, the first step in implementing the 'community-right-to-know principle' was launched through the requirement of government licensing for activities which might harm or destabilize the ecosystems in which they are performed.

The same legislation had an important institutional component, by creating the National Council for the Environment (CONAMA). This is a consultative organ integrated by federal, state and municipality agencies, and by non-governmental organizations active in the environmental and economical fields. The CONAMA is responsible for proposing environmental policies and drafting criteria for the preparation of the environmental impact assessment (EIA), and the respective report (RIMA), which became critical tools for guiding domestic environmental policy.

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[36] An account of the radical position assumed by developing countries (including Brazil) may be seen in Castro (1972).

[37] According to Motta (1996, p. 79) the instruments of command-and-control in use in Brazil are classified by the National Environmental Programme, as follows: (a) environmental standards (of quality and emission); (b) control of land use (based on zoning and conservation units); (c) licensing (including EIA); and (d) penalties (such as fines and compensations).

Accordingly, environmental agencies have been created in the majority of the Brazilian states since 1982. These agencies, the SEMA and the CONAMA, form the 'Brazilian Association of Environmental Agencies'.

Additionally, legislation was approved, allowing civil suits for damages caused to the environment, as well as aiming to preserve sites of landscape, aesthetic or historic value. Besides this, NGOs won the right to plead lawsuits in court (Law 7347 from 1985). Finally, in 1986 a strict regulation concerning location of industrial units and an obligatory EIA for new sites was created (CONAMA Resolution 001).

Additional improvements happened in the national context with constitutional changes in 1988. The Brazilian Constitution of 1988 contains an entire chapter on the environment, based on the right of the population to a sound environment as a precondition for a healthy quality of life. More specifically, the Constitution established the overarching principle that both property rights and the economic order must be consistent with - and will not be prejudicial to - environmental protection. It also reinforced the citizen's right to participate in environmental management through the introduction of a new type of 'environmental popular lawsuit'. Lastly, the states and municipalities were granted greater legislative autonomy on environmental matters.

At the beginning of 1989, the Brazilian Institute for the Environment and Renewable Resources (IBAMA) was created under the Interior Ministry, through the fusion of the SEMA and three other federal agencies (i.e., Forest, Rubber and Fishery). Later, in March 1990, a new SEMA was established at Cabinet level, responsible for planning, coordinating, monitoring and controlling all activities with a potential impact on the environment. IBAMA, which kept its pre-existing institutional structure, was transformed into the executive agency for the National Environmental Programme. In October 1992, SEMA and IBAMA were amalgamated into the newly created Ministry of the Environment[38].

The National Environment Programme, developed by IBAMA and partially financed by the World Bank, is an initiative with three main goals: (a) to strengthen environmental agencies both at the federal and state level, improving their coordination strategies and investing in staff-training programs; (b) to improve the

[38] Brazilian Embassy, 'Brazil and the Environment'. Washington: 1993, pp. 2-3.

management of the federal conservation units, severely compromised by the lack of budgetary resources; and, (c) to invest in the conservation and protection of 'special ecosystems', that is, those classified as 'National Heritage' by the 1988 Constitution, namely the Amazon, the 'Pantanal', the Atlantic Forest and Coastal Ecosystems[39].

The IBAMA has been severely criticized for not accomplishing any of these goals[40]. However, obstacles to enforcement of the law come, to some extent, from the government's administrative structure[41], because environmental issues are still dispersed within the public administration[42]. Another major difficulty faced by IBAMA is the lack of resources (as illustrated in the table below). Margulis (1992, p. 94) criticizes the use of command-and-control in developing countries because the environmental agencies lack the financial, human and infrastructure to enforce the law.

Table 3.8 - Brazil - budget of the federal environmental agency

(US$ million)	1989*	1990*	1991*	1997**
IBAMA	257.7	269.4	106.5	80

Source: Adapted from Maimon, 1992, p. 114, and Financial Times, 2 December 1997, p. 9.
Notes: * current spending, ** estimated.

Brazil has three levels of public administration: federal, state, and municipal. The federal government formulates an overreaching policy, leaving the more specific law and enforcement options to state and municipality. The complex nature of this constitutional approach has led to conflicting decisions and priorities, which have often had detrimental effects on the environment (as suggested by Motta, 1996, p. 80, the governmental structure lacks integration). A further bureaucratic layer, created through federal legislation, was the formation of 'metropolitan areas' (such as São

[39] Ibid., p. 5.
[40] For example, IBAMA estimates that unpaid fines for environmental offenses total more than US$ 400 millions, experts assess this backlog as a major challenge to simultaneously enforce the law and punish offenders. In this particular case the agency contracted lawyers to take legal action against the offenders (Financial Times, 6 June 1996, p. 5).
[41] The official responsible for the IBAMA's Financial Department said that a campaign was launched (so-called 'penalty operation') aiming to collect unpaid fines. The countervailing mechanism used by IBAMA was to include the offenders in governmental records ('Cadastro de Inadimplentes'), which prohibited them from applying for loans from governmental organizations. Finally, it was stated that the revenue from legal actions had been invested in new projects financed by IBAMA (interviewed on 21/08/96).
[42] Estado de S.Paulo, 19 March 1995, C-B, p. 6.

Paulo and Rio de Janeiro). These areas do not constitute an autonomous level of government, they are only an administrative concept implemented by the states.

In other words, the state and municipal government are empowered to exercise regulatory authority[43]. The most influential of these powers is the ability to approve or reject operating licenses of new projects that may have a significant environmental impact. State and local levels can also impose fines, within the limits set by federal law (Rappaport and Flaherty, 1992, p. 115).

Furthermore, a scholar[44] has called attention to the 'network of power, pressure and influence' in the Brazilian context, which includes political parties, communities, social movements and workers unions. This aspect is relevant in a country like Brazil as a consequence of its continental size, and the existence of several layers of governmental power. Similarly, Hurrell (1991, p. 209) states that "it is important to keep the actual political impact of such new social movements in perspective and not to allow their novelty to overshadow study of the traditional sources of political power".

In conclusion, the National Environmental Programme has introduced important alterations to the approach to environmental issues, particularly by moving the regulatory focus from pollution toward prevention and protection. Motta (1996, p. 80) states that the results achieved since this programme was established in 1981, are 'satisfactory vis-à-vis the short period for its implementation'. However, the environmental agencies face problems in making full use of the command-and-control instruments[45].

Considering that the UNCED has enhanced society's perception towards environmental issues, changes of concept, approaches and practices regarding the legislation for industrial pollution control[46] have been discussed. Apart from these

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[43] The municipality started to exert its constitutional rights in the mid-90s. Consequently, municipal authorities may duplicate legal requirements of the state environmental agency (which were created in the late 70s). For example, the municipal authority in Paulínia (petrochemical complex in the São Paulo state) aims to impose further licensing requirements. Therefore, a group of companies' representatives was created to negotiate these requirements, which has support from FIESP (interview at FIESP's Environmental Department, on 29/09/96).

[44] Interview with a Professor from the International Relations Department in the University of Brasília (on 19/08/96).

[45] The absence of governmental programmes to curb industrial pollution (or so-called 'brown issues') was stressed at the Environmental Department of the Foreign Relations Ministry, and also at the WWF office in Brasília (interviews made respectively on 21/08/96 and 22/08/96).

[46] For example, Coca-Cola (American company) has been involved in a Programme of Energy Conservation after an voluntary agreement with Eletrobrás (federal agency of electricity) in May 1996.

political and institutional changes, there are also economic changes taking place in the Brazilian context. In brief, these economic changes are, as follows: (a) privatization of state-owned companies in the petrochemical sector; (b) relocation of industrial sites away from the metropolitan area (mainly in São Paulo and Rio de Janeiro); (c) reduction of hierarchical levels in the companies' organizational structure, leading to closer integration between sites and support functions; and (d) a major diffusion of total quality control, which includes rationalization of raw materials, energy and wastes reduction in the manufacturing process.

In general, the current debate concerning industrial pollution control is increasingly concentrated on the interaction between environmental authorities and industry. In this context, the industrial capabilities, policies and practices of pollution control have been taken into account to reformulate the regulatory structure, which begins to rely on other instruments (such as environmental self-assessment and taxation of water usage, according to Motta, 1996, p. 79) and encouragement of the incorporation of voluntary schemes such as environmental certification.

3.3.2 - State level

3.3.2.1 - São Paulo state

The state government uses the Secretary of State for the Environment (SMA) as the core institution (created by State Decree 24933 in 1986) responsible for coordinating environmental issues. There is evidence that the current mandate is responsible for changes in the command-and-control approach[47], which has consequences for industrial activities in the state of São Paulo. For example, SMA published a 'resolution on information access'[48] emphasizing the public right-to-know

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This agreement has been developed under the auspices of the National Programme of Conservation of Electric Energy - PROCEL (Jornal do Meio Ambiente, August 1996, p. 9).

[47] The difficulty of obtaining data on the compliance of selected companies was highlighted by Secretary Fábio Feldmann (1995-1998) during a meeting, which includes other participants, as follows: the president of CETESB, the Director of Pollution Control, the Executive Assistant of the Director of Pollution Control, the Secretary's advisor, two representatives from the Juridical Department. Consequently, the request for information was taken by the director of pollution control and answered a few days later (interview at SMA, on 03/12/96).

[48] Resolution SMA 66 from 17/12/96 (Governo do Estado de São Paulo, Secretaria de Estado do Meio Ambiente, "Acesso à Informação Ambiental", December 1996, p. 5).

[49]. This resolution states that "the norms regarding information access must serve to promote the transparency and broad announcement of information maintained by the bodies with public responsibilities". Additionally, SMA states that "the juridical model of simple punishment has been partially inefficient to protect the environment ... The challenge is to rethink this model and to search for alternative ways to enforce the environmental legislation"[50].

Accordingly, SMA proposes a significant evolution in the *modus operandi* of public administration, though the creation of the juridical figure; the so-called 'Compromise of Conduct Adjustment Term'[51]. Consequently, SMA has provided the public administration with effective instruments to make the enforcement of the constitutional principles of environmental preservation, conservation and recovery possible.

Adhering to this 'Compromise Term' the offender is obligated to promote the recuperation of the degraded environment. Furthermore, such an agreement is similar to an 'extrajudicial execution title'. That is, if the offender does not fulfill the obligation assumed by the agreement, the immediate judicial execution of the obligation agreed (which includes the overdue administrative penalties) can be imposed.

In total, these attempts to improve the environmental management at the state level result in more transparency and efficiency; moreover, they aim to motivate compliance without making exclusive use of control and punishment. Additionally, there are other relevant examples from the current SMA's administration, such as: (a) integrated environmental licensing, which is an exclusive counter service aggregating the issuing of all licenses[52] from SMA and CETESB for activities located in the metropolitan area of São Paulo. This is an innovative solution to improve the standard of enforcement by the simplification of the former bureaucratic licensing procedures;

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[49] A scholar confirmed the difficulties in gathering data from Brazilian bureaucracy, emphasizing the lack of transparency at CETESB (interview with Associate Professor of the Production Department in the 'Fundação Getúlio Vargas - São Paulo', on 27/11/96).

[50] These rhetorical changes were constantly confirmed during interviews at the SMA, respectively by the coordinators of the NGOs (on 11/10/96) and consumers (on 20/09/96) programmes.

[51] The resolution SMA 5 (from 07/01/97) regulates this legal instrument (Governo do Estado de São Paulo. Secretaria de Estado do Meio Ambiente, "Compromisso de Ajustamento de Conduta Ambiental", January 1997, p. 3).

[52] More specifically, the operations from SMA's coordination of environmental licensing and natural resources protection (which includes land use, EIA and natural resources protection) and CETESB's pollution control Division are aggregated together.

and (b) the project of law (to be enacted at the state Assembly) for forest preservation, aiming to achieve the recovery of forest areas in the state (including new modalities of punishment[53]).

Further to this, SMA's activism in environmental management[54] is illustrated by the inclusion of consumer's environmental awareness among its programmes. The focus of SMA's programme is on eco-labelling products, methodology for life-cycle assessment and the lack of environmental concern among Brazilian consumers[55]. There is a clear connection between this programme and the launch of environmental certification (by the ISO). This is based on the assumption that TNCs' subsidiaries and Brazilian export-oriented companies will immediately incorporate this new environmental scheme[56].

The existence of market-related demands is the main argument supporting self-regulation, which may be true for export companies operating in sensitive sectors (such as paper, timber, mining, textile, and footwear). However, such an assumption is ambiguous for other manufacturing sectors with products for the domestic market (where environmental awareness is not a driving-force). Nevertheless, SMA has been supporting the discussion on ISO certification as a strategy towards motivating companies to be more proactive on environmental issues. As such it should be understood that more than this is necessary to change companies' behaviour.

The state environmental agency - CETESB - was the pioneer in the Brazilian context by establishing strict and comprehensive legislation[57] in 1976 that dealt with

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[53] Governo do Estado de São Paulo, Secretaria de Estado do Meio Ambiente, "Anteprojeto de Lei Florestal do Estado de São Paulo", October 1996.

[54] Folha de S.Paulo, 29 October 1995, p. 1-3, and interview with the coordinator of SMA's consumer programme (on 20/09/96).

[55] Reckitt & Colman's subsidiary (British household company) has produced evidence of the lack of environmental concern in the Brazilian market by withdrawing its range of green products. Moreover, the production line was adapted to produce its traditional (and cheaper) products when domestic demand increased after inflation was controlled. However, the launch of this range of green products was influenced by the UNCED (interview at the Marketing Department of Reckitt & Colman's subsidiary, on 24/10/96). Hurrell (in Hurrell and Kingsbury, 1992, p. 413) mentioned how quickly the Brazilian media and advertising industries incorporated the green appeal, that is the 'commercial advantages of environmentalism'.

[56] Gazeta Mercantil, 22 October 1996, p. C-6.

[57] The most relevant legislation regarding pollution control in São Paulo state are: (a) Law 118 (29/06/73) that created CETESB, (b) Law 997 (31/05/76) and Decree 8468 (08/9/76) that defined the prevention and control of pollution, (c) Decree 14806 (04/03/80) that defined a Programme for Industrial Pollution Control ('PROCOP'), (d) Decree 21880 (11/01/84) changed the PROCOP, hereinafter called Programme of Pollution Control (CETESB, 1992). This latter programme is partly financed by the World Bank and it has been evaluated as such by Freitas and Soares (1994). More

two phases of pollution control on both the preventive and corrective levels. CETESB was chartered as a state-owned company in 1973, mainly to allow for a larger degree of administrative flexibility, especially with regard to personnel management (Rappaport and Flaherty, 1992, p. 115).

As far as the pollution control approach followed in São Paulo state was concerned, CETESB[58] has been working with control of process and/or end-of-the-pipe solutions based on 'best available technology'. It was illustrated that the US emphasizes end-of-the-pipe solutions and the Scandinavian countries are concerned with industrial process and technology, CETESB therefore combines both[59]. The peculiarity of pollution control in Brazil comes from the definition of types of pollution (i.e., air, water and soil pollution), grounded in the federal Constitution of 1988 (Chapter VI - Article 225). Additionally, the amount of pollutants that companies are allowed to generate is defined by state regulations.

The discourse from CETESB is in tune with the official statement[60] from SMA. Accordingly, self-regulation (through schemes such as eco-labelling, BS 7750 and ISO 14000) is a powerful instrument for promoting cleaner industrial processes. The voicing of support from CETESB for environmental certification is crucial since a clear message that self-regulation is endorsed by all bodies within SMA's structure is required. Nevertheless, there is no similar support at the technical level, that is, among CETESB's staff (which are concerned with work conditions and wages). Thus, considering the lack of experience with industry self-assessment in Brazil, the potential results of such an approach by governmental agencies remains in doubt.

However, CETESB has achieved good results through unconventional approaches in the past. In one instance, the agency had to control air emissions via the burning of diesel. The objective was the reduction of sulphur emissions from diesel

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specifically, it has two components: (a) allocation of resources to finance improvement in industrial activities, and (b) technical assistance to improve the operational capacity of CETESB.

[58] Interview with the director of the Pollution Control Division at CETESB (on 24/10/96).

[59] CETESB is a reference agency for the WHO in Brazil and Latin America. The agency has agreements on technical cooperation at national (major universities) and international level (British Council and Overseas Development Agency, EPA, GTZ and GKSS among others). For example, GTZ is helping decontaminate polluted site and dispose of toxic wastes in São Paulo (Consolidating Development Opportunities, by Deutsche GTZ, n.d., p. 39). Additionally, Zulauf (1994, p. 40) states that CETESB's international cooperation includes agreements with WWF, Portugal's Secretary of the Environment, and the Japanese International Cooperation Agency.

[60] More specifically, SMA has sponsored workshops and seminars on environmental issues with the participation of environmentalists, business representatives and members of the academic community.

burned by a large number of companies in the metropolitan area of São Paulo. However, the agency decided to reduce the amount of sulphur (from 5 to 2.5 percent) in the fuel from just one producer - Petrobrás (state-owned petrochemical).

Moreover, it was confirmed by a CETESB's official[61] that the weight of the fines (which are defined by law and had lost value as a resulted of high inflation) has been increased, now representing a significant sum to offenders, thereby improving law enforcement. Additionally, the programme of incentives to locate sites in the interior of the state illustrates the long term commitment of CETESB to industrial pollution. In the last ten years, the programme has encouraged industries either to relocate current sites or to locate new sites in the interior of the state (Law 5597 from 1987). However, the legislation is stricter in the capital because of the high urban concentration (Law 4963 from 1986); CETESB therefore created regional offices to avoid potential double-standards in pollution control within the state.

Nevertheless, the major problem affecting CETESB's performance is lack of financial resources (mainly from the state government)[62]. This lack of resources has resulted in changes to the 'philosophical approach' followed by the agency. An official[63] from the National Development Bank (BNDES) affirms that CETESB was created to have a highly technical focus; it consequently follows a reductionist approach towards environmental issues. At present, CETESB is in a process of transformation, but it has already lost many qualified staff. Therefore, one of the founders of the agency has been reappointed as President to promote the much needed changes.

The first change is grounded in the legislation defining criminal responsibility (that is, the "pollution pays" principles) of the polluter. Second, is the proposal of obligatory self-assessment for industrial sites (based on the experience in the Rio de Janeiro state). Consequently, the companies will be responsible for data collection at critical points of the industrial process and the agency will evaluate the results. Besides this, the implementation of self-assessment will rationalize the agency's resources so that qualified technicians can be devoted to more relevant tasks than inspections at industrial sites. Third, the Brazilian economic liberalization and privatization have

[61] Interview with the official responsible for the Interior Division at CETESB's Pollution Control Division (on 24/10/96). On the same occasion the station of air quality control was visited.
[62] Ibid.
[63] Interview with the official of the Environmental Department at BNDES (on 29/08/96).

also demanded changes in CETESB's activities. As a result, it is expected that market forces will demand environmental concern from economic agents; environmental issues will became a market differential in terms of quality of product and process.

Regarding TNCs' double-standards, CETESB's director said that there is no evidence for criticizing the technological stage of Brazilian sites. The director alluded to the fact that foreign and export-oriented domestic companies[64] would lead the dissemination of environmental management in Brazil. This is mainly because these companies are able to secure access to cleaner technology without requiring assistance from CETESB.

Another CETESB's official[65] said that overcompliance is unusual even among TNCs' subsidiaries. One example of overcompliance is Honda's (Japanese company) new site, which has presented a project above the regulatory requirements and will be implemented as such. Besides this, there are other few examples of overcompliance in the environmental management of TNCs' subsidiaries, which are usually related to waste management.

3.3.2.2 - Rio de Janeiro state

The most recent legal requirement in the state of Rio de Janeiro is the enforcement of environmental audits[66]. The state environmental agency (FEEMA) started to implement the law in 1996 after many legal and technical difficulties[67]. More specifically, at the end of 1995, the state commission on environmental control from the Secretary of State of the Environment approved the guidelines[68] establishing the scope, responsibilities, procedures and technical criteria for environmental audits. This self-assessment defined by state legislation is part of the licensing system of pollution-intensive activities[69]. At the first stage of enforcement only selected companies comply according to a timetable set by the environmental agency. In brief,

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[64] It was certainly a reference to companies from the paper and pulp sector, because CETESB's director of pollution control previously worked for a paper and pulp company (interviewed on 24/10/96).
[65] Interview with the official at CETESB's regional office in Campinas, São Paulo state (on 14/10/96).
[66] The Law 1898 (from 25/10/91) establishes an obligatory annual environmental audit. This legal requirement was introduced by a green politician and activist - Carlos Minc - in 1991.
[67] Interview with the official of the Pollution Control Division at FEEMA (on 01/10/96).
[68] Deliberation CECA/CN 3,427 dated 14/11/95.
[69] The 'Sistema de Licenciamento de Atividade Poluidoras' was defined by the Decree 134, 18/06/96.

there is comprehensive regulation detailing the enforcement of environmental audits, which includes FEEMA's responsibilities, the public right-to-know and companies' environmental disclosure. However, as the implementation of legislation started in 1996, there was no evaluation of the results achieved.

Nevertheless, criticism of the enforcement of environmental audits came from the environmental department of BNDES[70]. It was said that the compulsory nature of environmental audit is meaningless considering that it originated as a voluntary industrial choice. For example, TNCs' subsidiaries located in Rio have been doing voluntary environmental audits for a long time. Therefore, it was not necessary to impose environmental audits as a legal requirement. However, why there is no voluntary environmental disclosure from TNCs' subsidiaries in Brazil is not questioned.

According to the BNDES's official[71] the environmental agency was created as a foundation without profit interests. Besides this, it was supposed to follow a holistic vision towards environmental problems based on the understanding that the Rio de Janeiro has a 'natural vocation' for tourism, banking industry, and other (non pollution-intensive) industries. FEEMA has been a good example of this type of institution, however it is now chaotic in a process of self-destruction.

The enforcement of obligatory audits is a turning-point in Brazilian environmental regulatory policy. For this reason, some criticism[72] is expected because self-assessment was introduced at the same time that the environmental agency's operations were deteriorating. In other words, FEEMA[73] is the agency responsible for enforcing both regulation and environmental assessment, but it lacks the technical, human and financial resources.

The major environmental issue in the metropolitan area of Rio is the water pollution at Guanabara Bay. It is said that the state-owned petrochemical company

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[70] Interview with the official of the Environmental Department at BNDES (on 29/08/96).
[71] Ibid.
[72] The annual frequency of the obligatory audit has generated criticism from industrialists (La Rovere and d'Avignon, 1995, p. 13).
[73] According to Zulauf (1994, p. 40) FEEMA has international cooperation agreements with the Japanese International Cooperation Agency and other similar institutions from Belgium and England. Additionally, GTZ (German agency) states that it is supporting FEEMA in Rio de Janeiro "in various fields of industrial environmental protection, including water control, toxic industrial waste, storage and transport of hazardous products" (Consolidating Development Opportunities, by Deutsche GTZ, n.d., p. 39).

(Petrobrás) is responsible for most of the pollutants discharged at Guanabara Bay, without having faced any punishment from the authorities[74]. Besides this, Petrobrás caused another oil spill[75] in the bay in 1997. This argument confirms Neder's (1994) statement that state-owned companies have been neglecting legal requirements towards pollution control. Another source[76] states that 'fifty five companies (including foreign and domestic) are responsible for 80 percent of the industrial pollution discharge in the bay's water'. More specifically, these are the companies taking part in a programme launched by the state environmental agency demanding the installation of effluent treatment systems prior to discharge. Additionally, these fifty five companies[77] were selected as the first to present the report of environmental self-assessment to FEEMA.

As far as Guanabara Bay is concerned, in 1995 a special loan line (approximately US$ 150 million) was launched by the federal government through the BNDES[78]. It provides for major polluters in the area willing to participate in the Recovery Programme for Guanabara Bay, by financing projects of pollution control. Surprisingly there were no applicants (from June 1995 to August 1996) for such loans. Consequently, governmental incentives to industrial pollution control did not produce any change in the slow recovery of the bay. Finally, the most obvious excuses from companies were: (a) economic recession, (b) lax behaviour from the state-owned petrochemical company, and (c) the chaotic situation in the environmental agency. However, a similar pattern of behaviour - that is reactive to the legislation - is also present in other areas of Rio de Janeiro. For example, the media stated that approximately 1,500 companies were penalized in 1996 because of environmental damage (the transport sector received the highest amount of fines)[79].

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[74] Interview with a Professor from the Federal Rural University of Rio de Janeiro (on 30/08/96), who is also a founder member of the Ecological Economics Society in Brazil.

[75] The spill of 600 thousand litres of oil was caused by a faulty pipe and the company cleared up the oil to contain further degradation in the Bay area (Estado de S.Paulo, 14 March 1997, p. A14).

[76] Data supplied by the Division of Industrial Control from FEEMA, which is the same data sent to the Inter-American Development Bank - one of the sponsors of the recovery programme for Guanabara Bay (Jornal do Meio Ambiente, August 1996, p. 7).

[77] The TNCs' subsidiaries (located in the Bay) that have installed effluent treatment are: Ciba-Geigy, Bayer, White Martins, Westinghouse, General Electric and Beecham Laboratory. Elsewhere, Sandoz is said to be implementing the effluent treatment system (Ibid.).

[78] Ibid.

[79] Jornal O Globo, 19 July 1996.

It may be helpful at this point to present an overview of environmental awareness in the state of Rio de Janeiro. More recently, public participation was enhanced as a result of environmentalists' campaigning. A Committee for the Environment was created by the municipality. This Committee was drafted by state law as responsible for defining the priorities of environmental policy for the city of Rio de Janeiro. Accordingly, the first group of local NGOs ('Defensores da Terra, Aquariana and GAE') to take part has a two year mandate in the Committee[80].

Following this, representatives of environmental NGOs[81] recognized the efforts made by the federal agency (IBAMA) in the Rio de Janeiro state. Despite the IBAMA's lack of resources and weak structure, its activities have been fundamental for environmental protection. Besides this, IBAMA has provided a room at its regional office for NGOs[82], as a proof of the federal government commitment towards public participation and transparency in IBAMA's administration. IBAMA's official said that NGOs will be able to recommend, participate and inspect environmental projects sponsored by the agency.

Nevertheless, there are still plenty of environmental problems in the Rio de Janeiro state. For example, the NGOs state that the commercialization of agrochemicals is completely out of control. Indeed, agrochemicals are sold without prescription and the packaging is re-used to store food; rural workers have consequently been contaminated. Finally, there is a total lack of information available to the general public on the amount of agrochemicals in the food chain. Therefore, environmental NGOs demand emergency action from the state Committee for Agrochemical Control.

[80] Jornal do Meio Ambiente, August 1996, p. 5.
[81] Ibid., p. 7.
[82] Ibid., p. 8.

3.4 - Non-regulatory environmental initiatives

This section will briefly introduce the most relevant non-regulatory initiatives regarding environmental issues in the Brazilian context. To maintain a degree of coherence throughout the chapter's organization, the industry-related attempts at self-regulation will be addressed in the subsequent chapters. Of particular interest in this section are the governmental initiatives for motivating the incorporation of environmental concerns into industry and the responses from the business community to this new challenge.

3.4.1 - Governmental environmental initiatives

Since the early 90s the Brazilian government has been constantly reinforcing the idea that environmental concern should be incorporated into a broad range of economic activities (from manufacturing to tourism). Such concern is best illustrated by the governmental policy of financing changes[83] in pollution-intensive technology throughout industry, which is managed by the Environmental Department of the National Development Bank (BNDES). This bank lent US$ 1.58 billions for environmental projects from 1991 to 1996. More specifically, the biggest demand came from privatized steel and petrochemical companies, which had accumulated significant environmental liabilities under state ownership[84].

Considering that there is competition for scarce capital, Brazilian companies were pressurized into incorporating environmental concern into their investment planning by BNDES. This is virtually the only source of long-term financing in Brazil, and has turned EIA into a basic requirement in evaluating investment projects. Overall,

[83] Gutberlet (1996, p. 59) has described other lines of credit for pollution control, as follows: (a) the PROCOP (current budget of approximately US$ 152 millions) is managed by CETESB with resources from the International Bank for Reconstruction and Development (represented by BNDES in Brazil) and the São Paulo state bank. This loan line has operated since 1980 with a high concentration of projects in the Cubatão area during the 80s, and in the interior of the state in the 90s, and (b) 'FINEP verde' (governmental research agency) provides financial support to companies improving their environmental performance by the use of preventive measures (consultancy, training, information system, etc.) with resources from the federal government and the Inter-American Development Bank.

[84] Financial Times, Survey, 6 June 1996, p. V.

BNDES[85] aims to finance and promote development in Brazil (through loans and incentives). In the case of loans it operates by taking into consideration the environmental behaviour of applicants; those deemed to have violated environmental regulations are rejected.

Moreover, BNDES and other state-owned regional development banks, which together lend approximately US$ 21 billion a year, signed in 1995 a 'Green Protocol' giving priority to environmentally sustainable industrial and agricultural projects. These banks also committed themselves to withholding finance from companies which are environmental offenders according to the Brazilian environmental authorities[86].

Additionally, the Minister of the Environment and the president of BNDES have been trying to convince private banks to join the governmental efforts to incorporate environmental protection into their decision making[87]. The pioneer experience at BNDES is used as an example that other banks should follow based on the Green Protocol's principles. More specifically, the protocol has obligated official banks to require environmental evaluation prior to the concession of loans. This protocol was inspired in the 'Declaration of Banks to the Environment' prepared by UNEP, which eighty banks worldwide plead to follow (including two Brazilian banks - BNDES and Banespa - the São Paulo state bank).

Another relevant point in BNDES's environmental approach is the refusal to finance industrial sectors that are environmentally unsustainable (e.g., iron mining and timber sectors). Therefore, according to BNDES's environmental official[88], the most criticized sectors (e.g., chemical, petrochemical, mining and steel manufacturing) have been changing their behaviour in Brazil. Besides this, the privatized steel companies (such as 'Cosipa, Companhia Siderúrgica Nacional, Companhia Siderúrgica de Tubarão and Usinimas') have their projects scrutinized to finance the clean up of past environmental damage. This represents a total investment of approximately US$ 400 million. In total, at the beginning of 1996, fifty projects were submitted to environmental risk analysis.

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[85] Interview with the official of the Environmental Department at BNDES (on 29/08/96).

[86] This protocol was personally launched by the Brazilian president, with support from the federal environmental agency (IBAMA). Therefore, this reference to environmental authorities is specifically focused on IBAMA's problems with unpaid fines (interview with official responsible for the Green Protocol at IBAMA, on 21/08/96).

[87] Gazeta Mercantil, 29 January 1996, p. A-12.

[88] Ibid.

BNDES was created in the late 50s without any environmental concern because it was not a relevant aspect. As it became a relevant question the bank adopted a new approach[89] including a line of incentives to assist Brazilian companies to minimize their environmental liabilities. Here one interesting point emerges, that is, foreign companies[90] had no access to these incentives. BNDES's official claimed that MNCs have access to financial and technological resources[91] from their headquarters. Baer (1995, p. 236) provides an overview of BNDES's credit system and confirms the exclusion of access to foreign firms. However, in 1994 the review of the Constitution abolished the distinction between domestic and foreign capital, the practical consequence of which was that foreign firms may apply for public funds to implement pollution control.

3.4.2 - Business environmental initiatives

As regards the initiatives from the business community in Brazil, it must be mentioned that they were highly influenced by environmental standards from industrialized countries. This is a consequence of both the openness of the Brazilian economy in the 90s and the existence of environmental barriers in export markets.

Nevertheless, since environmental improvements represent costs, the majority of companies are in a stage of non-compliance with Brazilian legislation. Therefore, it is largely at a rhetorical level that the environmental concern is increasing within the business community (Gutberlet, 1996). Additionally, there is growing interest in environmental certification. However, there are only isolated cases of certified companies[92]. Such concern is illustrated by the table below, which summarizes the most significant schemes.

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[89] The BNDES's official states that since 1973 the bank has been engaged in environmental projects. Later in the 80s the bank created a special loan line for environmental protection (inclusive by pressure from the World Bank) and institutionalized an Environmental Division, which in early 90s became the Environmental Department (Freitas and Soares, 1994, p. 115).

[90] Interview with the official of FIESP (on 27/09/96), and Folha de S.Paulo, 27 September 1993, pp. 1-7.

[91] On the specific issue of self-regulation from industry association, BNDES's official said that ABIQUIM will not assume that TNCs' subsidiaries are framing the rules for environmental protection in the chemical sector; however, in the official's opinion this is the reality (interviewed on 29/08/96).

[92] For example, the Brazilian companies Cetrel - waste management in the Camaçari complex in Bahia -, and Copesul - petrochemical in the Triunfo complex in Rio Grande do Sul - are certified by the ISO 14001.

Table 3.9 - Selected business environmental initiatives in Brazil

Industrial sector	Institution	Main objectives
Mining	Brazilian Mining Institute (IBRAM)	Orientation on EIA and recovery of degraded areas, cooperation with IBAMA
Chemical and petrochemical	Brazilian Chemical Industry Association (ABIQUIM)	Dissemination of clean technology and process, coordination of waste recuperation and Responsible Care
Paper and pulp	National Association of Paper and Pulp Producers	Dissemination of self-assessment, technology and reforestation
Steel	Brazilian Institute of Steel	Dissemination of solutions and financial sources for pollution control
Glass	Brazilian Association of Glass Industries (Abividro)	Sponsorship of recycling programmes
Mining, timber, agriculture, cattle and electronics	Amazon Business Association	Lobbying for industrial activities in the Amazon area, partnership with trade assn. state and local government, and research institutes
Mining, aviation, paper and pulp, petrochemical and steel	Brazilian Foundation for Sustainable Development	Dissemination and implementation of the concept of sustainable development through research and projects
Beverages, food, tobacco, packaging, cleaning and household, chemical fibers, and engineering	Business Commitment for Recycling (Cempre)	Promotion of integrated management of solid wastes, recycling of wastes and consumption of recycled products

Source: Adapted from Gutberlet, 1996, pp. 84-86.

As mentioned before, the UNCED was a turning-point for the business community's perception of environmental issues. Therefore, the most influential environmental initiatives were launched by the business community in the 90s. Considering the scope of this thesis on corporate environmental policies, it is imperative to further explain two of them. First, the federation of industries of São Paulo - FIESP - launched an environmental award in 1995, which selects one company per year that has best implemented environmental practices. FIESP also has an Environmental Department aiming to offer juridical and technical support to industrial companies[93]. Additionally, it works as a representative of the business community in the federal, state and municipal environmental committees. Finally, the incorporation of environmental issues by FIESP is relevant because this powerful organization

[93] Saneamento Ambiental, April/May 1996, pp. 27-30.

represents business interests (in an individual and/or collective basis) in Brazil. As such, it has the capacity to force all sorts of companies towards better environmental performance.

Another voluntary scheme is the 'Recycling Commitment' (Cempre) created by a group of large companies[94]. This group aims to promote and modernise recycling as part of an integrated waste management, including proper landfilling, composting and incineration. More specifically, the Cempre's institutional framework is based on the European Recovery and Recycling Association, and it has an annual budget of US$ 5 million donated by the members. Accordingly, as one would expect, the major environmental impact caused by company members was the proper disposal of product packaging[95]. More recently, Cempre was selected by the Ministry of the Environment as one of Brazil's best examples of promoting sustainable development[96] since the UNCED in 1992.

3.5 - Conclusions

Overall, the access to information from environmental authorities in Brazil is still a critical issue. The lack of disclosure is very obvious at CETESB (despite the recent regulation on public access to information) and FEEMA. These institutions, though following distinct approaches towards environmental protection, are considered the best institutions among the Brazilian state agencies. However, they did not escape without operational deterioration from the governmental crises during the 80s, and the subsequent restructuring during the 90s. It is evident that a new approach is urgently needed at the regulatory level. At the same time, it must be recognized that the current structure is still able to constrain companies' practices regarding industrial

[94] Cempre has clear influence from TNCs' subsidiaries, consequently among its members are the following foreign companies: Bombril (cleaning products), Coca-Cola (soft drinks), Gessy-Lever (food, cleaning products), Nestlé (food products), Pepsi-Cola (soft drinks), Procter & Gamble (personal hygiene, cleaning products), Rhodia-ster (polyester resin and fibers), Souza Cruz (tobacco) and Tetra Pak (aseptic drink packaging), and the Brazilian companies: Brahma (brewing, soft drinks) and Enterpa (waste hauling and engineering). Based on UNEP, Industry and Environment, April-June, 1994, p. 14-17, and Warner Bulletin, Journal of the World Resource Foundation, November 1996, p. 10.

[95] Coca-Cola (American company) was the founder of this scheme, bringing some recycling experiences from its home country (interview with the environmental manager of Coca-Cola's subsidiary, on 02/10/96).

[96] CEMPRE News, Number 34, June 1997.

pollution. This is particularly true for the most visible companies within the Brazilian context (such TNCs' subsidiaries, large domestic groups and former state-owned firms).

Accordingly, the Brazilian legislation obligates industries to have a permanent group (so-called CIPA) with representatives from both the workers' union and the company, aiming to prevent accidents and ensure workplace safety. Besides this, companies have to renew the operational licenses which requires a set of practices to fulfill the legal requirements. Additionally some Brazilian states have special requests. For example, in the Rio de Janeiro state there is a programme of self-assessment controlled by FEEMA. Another legal requirement is related to the installation of new sites. It is necessary to perform an EIA prior to the installation and/or substantial modification of the operational processes, which must be made by a third party hired by the company. The EIA final report (so-called RIMA) is incorporated at the licencing process by the environmental agencies.

The state environmental agencies follow a case-by-case approach when issuing licences (including those for projects, installations and renewals) for industrial activities, which is a consequence of the volume of environmental legislation to be enforced. Usually the pollution standards are site-specific following negotiations between company and environmental agency. Consequently, there are no uniform standards for pollution control in Brazil despite the parameters established by the state legislation on maximum allowances. This approach reduces, according to ABIQUIM's official[97], the power of industry association in influencing the regulatory policy for industrial pollution control in Brazil.

The action of interest groups[98] in the definition of legislation is neither active nor apparent for environmental issues in Brazil. For example, the project (of law 3160) to turn environmental auditing into a legal obligation has been under discussion in the Federal Congress since 1992, without clear indication if the delay is the result of lack of concern or lobbying from those against the project[99]. Moreover, environmental

[97] Interview with the official of ABIQUIM (on 04/09/97).

[98] In general terms there are identifiable interest groups in the Brazilian Federal Congress, such as representatives of the catholic church, automotive industry, workers unions, state companies, public servants, large farmers and major industry associations.

[99] This project follows the 'pollution-pays principle' and incorporates environmental disclosure as a legal requirement. Therefore, it is claimed to be a very strict regulation by industry associations, such as FIESP, CNI and ABIQUIM (Gutberlet, 1996, p. 57).

pressure groups usually make better use of the media than Congress members. Finally, there are few politicians (at all governmental levels) who are publicly committed to environmental issues in Brazil[100].

The literature (Vernon, 1993 and Vogel, 1986) stresses the existence of different national approaches to environmental issues, without suggesting that one approach is better than the other. Brazilian authorities have been supporting the transition from the command-and-control system to more creative ways of enforcing the law, which include for example, incentives to voluntary environmental initiatives from the business community. In the opinion of CETESB's inspector[101] the voluntary schemes will force companies to go further than the legal compliance, as a consequence of powerful marketing and/or image concerns. However, it was also claimed that environmental improvements entailing high investments will only be made when obligated by the authorities.

In general, the environmental agencies (that is, FEEMA and CETESB) lack the agility and creativity to respond to new demands. In other words, it is easy to impose new legal requirements but burdensome to implement them. However, it is interesting to note that some attempts were made, for example the environmental authority used the media to disclosure the major polluters of the Tietê river (in São Paulo) to coincide with the recovery programme launch in 1992[102]. A similar approach was followed by FEEMA (in Rio de Janeiro) regarding the major polluters of the Guanabara Bay. At present, the most innovative approach comes from the Secretary of State of the Environment[103] in São Paulo, and its attempts to change the regulatory policy (from command-and-control towards environmental responsibility) and to disseminate the contents of the Agenda 21 (plan of action from the UNCED). In the Rio de Janeiro state, FEEMA has shown some strength by pioneering the implementation of self-assessment as an instrument of pollution control, despite its structural deficiencies (La Rovere and d'Avignon, 1995, p. 13).

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[100] Zulauf (1994, pp. 60-61) states that the inclusion of the 'Chapter on Environment' in the Brazilian Constitution of 1988 was an exceptional occasion, when 50 politicians forged the special commission on the environment chaired by Congressman Fábio Feldmann.

[101] Interview with an inspector in the regional office of CETESB in Campinas (on 24/10/96).

[102] Veja, 8 March 1995, pp. 70-84.

[103] Data from interviews with SMA's Secretary (on 03/12/96), SMA's coordinator of the NGOs programme (on 11/10/96), and with CETESB's official in the Division of Technological Cooperation (on 11/10/96).

In such a context, self-assessment is the new instrument for improving environmental performance. Considering that environmental agencies lack the resources to inspect and enforce regulation, companies will evaluate and report their operations. Hence, the agency will be freed from the inspection activities, and the frequency of site inspection will be reduced[104]. It is expected that this approach will emphasize companies' responsibilities, since CETESB lacks the human resources to keep a tight schedule of inspections. Besides this, it is well-known that companies used to control emissions and discharges during each batch production since the inspector is not constantly present. In the future it is presumed that the relationship will be based on 'trust'[105]. Nevertheless, failure to achieve reasonable results will subject companies to punishment and/or the return to the former inspection system.

CETESB's official[106] has suggested a pattern of behaviour amongst companies (including domestic and foreign) in Brazil, as follows: (a) companies that will enforce the law after being punished, and (b) companies that will be punished several times prior to complying with legal requirements. Overall, there are no cases of voluntary action and/or overcompliance among companies in Brazil. According to Amado and Brazil (1991, p. 40) the "Brazilian organizations are predominantly worried about immediate results, achievement, and short-term performance, which are particularly stressed by managers with an engineering background. Consequently, these actions "impair the purposes and goals of productivity, cost reduction, and quality, as well as organizational efficiency".

As specifically regards TNCs' subsidiaries, the general rule is that they will be warned once or twice, but will accomplish the legal requirements prior to being punished. Besides this, these companies maintain a process of negotiation with the environmental agency. CETESB's inspector[107] suggested that TNCs' environmental management is more complex because of corporate influence and control through audits. Usually, the subsidiaries' minimum requirement is the legislation of the country of operation and 'there is no evidence of headquarters suggesting subsidiaries

[104] According to CETESB's official (interviewed on 14/10/96) the frequency of inspection will be based on the risk of the operation.
[105] Interview with CETESB's director of the Pollution Control Division (on 24/10/96).
[106] Interview with the head of CETESB's regional office in Campinas (on 14/10/96).
[107] Ibid.

to ignore legal requirements'. On the other hand, the headquarters have no real control over subsidiaries' practices.

The argument that by following corporate guidelines the subsidiary's practices will be beyond the local legislation is a recurrent fallacy. However, this is a common argument among TNCs' subsidiaries, which is contradictory because their practices have not incorporated these corporate guidelines. Moreover, Brazilian standards are claimed to be a copy of American standards (as suggested by Neder, 1994 and Monosowski, 1989). However, the criteria of 'technical-economic viability' is the basis of the decision-making process at TNCs' subsidiaries in order to solve the dilemma between local versus corporate requirements. In reality Brazil has a very modern environmental regulatory policy since the changes in the federal Constitution were made in 1988. Nevertheless, the evidence confirms the argument (such as in Haas et al., 1993) that developing countries lack the institutional resources to enforce environmental regulations (generated at national or international level).

Finally, it is also relevant to point out the existence of a 'public attorney', who may at any moment initiate a legal action against environmental degradation. This is a new instrument of public control regarding environmental issues in the Brazilian context, but it is unevenly distributed throughout the country. Consequently, some local communities may close down industries due to pollution problems, but others lack a similar mechanism. Some of the aspects discussed throughout this chapter on the host country context will be repeated in subsequent chapters which address the findings from selected cases in the chemical and pharmaceutical sectors.

Chapter IV - Case studies analysis - chemical sector

In this chapter industry-related explanations for the implementation of corporate environmental policies in TNCs' subsidiaries will be discussed. The chapter focuses on the chemical industry (its selection was justified in section 1.2, of this thesis). More specifically, it presents the findings from three cases - Zeneca, DuPont and BASF, which were investigated in order to evaluate the proposition (introduced previously in section 2.5) regarding industry's influence on environmental practices. Briefly, the chapter's main sections are: a profile of the chemical industry (in the world and in Brazil), a profile of the selected TNCs (including their Brazilian subsidiaries), and finally industry-related explanations based on data from the case studies. This latter section includes regulatory and economic aspects faced by TNCs' subsidiaries in Brazil (thus it confirms aspects already discussed in the previous chapter). Consequently, other explanations (that is, those regarding home and company-specific variables) will be addressed in chapter six.

The main argument developed in this chapter is based on the following question: why and how does industry structure affect the implementation of corporate environmental policy in Brazilian subsidiaries? It is worthwhile indicating that some authors go deeper than others into the question of how important industry-related explanations are (such as Rumelt, 1991). They usually start their argument by asking what really configures an industry and its boundaries (Easton et al., 1993). Ballance (1987, p. 23) said that "in describing an economist's view of the industry life cycle, a difficult task is to specify what is meant by the term 'industry'. In fact, no one definition is possible. ... the availability of data may impose a definition upon the user which does not necessarily suit conceptual requirements".

The attempt to assign firms to a particular industry may be based on the researcher's judgment of the comparability of the cases. It happens mainly "when products supplied by a cluster of firms are differentiated", in this case, "a precise delimitation of the industry can not be found. Actually, industries consist of shifting groups of competitors which are clustered around particular products or processes" (Ballance, 1987, pp. 23-24). Additionally, Porter (1980) suggests that the definition of the industry is dependent on the actor's perception of such an industry. Moreover, the

selection and consequent justification of industry may be specifically based on some (and not all) the characteristics of a set of firms (what brings them together rather than what separates them).

Such a discussion is not commonly made in the literature on TNCs and environmental issues (despite efforts in IPE to bring together distinct levels of analysis, including the firm-level as in Sally, 1995). Besides this, it is important to note that this thesis investigates other aspects (to be introduced in chapter six) apart from the industry context. In such a case, the industry is a kind of control variable, setting limits to the analysis of a phenomenon, and as such assisting the further development of knowledge. This decision is consequently grounded in the current IPE paradigm which emphasizes regulatory and economic aspects of TNCs' practices.

One vital component of the approach followed in this research is multi-level analysis. Such an approach is present in the industry-related discussion on the assumption that there are distinct industrial contexts within any industry. More specifically, multi-level analysis is represented by the division of the chemical industry structure into two distinct contexts, that is, international and national. However, some aspects of the world chemical industry are reflected in the Brazilian chemical industry, mainly due to the presence of large TNCs, others are not. This finding leads to the discussion in chapter six of ontological stratification by variance of context, that is, the relevance of the country of origin in the explanation of TNCs' environmental practices.

4.1 - Profile of the industry

This section will briefly introduce the main characteristics of the chemical industry from a worldwide viewpoint. Additionally, it will provide an overview of the Brazilian chemical industry. Overall this section will assist in the data analysis of three case studies, specifically those industry-related aspects explaining environmental practices in Brazilian subsidiaries (such as technology, cost, competition and market addressed in section 2.5). Finally, it is relevant to mention that the selected subsidiaries are not operating in all business areas as the corporations; therefore, there

is specific emphasis on agrochemicals and specialties throughout this chapter as these are the most important segments of activities in the Brazilian subsidiaries.

4.1.1 - World chemical industry

4.1.1.1 - Overview and trends

The life-cycle perspective has been the main framework used by different authors for analysing industrial sectors. According to Ballance (1987, p. 26) the chemical industry provides a telling example of a mature industry. Until the 1920s, "producers were mainly suppliers of intermediate inputs used by other industries. While this function still persists, the emergence of petrochemicals led to all sorts of new product lines based on synthetics (e.g., tyres, textiles, paint, and clothing). Chemical firms outgrew their 'supplier role' and entered a second 'product' phase dominated by items intended mainly for the final consumer rather than other industries". More recently, Ballance adds that they have faced the effects of market saturation, over-capacity, rising energy costs and environmental concerns. In the author's opinion, these problems "have converted chemicals into a mature industry with a service-oriented mode of operation", a perspective shared by Porter (1980). Just like firms in other maturing industries where firms have their margins squeezed, "chemical producers have become increasingly willing to sell their know-how". In short, the current features of the chemical industry contrast with the mass production approach which marked earlier phases in its development (Ballance, 1987, p. 26).

The pressure on the world production of industrial chemicals can be attributed to the creation of new capacity, both in the developing and industrialized countries. This coincided with the petroleum crisis (during the 70s) that triggered changes in the industry's standards of efficiency and productivity. After 1972, the shares of world production claimed by European, Japanese and American chemical firms declined. In some segments, such as the production of synthetic fibres, the Triad producers lost shares to India, Indonesia, South Korea and Thailand. It is also recognized that "new environmental regulations, for example, have limited the industry's growth of production in Western countries. Firms operating plants designed in the early 1970s have also suffered because of their high energy costs" (Ibid., p. 104).

However, impacts on the industry have showed variances because the chemical sector is an industrial branch of a very heterogeneous character. Its "main activities consist of chemically transforming materials into diverse substances, giving them new physical and chemical properties. For these activities, the chemical industry employs raw materials from the petroleum, mining and extractive industries such as oil, minerals, metals and certain agricultural products"[1] (EC, 1997, p. 7-1).

The importance of energy costs became critical because the chemical industry is an intensive energy user, mainly in the upstream basic chemicals subsector. It "consumes coal, oil products, natural gas and electricity, using them both as raw materials (feedstocks) and as fuels". In the case of some basic chemicals, "the energy content can account for more than 60% of the production cost" (Ibid., p. 7-5).

The chemical industry dependence on those raw materials will influence the location of main plants (Kogut, 1985), affecting the balance between comparative and competitive advantages. Ballance (1987, p. 161) argues that "problems of shipping or handling can also deter local manufacture of intermediate chemicals (e.g. ethylene and sulphuric acid) from their raw materials". Despite the decline of transport costs over the last decades, it is still a significant element in determining the location of processing facilities. On the other hand, the production of basic chemicals (e.g., salts, sulphur and hydrocarbons) may benefit from locating near user industries. Moreover, location near consumer markets is preferred as a consequence of the variety of end-uses for chemical products. Finally, most of the chemical operations are subject to considerable economies of scale (Ibid., p. 166).

Briefly, there are three main products segments: (1) basic chemicals, which include basic organic and inorganic chemicals, fertilizers, plastics in primary form and synthetic rubber, (2) pharmaceutical products, and (3) speciality chemicals, which include pesticides and other agrochemical products, paints, varnishes, soaps and detergents, cleaning and polishing preparations, perfumes, toilet preparations, and man-made fibres (EC, 1997, p. 51).

It is also possible to categorise chemical products by nature of their consumers. In this case there are two groups: (a) end-products, which includes a diverse set of products consumed by households: such as paints, varnishes, drugs, soaps, polishes,

[1] The main raw materials from the mineral oil industry are naphtha, gas, oil, heavy and gaseous mineral oil fractions and natural gas (EC, 1997, p. 7-5).

film and explosives, and (b) industrial products, i.e., products to be incorporated in the manufacturing process of other products and/or industries: such as basic chemicals, polymers (synthetic resins, plastics and man-made fibres), fertilizers, pesticides and industrial intermediates (acids and solvents) (Ballance, 1987, p. 146).

Most chemical firms are extremely large and supply a variety of products which include not only basic chemicals but also intermediate and end-products (the so-called 'integrated' and/or 'diversified' companies). Some chemical firms have moved downstream to produce a score of products in other industries. The opposite is also true, since heavy chemicals users, in industries such as textiles, steel, food and oil, now produce their own chemicals. At the same time, the production technologies in use offer many alternatives for different routes from raw materials to end-products. Ballance (1987, p. 146) concludes that "for all these reasons the boundaries of each industry are extremely blurred and make any quantitative assessment a tentative one".

The last decade has witnessed the formation of larger groups, argued as necessary for the internationalisation of operations and for the implementation of global strategies in a worldwide basis, from a competitive perspective. More specifically, the major objective has been "benefit of large scale production and of the international division of labour in order to secure the comparative advantages in terms of market skills and production costs offered by the different regions of the world" (EC, 1997, p. 7-6).

Alongside pressures for reduction of costs, one important aspect of the chemical industry has been its ability to re-invent itself. The industry is said to be at the forefront of modern technology. It is constantly developing new and improved products and processes, creating and serving completely new markets. It will also enable other industries to become efficient and productive by the use of more effective substitute materials and products (Ibid., p. 7-5).

According to Grosse (1989, p. 212) this has become an important factor in the differentiation of firms because "not only is the industry multifaceted in terms of products groups, but it also is quite varied in terms of technology intensity. Some of the base chemicals are considered very low-tech, requiring little R&D and competing primarily on price and availability grounds". The chemical industry received, indeed, by the OECD (1992, p. 111) the classification of medium-technology industry (such as

motor vehicles, non-electrical machinery, and rubber & plastics). This category of R&D intensity (i.e., the ratio of R&D expenditures to gross output) includes industries that "tend to be large, traditional sectors whose output is frequently mass produced and is increasingly subject to international trade".

A large share of R&D expenditures consists of basic research. However, such research is only the very beginning of the innovation process, because many risks are faced in terms of contingency and lack of internal control (Nelson, 1991). Besides this, there is intense competition posed by other firms, thus "commercial success or failure in this industry, ... , is largely a matter of what happens after a laboratory discovery" (Landau and Rosenberg, in Rosenberg, 1994, p. 190).

In the past, chemical companies have competed on price and on the most cost effective manufacturing plants, which resulted in lower prices and encouraged customers to see products as interchangeable. Later, technological dissemination contributed in turning expensive and innovative speciality products into another commodity. In sum, the chemical industry has been struggling against the reputation of having "a bad record for creating value rather than commoditising its output"[2].

In fact, the chemical industry has been traditionally analysed by its cost factors, including: (a) labour costs and productivity, and (b) energy price and efficiency in its use. Considering the first factor, Europe, Japan and the US have higher wage costs and higher productivity, as a consequence of the substantial accumulation of capital. Additionally, high labour costs have helped to stimulate technological progress and R&D in those countries (UN, 1994a, p. 2). The labour cost (as share of production costs) is respectively 20 percent in Europe, 17 percent in the US, and 13 percent in Japan (EC, 1997, p. 7-5).

Regarding the second factor, it may said that the energy "purchased by the European chemical industry is about one third more expensive than in the US". Moreover, the "total energy consumption has remained constant since 1985 despite an increase of some 40% in chemical production, which means that there has been a major increase in energy efficiency" (UN, 1994a, p. 3). Overall, the search for lower costs of production has certainly been a strategy in financing R&D expenditures.

[2] Financial Times, 25 September 1997, p. 2.

A more recent aspect of the cost structure in the chemical industry is environmental protection expenditures, which has been indicated as an element affecting the competitiveness of chemical companies. The figures available are very scant, but it is said that these costs are the highest in Germany. Likewise, Britain has quite heavy costs, and in the US "environmental costs are only 2% of turnover or half as much as in Germany" (UN, 1994a, p. 4).

The chemical industry has a close relationship with the economy as a whole, following a similar cyclical pattern. However, the fluctuation in output is especially great for basic chemicals, due to the "stockbuilding both in downstream customer sectors and within the chemical industry" (EC, 1997, p. 7-3). The chemical industry "is driven by cycles of international economic growth, by movements in input and product prices and by adjustments to industrial capacity"[3].

Accordingly, during a period of economic growth, "demand rises rapidly because chemicals are raw materials for other manufacturing industries. Profits rise more rapidly than sales because most of the costs of chemical production are in the capital invested in manufacturing plants"[4]. Besides this, chemicals plants are of varying ages and efficiencies requiring continual improvement in technological terms. Consequently, much of the profit earned in the previous stage is invested into the building of new plants leading to a sharp rise in manufacturing capacity. The increase in capacity will depress prices, and threat the profitability of some of the older (less efficient) plants.

In opposition to this, when the economic cycle turns down, "manufacturers of consumer and industrial goods cut their orders of raw materials and chemicals' manufacturers reduce production in response", undermining the profitability of less efficient plants. Consequently, cost structure is a strategic concern in the medium- and long-term, as the sector is threatened by falling prices (due to overcapacity). As a result a chemical company "lays off employees, closes older plants, restructures through mergers and acquisitions and waits for economic recovery"[5].

Following the same cyclical explanation "the chemical sector will remember 1994 as the year of recovery" with "the first significant rise in product prices of the

[3] Financial Times, 25 September 1997, p. 1.
[4] Ibid.
[5] Ibid.

1990s and a lower cost base after the restructuring"[6] during the 1991-92 recession period. The second half of the 1980s had witnessed a rapid expansion of chemicals production and trade, in which the "world gross output in chemicals grew from US$ 744 billion to US$ 1.136 trillion". In 1991, "chemical trade accounted for 9 percent of total world trade" at US$ 295 billion. Overall, the OECD countries account for over 80 percent of production and over 85 percent of chemical trade throughout the period 1986-91 (ILO, 1995, p. 10).

Additionally, it has been indicated by ILO (1995, p. 11) that one "factor tending to integrate world chemical markets is the increasingly global frame of reference" of many chemical TNCs. In other words, a large amount of trade in chemicals is intra-enterprise in nature. More specifically, in 1991 "imports of US parent chemical companies from their foreign affiliates amounted to US$ 10.5 billion, which represented 72 percent of their total imports of US$ 14.5 billion, and 44 percent of national chemical imports of US$ 23.9 billion". Likewise, the US subsidiaries of foreign chemical companies imported goods with a value of US$ 9.8 billion, of which US$ 7.7 billion" (i.e. 79%), originated from their foreign parent companies. Moreover, this "intra-enterprise trade is complementary with foreign investment". Therefore, new FDI in chemicals will cause an increase in international trade flows.

At present, Europe is regarded as a major player in the world chemical industry, "with half of the largest chemicals firms being European in 1994, representing 51.5% of the total turnover of the world's top chemical producers" (EC, 1997, p. 51). However, the first position in the ranking of the world's largest chemical companies is held by the American company - DuPont (as illustrated in table 4.1 below).

[6] Financial Times, 20 January 1995, p. 39.

Table 4.1 - World's top ten chemical companies - 1994

Companies	Country of origin	Turnover (million ECU)
E.I. du Pont de Nemours	US	28,707
Hoechst	Germany	25,812
BASF	Germany	22,711
Bayer	Germany	22,579
Dow Chemical	US	16,878
Ciba-Geigy	Switzerland	13,599
Rhône-Poulenc	France	13,123
ICI	UK	11,863
Mitsubishi Chemical	Japan	11,056
Akzo Nobel	Holland	10,299

Source: Adapted from EC, 1997, p. 51.

More specifically, Europe is a global leader in chemicals because seven of the world's ten largest chemical companies are European-based. Moreover, the world's top thirty chemicals companies - of which eighteen have their headquarters in Western Europe - account for 28 percent of world chemical turnover (EC, 1997, p. 7-6).

However, whilst European, American and Japanese producers have been cutting a quarter of their workforce and reducing capacity, their new competitors in Asia have been building new plants. Therefore, there is the prospect of "another period of selling low technology products into crowded markets"[7]. For example, in bulk chemicals companies need to run plants close to 95 percent of production capacity to be profitable. But, from 1990 to 1994, "they were running nearer to 80 percent, leading to rock-bottom prices as producers fought for market share"[8].

The competition from Asia's exports will bring a fundamental change to the global structure of the commodities chemical industry. Markets are static within the mature economies, and most of the products are based on technology (out of patent protection) discovered in the 1950s and 1960s. Consequently, producers will rely heavily on volume growth to raise turnover[9].

Another alternative is to switch to speciality chemicals, since the prices are less susceptible to overcapacity, the profit margins are generally better than in bulk chemicals and demand is still rising. In reality, it has resulted in the recent creation of

[7] Financial Times, Survey, 27 October 1995, p. I.
[8] Ibid.
[9] Ibid.

large chemicals businesses which intend to exclusively concentrate on this sector[10]. It is interesting to note that most of the large speciality groups have come into existence as a result of intense mergers and acquisitions[11] in the period 1994-95. More specifically, in the early 1990s, "many companies tried to disinvest from non-core businesses they had acquired in the 1980s". More recently, a number of European companies "were strengthening their core businesses through acquisitions and joint ventures, although this has been less the case in France and Germany" (EC, 1997, p. 7-6).

In addition to this, the demand for speciality chemicals is growing rapidly in Asia under fierce price competition because there is no technological barrier for local producers (to manufacture food additives, hair shampoos, etc.). Consequently, there are many local producers of agrochemicals. Besides this, American and European producers tend to have higher costs, and to claim that widespread dumping is depressing profits in Asia[12]. It is rarely mentioned however, how specific trade-offs are handled; "the growing markets are in Asia and the lowest labour and environmental costs are there as well"[13]. In such a case, high cost in the transportation of raw materials may be compensated by low labour and environmental costs.

Moreover, the standardization of product specifications "is forcing competitors to face each other out in every market in the world, or lose out altogether"[14]. Since demand and prices are suffering in the battle for market share, developments that affect the global industry are far more important than the state of a single economy.

Nevertheless, it is estimated that US$ 100 billion is being spent, from 1995 to 2000, worldwide on new chemical plants, of which roughly half will be concentrated in the Asia-Pacific region[15]. There is also a significant degree of development in the Middle East, partly as a result of the strong financial position of the large chemicals companies. In the case of ethylene production another region with significant

[10] Financial Times, 25 September 1997, p. 2.
[11] For example, Clariant and Ciba are the result of spin-offs and mergers, and ICI sold its titanium dioxide and polyester businesses to DuPont for US$ 3 billion to acquire speciality businesses (Financial Times, 8 February 1997, p. 5).
[12] Financial Times, Survey, 27 October 1995, p. I.
[13] Financial Times, Survey, 25 September 1997, p. 4.
[14] Financial Times, 14 April 1997, p. 8.
[15] Financial Times, 3 April 1997, p. 4.

expansion is South America where "capacity will increase 34.7 percent over the next four years, from 4.6 million tonnes/year to 6.2 million tonnes"[16].

After the slowdown in the early 1990s the large chemical companies "have benefited from stronger demand, and have had the financial strength to consider expansion opportunities away from their main production bases in Europe and North America"[17]. However, the main consequence of this trend is over-supply, lower prices and damage to profits when the chemical plants were activated.

It was expected that producers would try to hold on to their market share in 1997 and 1998 by undercutting price in many chemicals (such as polyurethane, acrylics, polypropylene and even ethylene). Although the scale of the oversupply will vary regionally, its effects will be global[18]. The expansion in the Middle East, and mainly in Asia, has an interest in establishing a market share, rather than achieving profits. Consequently, local production will remove the opportunity for western companies to export spare production to Asia. Moreover, production in Asia is damaging profit margins closer to home, because the Asian competitors are not only producing bulk products and standard chemicals, but also organic intermediates, pharmaceutical chemicals, and dyes and vitamins. Besides this, these competitors are coming to Europe through imports and direct investments (EC, 1997, p. 7-5).

Indeed, experts anticipate "a dramatic increase in the share of Southern and Eastern Asia (excluding Japan) in the global chemicals market (EC, 1997, p. 7-4). But, it is still evident that "Europe is the world's largest geographic sector for chemicals with more than one third of global chemical production sitting within European borders" (UN, 1994a, p. 11). However, it has decreased from 32 percent in 1992 to 29 percent in 1994 (see table 4.2 below). The explanations are based on higher energy costs, poorly developed and fragmented transport infrastructure, heavy taxation, and finally high labour costs in Europe (Ibid., pp. 12-14).

[16] Ibid.
[17] Ibid.
[18] Financial Times, 7 January 1997, p. 4.

Table 4.2 - Geographic breakdown of world turnover on chemicals

1994

Area	Participation (%)
European Union	29.0
USA	26.0
Japan	18.0
Asia(*)	11.0
Central and Eastern Europe(*)	5.0
Latin America(*)	4.0
EFTA	3.0
Other(*)	4.0

Source: Adapted from EC (1997, p. 7-4). Note: areas marked by (*) are estimates.

Another explanation for such a decrease in participation comes from the lower investment/turnover ratio in Europe when compared to the US and Japan. In the last few years, "investment has been stable at around 8% of turnover in the US, whereas it has declined dramatically in Japan to about 6% of turnover" (from 10% in 1990). In Europe, "chemical industry investment has been declining since the 1990 peak, from 7% to less than 5% of turnover" (EC, 1997, p. 7-4).

Regarding future actions, the chemical industry will continue with its restructuring plans, which includes the reduction of the workforce, the shutting down of the least efficient plants in order to avoid structural overcapacity and the exchange of assets, mergers and joint ventures (UN, 1994a, p. 37).

4.1.1.2 - Overview of selected segments

The agrochemical segment of the industry includes the manufacture of insecticides, rodent killers, fungicides, herbicides, plant growth control products, as well as biological products designed to protect plants against diseases and parasites. On a worldwide basis, "cereals accounted for almost 20% of agrochemical use, whereas fruit and wines, maize, and cotton accounted each for nearly 10%" (EC, 1997, p. 7-25).

The implementation in 1990 of the 'common agricultural policy' in Europe has diminished the demand for agrochemicals. Consequently, the European portion of the

world market (see table 4.3 below) has declined considerably. At the same time, American and Japanese groups are strengthening their position in Europe[19] attracted by the potential prospects of East European markets (Ibid., p. 7-26).

Table 4.3 - Agrochemicals - world sales by area and product - 1994

(million ECU)	*Herbicides*	*Insecticides*	*Fungicides*	*Other*	*Total*
North America	5,460	1,825	610	405	8,300
Western Europe	3,020	1,175	1,935	590	6,720
Japan	1,475	1,600	1,535	90	4,700
Latin America	1,450	825	540	115	2,930
Far East	850	1,315	490	60	2,715
Eastern Europe	365	380	180	30	955
Others	375	990	130	10	1,505
Total	12,995	8,110	5,420	1,300	27,825

Source: Adapted from EC (1997. p. 7-26).

More specifically, demand for agrochemicals is closely linked to shifting dynamics within the agricultural sector. It is also affected by legal, economic or even environmental constraints. For example, climatic conditions favour the proliferation of parasites and insects influencing the demand for chemical products in agriculture. Finally, variances in labour costs can generate different demands among countries (e.g., herbicides are intensively used in countries with higher labour costs) (EC, 1997, p. 7-25).

Another relevant aspect of this segment is that R&D expenditures define competitiveness. Moreover, R&D in agrochemicals is responding to changes in agricultural practices and increasing environmental pressures. As such, the R&D costs in the top twenty world companies represent nearly 10 percent of their turnover in the sector. One of the main lines of research in agrochemicals is the development of products that are less endangering to the environment. Consequently, alternative products are becoming available as the result of biotechnological development (Ibid., p. 7-26).

In other words, progress in biotechnology may produce major changes in the market in the medium future. It is supposed that the market of plant/herbicide pairs (an activity not yet widespread) will affect the "structure of the sector since it will

[19] For example, DowElanco has launched an investment programme in France and Germany, while DuPont is opening a research centre in Europe (EC, 1997, p. 7-26).

facilitate the rapprochement of seed producers and agrochemical producers"[20]. Therefore, "transgenic crops could radically reshape the agrochemical market, shifting demand in favour of selected herbicides and slashing the use of chemical insecticides and fungicides" (Ibid.).

This segment of the chemical industry is relatively concentrated with the top twelve companies (from the US, Europe and Japan) controlling more than 80 percent of the world market. Accordingly, the five leading European companies - BASF, Ciba-Geigy, AgroEvo, Zeneca and Bayer - are also among the six leading world manufacturers. Furthermore, the favourable market prospects in Asia, especially in China[21], and in Eastern Europe have motivated European producers to invest in these countries (Ibid., p. 7-27).

Moreover, the agrochemical industry is faced with changing technology and intensifying cost pressures. At present, technology is moving towards genetically engineered plants that will be more resistant (to disease, insects, drought, pollution and herbicides). Therefore, large agrochemical companies are investing billions "in small and medium sized biotechnology companies in the hope of accelerating their own transformation into life sciences companies"[22]. After acquiring control of the appropriate biotechnology, these companies can use their distribution capabilities to market the new technology more quickly.

This trend towards transgenic crops is unstoppable, though companies will have to become more sensitive to consumer attitudes, particularly in Europe. Therefore, the wave of biotechnology acquisitions has been largely driven by defensive reasons, namely, to stop competitors from gaining access to those technologies[23].

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[20] However, the recent alliance between Zeneca (British company) and Monsanto (American company) has also resulted from weak demand, intensification of competition, and increased costs of R&D and registration (EC, 1997, p. 7-26).

[21] More specifically, Zeneca has resulted from the ICI demerger, while AgroEvo is a joint venture created by the Hoechst and Schering groups in 1994. AgrEvo has been established in China since 1994, and has bought a firm in South Korea and Zeneca has joint venture projects in China for the construction of agrochemical plants (EC, 1997, p. 7-27).

[22] In 1997, Monsanto acquired Calgene a pioneer in fruit and vegetable research. In 1996, AgrEvo bought a 75% stake in Plant Genetic Systems in Benelux (for US$ 550 million). Finally, in 1997 DuPont acquired a 20% stake in Pioneer Hi-Bred International in the US (for US$ 1.7 billion) (Financial Times, 25 September 1997, p. 5).

[23] Ibid.

In conclusion, it is estimated that in 1996 the world agrochemical market grew by 3.6 percent to £ 31.3 billion[24]. More specifically, the restructuration included the reduction of workforce and distribution costs (by transferring responsibility to the hands of specialist companies[25]). However, the recovery of recent years is much more a result of factors outside the industry's control, such as robust commodity prices and relatively good weather.

The segment of speciality (or industrial chemicals) includes a variety of heterogeneous products (e.g., explosives, glues and gelatins, essential oils, photographic chemical material, prepared unrecorded media, etc.), which have applicability in a number of industrial and household uses. Despite the intense competition, the prospect for industrial chemicals is still favourable. However, R&D expenditures will become increasingly important in order to retain or expand market shares. This includes the development of environmentally-friendly products since demand is expected to grow (EC, 1997, p. 7-59).

There are differences between the industrial and end-user markets in the chemical industry. As a result of this, the manufacturers of speciality have to meet the specifications of particular clients in a niche, which requires a service-oriented market approach and an excellent understanding of the clients' products or production process. Consequently, this customised approach provides opportunities for higher profit margins (Ibid.).

It is relevant to note the lack of data on production and consumption, due to the variety of products in the speciality segment. Furthermore, a large part of these products are manufactured mainly by independent companies owned by TNCs, a specific group of TNCs and their regional and/or local subsidiaries. Despite the production concentration in the hands of TNCs, there are a multitude of small MNCs operating in niche markets within the industry. The complexity of this segment is enhanced "by the fact that vertical integration activities have made the market less transparent" (Ibid., p. 7-60).

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[24] Ibid.

[25] This is mainly because the marketing of agrochemicals is expensive, accounting for approximately 20 percent of sales revenues. Agrochemicals are sold to a diverse, conservative and cost-conscious market (Ibid.).

4.1.2 - Brazilian chemical industry

The main chemical producers in Latin America are located in Brazil, Mexico and Argentina, and they have shown a quite distinct performance when compared to the industry worldwide. According to an ILO's report (1995, p. 17) "Latin America's gross output in chemicals stagnated during the mid-eighties", while it expanded rapidly in the rest of the world. In this period "the region's share of world chemical output diminished from almost 7 percent in 1985 to 5.6 percent in 1987". However, from 1988 the chemical production of the region began to accelerate and grew until 1990, reaching US$ 67.2 billion, at a rate similar to the rest of the world's chemical industries. Consequently, the relative position of Latin America in the world chemical industry remained stable, and "exports increased between 1986 and 1991, from US$ 3.6 billion to more than US$ 7 billion", raising the exports share in the total chemical production.

Further to this, there are two new and inter-related issues affecting the chemical industry in the region. First, the creation of the trading bloc (that is, Mercosur), which may increase opportunities for new investments and trade patterns, despite the asymmetry in economic potential between the bigger (i.e., Brazil and Argentina) and the smaller members (i.e., Paraguay and Uruguay). Second, is the process of privatization and deregulation started in early 90s. For example, Brazil, which is said to have the largest and most developed chemical industry in Latin America, has privatized its highly fragmented petrochemical production[26] (ILO, 1995, p. 17).

More specifically, the oil and gas exploration, and petroleum refining are still managed by Petrobrás[27]. But state participation in the second phase of the production chain (that is, the manufacturing of basic chemicals and fertilizers) was privatized. This segment concentrated on three state companies (i.e., Copene, Petroquímica União and Copesul), which were acquired by private domestic groups. Consequently,

[26] Petrobrás remains a state-owned oil company which supplies much of the naphtha used as feedstock by the downstream industry (ILO, 1995, p. 17).

[27] Based on a deregulatory law from August 1997, foreign companies will acquire a stake in oil exploration and production through joint ventures with Petrobrás. The opening of this sector is based on the following aspects: (a) domestic production represents only 55% of the economy's demand (1 million barrels a day), and (b) oil imports have generated annual trade deficits from US$ 6 to US$ 11 billion in recent years (Financial Times, 2 December 1997, p. 9).

the second and third stages of chemicals manufacturing are now dominated by private companies. In such a context, foreign capital is concentrated in the petrochemical complexes of São Paulo state, and domestic capital in the petrochemical complexes of Camaçari (Bahia state) and Triunfo (Rio Grande do Sul state).

The recent privatization in Brazil had no impact on the relative participation of foreign firms within the chemical sector[28] (see table 4.4 below for an overview). Moreover, the changes in the capital composition of the industry[29] had no influence over TNCs predominance in some segments (mainly those technologically and capital intensive) of the industry (such as agrochemicals, specialities, paint and varnishes, etc.).

Table 4.4 - Brazilian petrochemical and chemical industry - participation per origin of capital*

Industrial sectors	*Domestic*	*%*	*Foreign*	*%*	*State*	*%*
	1995	1996	1995	1996	1995	1996
Petrochemical & chemical	14	**16**	22	**17**	64	**67**

Source: Exame, 'Melhores e Maiores', July 1997, p. 11.
Note: * Share based on total sales of the 20 biggest companies.

An important aspect of the Brazilian chemical industry is the lack of competitiveness of the domestic companies (which operate with one or few plants). These companies are dependent on technology, and in some cases equipment, from foreign groups (BNDES, 1988, pp. 82-83), which increases their vulnerability in face of foreign competitors operating in the country. Grosse (1989, p. 209) states that "the world's twenty largest chemical producers have subsidiaries in Latin America, with concentrations in the largest markets". Consequently, Brazil is no exception in such a phenomenon, with a very high level of concentration (similar to the concentration in the world chemical market).

[28] There was very little foreign interest in the early privatization (Financial Times, 16 July 1990). A more recent study by KPMG (consultancy firm) says that foreigner investors are not acquiring Brazilian companies because of their environmental liabilities, which represent financial- and image-related risks (Folha de S.Paulo, 1 June 1997, C-2, p. 2).

[29] Based on the 'list of the 500 largest companies in Brazil', it is possible to confirm the acquisition of major state-owned petrochemical and chemical companies by private domestic groups (Conjuntura Econômica, August 1995, pp. 21-31).

According to the BNDES (1988, p. 81) foreign companies hold no less than 40 percent of the aggregated value of the Brazilian chemical market[30], which is evidence of their capacity in the technological development of products and processes. There is also a great difference between the size of foreign and domestic chemical companies. Besides this, the Brazilian subsidiaries have access to the outcome of high investment in R&D. Consequently, these companies are usually multi-divisional, operating with local and international linkages throughout the productive chain.

It is recognized that TNCs "generally overshadow local competitors in the segments that they serve in any Latin American market". The major exception in Brazil remains the petrochemical division of the state-owned oil company (Petrobrás), which constitutes a major competitor in the region. Following the logic of large-scale economies, the TNCs' production of many products tends to be centralized, which is usually concentrated in the home market. Therefore, "much of the sales that do occur in Latin American markets come from imported chemicals" (Grosse, 1989, p. 210).

This reality is particularly evident in the speciality chemicals segment. Considering that this segment is more intensive in R&D, foreign capital accounts for approximately 80 percent of the Brazilian market. Furthermore, foreign companies dominate the agrochemicals sector[31], which has been described as an oligopoly. It is composed of the major world producers following a strategy of diversification based on technology. In Brazil there are subsidiaries of Dow, AgroEvo, Bayer, Novartis, Monsanto, Zeneca, BASF, DuPont and Akzo Nobel, accounting for more than 50 percent of the total internal offers of agricultural products.

The dynamics of the Brazilian chemical sector are quite different from the world industry. Grosse (1989, p. 209) affirms that the industry itself may be best viewed "as a set of company groups, with relatively infrequent competition between competitors" in more than one of the following groups: commodity chemicals, industrial chemicals, fertilizers, pesticides, and plastics. The common aspect among

[30] An estimated market of approximately US$ 9 billion (including fertilizers and gases) in late 80s (Grosse, 1989).

[31] The Brazilian association of agrochemicals producers (ANDEF), which represents 90% of Brazilian production, reported a revenue of US$ 1.86 billion in 1997 (21% increase compared to 1996). Accordingly, herbicides accounted for US$ 1 billion (54% of total), fungicides for US$ 342.5 million (29.7%), insecticides for US 382.5 million (24.7%), and other products totalled US$ 135 million (Manchete Rural, no. 130, Abril 1998, p. 32).

"these businesses is a dependence on chemistry as the key technology underpinning the products", of which most of the chemicals are petroleum- or natural-gas-based.

The increase of FDI in the Brazilian chemical industry was "dependent primarily on the growth of the huge national market", even during the 1980s' recession (Grosse, 1989, p. 213). However, data segregating private and foreign investment and sales in the distinct chemical segments is quite scarce. The table 4.5 illustrates FDI in major chemical segments.

Table 4.5 - Foreign direct investment in Brazil per segments of the chemical industry 1994 (US$ million)

Industry segments	Investments	Reinvestments*	Total
Chemicals	**3,530**	**1,840**	**5,370**
Basic chemicals	**2,466**	**1,133**	**3,599**
Petroleum by products	**643**	**405**	**1,048**
Paints, varnishes and lacquers	**308**	**256**	**564**
Fertilizers	**113**	**47**	**160**

Source: Banco Central do Brasil (position on 25 October 1994).
Note: * means new investment in current operation.

One of the reasons for scarcity of data is the absence of industry boundaries. In other words, it is quite complex to define the major competitors within each segment of the Brazilian chemical industry (as suggested by Grosse, 1989). The difficulty emerges from the fact that there are firms that have diversified into chemicals, that are classified in other industries and/or operating as conglomerates (e.g., oil firms such as Shell and Exxon are very active throughout Latin America). The core chemicals companies may also compete in some categories of products but not in all products within one category.

For example, in agricultural chemicals Zeneca, BASF and DuPont compete in the herbicides market; and Zeneca and DuPont compete in insecticides; however the competition in biocides is between BASF and Zeneca[32]. This would become more complex if other categories of products manufactured by the Brazilian subsidiaries were included. Moreover, there is a lack of reliable data (as well as disclosure) on the market share of diversified chemical companies in distinct segments. The data

[32] Anuário das Indústrias de Química Fina do Brasil, 1995, ABIFINA.

available is usually present in aggregated form, ranking the major companies (as in table 4.6 below).

Table 4.6 - Ranking* of top twenty companies in the Brazilian chemical industry - 1996**

Company	Sales US$ million	Industrial segment	Origin of the capital
1 - Petrobrás	23,584.7	petrochemical/chemical	Brazilian state
2 - Copene	1,345.3	petrochemical/chemical	Brazilian
3 - BASF	1,247.8	diversified	German
4 - Trikem	737.6	petrochemical	Brazilian
5 - Copesul	724.4	petrochemical/chemical	Brazilian
6 - Kodak Brasileira	689.8	diversified	American
7 - White Martins	668.4	chemical/gases	Brazilian
8 - Bayer	634.6	diversified	German
9 - Du Pont	619.3	diversified	American
10- Rhodia	612.5	diversified	French
11- 3M	559.3	speciality	American
12- Tintas Coral	489.5	paints	English
13- Petroquímica União	477.4	petrochemical	Brazilian
14- Hoechst	463.2	diversified	German
15- Solvay	440.7	petrochemical	Belgium
16- Ultrafértil	437.2	fertilizers	Brazilian
17- Manah	411.3	fertilizers	Brazilian
18- Novartis	408.0	diversified	Swiss
19- Polibrasil	379.4	chemicals	Brazilian
20- OPP	375.4	polyethylene	Brazilian
Total+	35,305.8		

Source: Adapted from Exame, 'Melhores e Maiores', July 1997, p. 192.
Notes: * Based on the companies' classification by their gross revenue, ** Zeneca is not among the top twenty, but has the fifth position (with revenue of US$ 251 million in 1996) among the top British companies in Brazil (Exame, 'Melhores e Maiores', 1997, p. 95), + total of sales of top twenty companies.

According to ABIQUIM[33] the chemical industry had a net income of approximately US$ 24 billion (including the petrochemical sector) in 1994, which represents 2 percent of the Brazilian GNP. Moreover, exports reached US$ 1.6 billion in 1994, compared to US$ 1.3 billion in 1993, and imports reached US$ 1.3 billion in 1994. However, the period from 1991 until mid-1994 is characterized as recessive, during which companies adjusted to the greater openness of the economy with the

[33] ABIQUIM is the Brazilian chemical industries association founded in 1964. It now has 215 members responsible for 90% of the national production in this sector (Gutberlet, 1996, p. 84).

reduction of import tariffs. These economical changes in Brazil have coincided with the recession in the US, Europe and Japan resulting in an offer surplus in the international market. The table 4.7 shows the segments for which the association holds statistics[34], representative of US$ 11.8 billion of the industry's total sales.

Table 4.7 - Sales at the chemical sector - selected groups of products* - 1994

Group of products	Domestic market (US$ million)	External market (US$ million)	Export - Import
Inorganic	1,253.9	50.6	(142.6)
Fertilizers intermediates	1,259.2	21.1	(335.1)
Basic organics	1,400.4	434.5	(19.4)
Thermoplastic resins	2,150.1	488.2	277.1
Other organics	1,230.6	211.2	93.8
Plastic intermediates	740.8	100.3	(3.8)
Fibers intermediates	557.8	55.2	7.7
Elastomers	265.9	82.0	19.1
Thermofixed intermediates	339.9	10.4	(30.2)
Plastifiers intermediates	291.4	54.7	24.8
Paints and organic pigments	262.2	27.2	(66.8)
Solvents	191.5	53.9	22.7
Detergents Intermediates	153.1	17.1	9.5
Agriculture intermediates	59.6	25.7	13.2
Total	10,152.4	1,632.2	(129.7)

Source: Conjuntura Econômica, August 1995, p. 48.
Note: * there is no data available for segments such as: paint and varnish, fine chemical and specialties, soap, detergents, cosmetics and perfume, agrochemical, artificial and synthetic fibers and fertilizers.

Consequently, Brazilian exports of chemical products are concentrated in the basic stages of petrochemical manufacturing, thus these products are intensive in the natural resource petroleum. Other export products are also intensive in natural resources from the agriculture and forest industries (BNDES, 1993, pp. 22-23). Apart from this, the OECD (1992, p. 71) confirms that most of its chemical exports to the newly-industrialising economies (such as South Korea, Taiwan, Singapore, Hong Kong, Brazil and Mexico) are constituted by speciality chemicals. These countries account for 8 percent of total OECD chemicals exports, and 28 percent of OECD exports of chemicals to non-OECD countries. Altogether this confirms the Brazilian dependence on more technologically intensive products.

[34] These analyses of industrial sectors are not made on a systematic basis, therefore, there is no data for 1995 onwards (Conjuntura Econômica, August 1995, pp. 47-49).

4.2 - Profile of the companies

A profile of the selected companies will be outlined in this section, which includes both corporate and subsidiary levels.

4.2.1 - Corporate overview

Firstly, the Zeneca Group will be described, which is the smallest and most recently created company of the three selected cases. In brief, ICI (British chemical company) demerged its pharmaceuticals and agrochemical units in 1993[35] creating a new company called Zeneca. It was suggested (by the media) that 'financial logic' was just one of the factors justifying disinvestments, because the 'industrial logic' was equally important. In the ICI-Zeneca case, the different businesses had nothing in common. Therefore, Zeneca concentrated on pharmaceutical and agrochemical and ICI on organic and inorganic chemicals[36].

The ICI-Zeneca demerger therefore "allowed the manager of its pharmaceutical business to escape from under the shadow of the older, cyclical chemicals business"[37]. The Zeneca Group concentrates on bioscience business, including R&D of pharmaceuticals, health care, agrochemicals and specialties. In April 1995, the company completed the acquisition of 50 percent of Salick Health Care, which with Stuart Disease Management Services forms the health care business in the US (Zeneca, 1995). The tables below shows an overview of Zeneca, its main business and the geographical scope of its activities (which are clearly out of the home country).

Table 4.8 - Corporate worldwide overview - Zeneca

	1993	1994	1995	1996
Turnover (£m)	**4,440**	**4,480**	**4,898**	**5,363**
Net income (£m)	**431**	**443**	**336**	**543**
Number of Employees	**32,300**	**30,800**	**31,400**	**31,100**

Source: Zeneca Annual Report and Accounts, 1995 and 1996.

[35] Financial Times, 6 March 1996, p. 17.
[36] Financial Times, 10 February 1996, p. 18.
[37] See Owen, G. and Harrison, T. (1995) for a comprehensive analysis of why ICI decided to demerge.

Table 4.9 - Worldwide sales per business division

Zeneca - 1996

Activity	*%*
Pharmaceuticals	49
Agrochemicals	32
Specialties	17
Healthcare	2
Total	100

Source: Zeneca, Annual Report, 1996.

Table 4.10 - Worldwide sales per geographical area

Zeneca - 1996

Area	*% of total*
United Kingdom	9
Europe	27
Americas	48
Asia, Africa & Australasia	16
Total	100

Source: Zeneca, Annual Report, 1996.

In Britain Zeneca is the third biggest pharmaceutical company (with exports in 1995 of nearly £ 2 billion). Moreover, the pharmaceuticals and agrochemicals business are both said to have strong R&D pipelines containing innovative products. The corporation states that Zeneca is one of the world's top five agrochemical companies (Zeneca, 1997). This is the Groups second biggest business area within which the major products are distributed, as follows: 54% herbicides, 20% insecticides, 10% fungicides, 9% seeds and 7% miscellaneous. The corporation stated that the demerger was successful for this segment because performance of agrochemicals was better in 1995, than in 1994. Finally, Zeneca operates through 207 subsidiary companies, with manufacturing in 25 countries and products sold in over 100 countries worldwide (Zeneca, 1995, p. 67).

The second selected company - E.I. Du Pont de Neumours - is not only the biggest American-based chemical company, but also the world's largest (EC, 1997, p. 51; DuPont, 1996). The Group is organized into five business segments, as follows: petroleum, fibers, polymers, chemicals, and diversified businesses. It was founded in 1802 by a Frenchman as a gunpowder plant (known as DuPont) in Delaware. The plant

grew quickly and benefited from government contracts during the War of 1812 and later during the Mexican-American War (in late 1840s)[38].

Additionally, DuPont added the manufacturing of dynamite and nitroglycerin (1880) and introduced guncotton (1898) and smokeless powder (1894). In 1903, the new owners instituted a centralized structure with functionally organized departments[39], an innovation widely adopted by large companies. By 1906 DuPont controlled 70 percent of the US explosives market. Later the company was forced to divest of a part of the powder business (due to antitrust legislation). However the earnings gained from the First World War were used to diversify into paints, plastics and dyes businesses. In short, DuPont's long list of inventions includes neoprene synthetic rubber (1931), Lucite (1937), nylon (1938), Teflon (1938), Orlon and Dacron.

Conoco (former Continental Oil) was acquired in 1981. A partnership between DuPont and Merck began in 1991 through an independent drug company (DuPont Merck Pharmaceutical) to focus on non-US markets. Finally, DuPont has completed an agreement to acquire large parts of ICI (British company) industrial chemical business[40]. Overall, the company operates 200 manufacturing and processing facilities in 40 countries worldwide (DuPont, 1996). The tables below illustrate DuPont's figures, business areas and geographical scope of activities (which are concentrated in the US market).

Table 4.11 - Corporate worldwide overview - DuPont

	1993	1994	1995	1996
Sales ($m)	**37,098**	**39,333**	**42,163**	**43,810**
Net income ($m)	**566**	**2,727**	**3,293**	**3,636**
No. of Employees	**114,000**	**107,000**	**105,000**	**97,000**

Source: DuPont, Annual Report, 1995, 1996.

[38] Hoover's Handbook of American Business 1997, p. 521.
[39] See Chandler (1994, pp. 76-77) for a detailed account.
[40] Most interesting is that the tioxide business (i.e., pigments) has faced environmental problems in one of the British plants because of a toxic gas leak. However, the transaction (completed in 1998) includes polyester films, resins and intermediates, along with the white pigments operations in Europe, Asia and Africa (Wall Street Journal, 14 July 1997, p. 3).

Table 4.12 - Worldwide sales per business division

DuPont - 1996

Activity	*%*
Petroleum	47
Fibers	16
Polymers	15
Chemicals	9
Other businesses*	7
Life sciences	6
Total	100

Source: DuPont, Annual Report, 1996.
Note: * include agricultural herbicides and insecticides, electronic materials, medical products, printing and publishing products, and safety and environmental services.

Table 4.13 - Worldwide sales per geographical area

DuPont - 1996

Area	*% of total*
US	52
Europe	37
Other regions	11
Total	100

Source: DuPont, Annual Report, 1996.

The last selected case is BASF, which is the world's third largest chemical manufacturer (EC, 1997, p. 51). The German conglomerate has five business areas, as follows: oil and gas, chemicals, health and nutrition, plastics and fibers, colorants and finishing products (BASF, 1996). The company (originally called Badische Anilin & Soda Fabrik) was founded in Mannheim (Germany) in 1861, but moved to Ludwigshafen in 1865. BASF was a pioneer in 'coal tar dyes' developing a very successful synthetic indigo in 1897. Additionally, ammonia was synthesized in 1909 allowing the company to enter the nitrogenous fertilizers market in 1913. BASF joined the I.G. Farben cartel with Bayer and Hoechst in 1925, and during the World War II the company developed polystyrene, PVC, and magnetic tape[41].

In 1952 BASF regained its independence, beginning to rebuild its destroyed factories. In late 50s BASF negotiated joint ventures abroad including one with Dow Chemical in the US. In 1969 the German oil and gas producer Wintershall was acquired and BASF consequently became a leading plastics and synthetic fibers

[41] Hoover's Handbook of World Business, 1997, p. 98.

manufacturer. In the US, the company bought Wyandotte Chemicals (1969), Chemetron pigments (1979) and Immont paint and ink business (1985). Despite these acquisitions BASF remained largely dependent on the sale of basic chemicals.

In the early 90s BASF bought another chemical company in eastern Germany. It also concluded an agreement with Russia's Gazprom for natural gas, and a contract with France's Elf Aquitaine for North Sea gas. In 1992 Mobil's polystyrene-resin business was added, achieving almost 10 percent of the US market. In early 1994, BASF bought ICI's polypropylene business becoming the second largest producer of this plastic in Europe. In the same year the company acquired the pharmaceutical arm of Boots (UK) for US$ 1.4 billion. Added to BASF's history is that audio and video tapes business was sold in 1996; the drugs division, Knoll, recently diversified into the generic German drug market; and textile dyes expanded following the acquisition of Zeneca's business worldwide. Overall, BASF has production facilities in 39 countries and sells its products in 170 countries worldwide (BASF, 1996). The tables below provide an overview of BASF Group, as well as evidence of its concentration in Europe[42].

Table 4.14 - Corporate worldwide overview - BASF

	1993	1994	1995	1996
Sales (DM million)	**40,568**	**43,674**	**46,229**	**48,776**
Net income (DM million)	**761**	**1,170**	**2,423**	**2,839**
Number of Employees	**112,020**	**106,266**	**106,565**	**103,406**

Source: BASF, Annual Report, 1996.

Table 4.15 - Worldwide sales per business division

BASF - 1996

Activity	%
Plastics & fibers	25
Colorants & finishing	23
Health & Nutrition	19
Chemicals	15
Oil & gas	11
Other	7
Total	100

Source: BASF, Annual Report, 1996.

[42] The corporation states that Europe is the company's home market (BASF, 1996).

Table 4.16 - Worldwide sales per geographical area

BASF - 1996

Area	*% of total*
Europe	36.6
Germany	26.6
North America+	19.6
Asia, Pacific and Africa	11.7
South America	5.5
Total	100

Source: BASF, Annual Report, 1996. Note: + includes Mexico.

In short, the major competitors of DuPont in the chemical and agricultural businesses are BASF, Bayer, Novartis, Dow, Hoechst, Imperial Chemical, Monsanto, Rhône-Poulenc and Union Carbide. Similarly, the worldwide competitors of BASF are Bayer, Novartis, Dow Chemical, DuPont, Hoechst, Monsanto, Rhône-Poulenc, Royal Dutch/Shell and Union Carbide. Finally, Zeneca has the following competitors for its agrochemicals business, DuPont, BASF, Novartis, AgroEvo, Bayer and Dow Elanco.

4.2.2 - Brazilian subsidiaries

Considering the ranking of the biggest private companies in Brazil, the selected cases are positioned as follows: BASF is third in the industry classification, and 42nd among the biggest[43]; DuPont is 9th in the chemical sector and 100th in the general ranking; and Zeneca is 29th in the chemical sector and 300th in the general ranking. The table 4.17 compares their sales in Brazil.

Table 4.17 - Overview of selected Brazilian subsidiaries - 1996

Company	Sales (US$ million)	Number of employees
BASF	**1,247.8**	**4,429**
DuPont	**619.3**	**1,132**
Zeneca	**251.0**	**494**

Source: Adapted from Exame, 'Melhores e Maiores', July 1997, p. 192.

[43] Among the 500 biggest private companies, per sales in 1996 (Exame, 'Melhores e Maiores', 1997).

It is interesting to start the account of the subsidiaries with Zeneca, because it has provided details of the restructuration since its demerger from ICI. More specifically, the Brazilian subsidiary (called 'Zeneca Brasil S.A.') manufactures agrochemicals and specialties. However, there are other Zeneca independent affiliates in Brazil responsible for pharmaceuticals[44] and specialties[45]. More specifically, 'Zeneca Brasil' manufactures herbicides, insecticides, fungicides, corn seeds, biocides and public health products, though the core business is agrochemicals[46]. These business are organized by two sites (Jacareí and Paulínia) in the São Paulo state.

In fact, the business restructuration started prior to the demerger from ICI, through changes in the internal organization in 1989. It was further implemented after the demerger following the strategic principle of 'focus on strong businesses'[47]. Consequently, the site of dye manufacturing (including other units of silica gel and formic acid[48]) was rationalized and transferred (including staff and equipment) to the Jacareí site.

Similarly, the Paulínia site was reorganized by relocating all primary chemical manufacturing to one unit. This site is also partly responsible (other inputs come from Argentina) for the chemical manufacturing of biocides[49] (specialties business). Another specialties business subordinated to Zeneca's subsidiary is the production of resins, which is made by toll-manufacturing (that is, Zeneca provides raw materials to be processed by another company).

In summary, since 1996, 'Zeneca Brasil' has essentially become concentrated on agricultural businesses, which includes the seeds business[50] (i.e., a joint venture

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[44] The joint venture with Wellcome was sold to Glaxo in 1995, but the site in Cotia (São Paulo state) became 'Zeneca Farmacêutica'.

[45] That is the manufacturing of industrial chemicals for leather coating; this affiliate (called STAHL) is located in Portão, Rio Grande do Sul state. Additionally, the production of textile dyes was sold worldwide to BASF in 1996.

[46] The recent trend of demergers raised discussion over the meaning of 'core business'. It is said that this new logic "challenges the validity of 'relatedness' between businesses as a sufficient justification for inclusion in the portfolio" (Financial Times, 24 November 1995, p. 14).

[47] For example, the 'plastic films' site located in the Bahia state (an investment of US$ 100 million) was sold to the Brazilian group 'Vicunha' because of financial problems.

[48] The silica gel unit was a joint-venture with Gessy Lever (Unilever subsidiary), therefore it was sold to them, as well as another site producing silicate of soda (located in São Paulo city). The formic acid unit had obsolete technology, but was sold to a domestic firm.

[49] These inputs are basically used in the treatment of industrial reservoirs (in the leather and painting industries) and in swimming pools to prevent insects.

[50] Zeneca's seeds units are located in Cravinhos (São Paulo state), Paracatu and Janaúba (Minas Gerais state).

with Royal VanderHave Group based in the Netherlands). This joint venture explicitly recognizes the challenge for this segment, considering that bio-technologically modified seeds will influence, to an increasing degree, the agrochemicals business in the future. This is particularly the case in Brazil where the seeds market is very segmented and thus highly competitive. In Brazil, agrochemicals are sold to wholesale companies and/or large farmers; insecticides are sold mainly to large retail companies. Consequently, there are contacts with final and intermediate consumers.

The main competitors in the Brazilian market of agrochemicals are: Ciba-Geigy[51], DuPont, Bayer, BASF and Monsanto. Accordingly, the domestic market is shared among TNCs' subsidiaries, in which Ciba-Geigy has the first position, Zeneca has the second and DuPont the third.

At 'Zeneca Brasil' agrochemicals represented approximately US$ 150 million of a total revenue of US$ 227,222 million in 1995 (ABIQUIM, 1996, p. 245). There are two units producing herbicides at the Paulínia site (the oldest unit started in 1982, and the most recent in September 1996). The herbicide is sold in the domestic market and exported (a small percentage) to Latin American markets (see table below for an overview of Zeneca's subsidiary).

Table 4.18 - Brazilian subsidiary - Zeneca

Net Income (US$ 1,000)	**1993**	**1994**	**1995**
Domestic	196,098	187,375	204,494
Export	16,411	20,391	22,728
Total	212,509	207,766	227,222
	1993	**1994**	**1995**
Number of employees	752	733	890

Source: ABIQUIM, 1996, p. 245. Note: this publication is updated every two years and there is no other reliable source.

The Brazilian subsidiary is relatively important within the Zeneca Group's structure in Latin America for having a unit of primary chemical manufacturing. Additionally, public health products (i.e., insecticides) represent a small percentage of revenues although the Paulínia site is the corporation's worldwide manufacturing

[51] Swiss companies Sandoz and Ciba-Geigy merged on March 1996 creating Novartis. The new company is the world's second-largest drug group, and one of the world's biggest seed and pesticide producers. Thus it competes with Zeneca in the same business areas (Economist, 9 March 1996).

center[52]. Consequently, the general manager of this site is the manufacturing manager for Latin America. He is therefore responsible for the harmonization of operational procedures (including SHE aspects) among the subsidiaries in Argentina, Guatemala, and Mexico.

With a long and stable history in Latin America[53], DuPont has fewer affiliates in the region than most of its competitors. More specifically, there are manufacturing subsidiaries in the five largest markets (that is, Mexico, Brazil, Argentina, Venezuela and Colombia). These operations within Latin America are coordinated by the 'regional headquarters' located in Brazil (DuPont, 1994, p. 75), which means that there is a corporate level in the Brazilian subsidiary. According to Grosse (1989, pp. 218-220), DuPont's competitive advantages in this specific region are based on: (a) proprietary technology, especially in synthetic fibers and industrial chemicals; (b) product brands (e.g. Lycra, Dacron) that are associated with high quality; (c) scale economies from its small number of large plants; and (d) its position as the low-cost producer of titanium dioxide in the world.

The Brazilian subsidiary of DuPont has operations on the following business areas: plastics, industrial chemical, agricultural and veterinary chemicals, pharmaceuticals, pigments, and mining. There are three sites in Brazil, which are located in Paulínia (São Paulo state), Barra Mansa (Rio de Janeiro state), and Uberaba (Minas Gerais state). The table below provides an overview of DuPont's performance in Brazil.

Table 4.19 - Brazilian subsidiary - DuPont

Net Income (US$ 1,000)	**1993**	**1994**	**1995**
Domestic	277,758	325,404	361,507
Export	1,946	1,827	3,335
Total	279,704	327,231	364,842
	1993	**1994**	**1995**
Number of employees	1,274	1,184	1,155

Source: ABIQUIM, 1996, p. 124. Note: this publication is updated every two years and there is no other reliable source.

[52] This insecticides has the same active principle of pesticides (called 'pyrethroid').

[53] Some restructuring is expected at DuPont Group from 1997; more specifically in the oil and gas business in order to build its life science business (Financial Times, 14 July 1997, p. 19).

The BASF Group is in the process of restructuration[54] through acquisition and/or demerger (a current trend in the world industry). This restructuration has implications in South America, by the relocation of businesses within this region. More specifically, it was decided that intermediate products for the leather industry should be under the command of the Argentinean subsidiary due to its strong leather market. Similarly, agrochemicals businesses are managed by the Brazilian subsidiary since it has the strongest market in Latin America.

Briefly, the BASF Group has unified the chemicals, paint and resins units in Brazil under the control of 'BASF S.A.'. However, there are other independent business[55] in Brazil (e.g., graphics inks, and pharmaceuticals). The Brazilian unit manufacturing chemicals for use in leather was closed and the product has therefore been imported from Germany. There was also the acquisition of a domestic firm - Elastogram - manufacturing polyurethane. Overall, these changes were made in order to implement the corporate business strategy of worldwide concentration in three fields - pharmaceuticals, energy and chemical-specialties (BASF, 1996).

In short, the major BASF[56] businesses in Brazil are: paints and resins, plastics, industrial paints, agrochemicals, chemical products, and pharmaceuticals. The largest segment in terms of revenue is paint and resins, second is plastics, and third is agrochemicals (intermediate chemical and pharmaceuticals are not representative in the turnover). The main sites of 'BASF S.A.' (i.e., the subsidiary under investigation which manufactures basic chemicals, agrochemicals and speciality) are located in the states of Pernambuco (Jaboatão), Bahia (Camaçari), São Paulo (São Bernardo do Campo and Guaratinguetá), Rio de Janeiro (capital) and Rio Grande do Sul (Sapucaí do Sul). The table below shows the performance of the Brazilian subsidiary, confirming that BASF is the largest subsidiary among the selected cases.

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[54] A BASF official said that 'the group's restructuring efforts outweighed losses felt from the drastic plunge in world prices for its petrochemical products'. Besides it is stated that BASF has plans to expand in natural gas and pharmaceuticals (Wall Street Journal, 13 March 1996, p. 4).

[55] Accordingly, the 'FDO' (aromatic chemicals) and 'Sintesia' (chemical products) businesses were sold, as well as the worldwide division of audio and video tapes. Another change in BASF's worldwide business is the purchase of Zeneca's dye textile division; the Brazilian subsidiary consequently incorporated the Zeneca site in Brazil (in Jacareí, São Paulo state).

[56] The Brazilian subsidiary will receive investments of approximately US$ 300 million for the period 1997-99, in which 80 percent will be invested in Brazil. The Guaratinguetá site will install a new plastic unit (US$ 5 million), the São Bernardo do Campo site will modernize the manufacturing of paints and varnishes (US$ 21 million), and finally the pharmaceutical site of Knoll in Rio will be expanded and modernized (US$ 30 million) (Gazeta Mercantil, 28 November 1996, p. C-4).

Table 4.20 - Brazilian subsidiary - BASF

Net Income (US$ 1,000)	1993	1994	1995
Domestic	225,250	505,375	784,743
Export	31,655	42,690	67,333
Total	286,905	548,065	852,076
	1993	**1994**	**1995**
Number of employees	2,577	4,825	4,503

Source: ABIQUIM, 1996, pp. 71-72. Note: this publication is updated every two years and there is no other reliable source.

The BASF subsidiary[57] has increased its income, but it registered a net loss for the late years. Nevertheless, it is the fastest growing chemical company in Brazil, with an increase of 20 percent in the 1996 income. This latter aspect is the main reason for recent increases in capital and the business restructuration[58]. This included the creation of a regional headquarters and changes in the board of director for South America. Consequently, the Brazilian subsidiary's CEO is responsible for South America (coordinating 16 affiliates), since the regional headquarters were created in 1996. Until 1992, the Brazilian corporate level was responsible for Argentina, Paraguay and Chile (so-called South Cone) however from 1996 the subsidiary has also coordinated operations in Venezuela, Colombia, Equator and Peru.

4.3 - Industry-specific explanations

This section aims to address the major environmental issues surrounding the chemical industry and consequently the responses taken to minimize its impacts on the environment. Finally, the empirical results from the selected cases are presented with a focus on industry-specific aspects (which are mainly regulatory and economic issues).

[57] Gazeta Mercantil, 28 November 1996, p. C-4.

[58] The BASF Group has stated that the regional trading bloc (Mercosur) required a new structure in the region. The Group's sales in the 'South Cone' totalled US$ 1.28 billion in 1994, in which Brazil accounts for 77.3% and Argentina for 14.9% (Química e Derivados, June, 1995, p. 40).

4.3.1 - Environmental impacts and liabilities

4.3.1.1 - Environmental impacts caused by the chemical industry

There is little debate within the world chemical industry on the fact that strong environmental performance is critical to its success (Evan, 1974; Vaugham and Mickle, 1993; Arora and Cason, 1996). More specifically, there is evidence throughout the industry that more money, time and effort is being put into improving environmental performance (UN, 1994a, p. 14). In addition to these investments, there is a strong commitment towards the Responsible Care (RC) initiative throughout chemical industries' associations at national and international levels (ICCA, 1996; CMA, 1996; VCI, 1996; CEFIC, 1995; CIA, 1995).

The chemical industry's environmental problems may be "separated into the pollution caused during the production process, and the downstream pollution that occurs during consumption and disposal of the industry's final products" (EC, 1997, p. 7-7). In general, the major environmental issues in this sector include risk management, health and safety, accidents and emergency response, and safe distribution procedures (UNEP, 1994). Consequently, the industry's priority has been placed into responses (basically through environmental disclosure) to stakeholders concerned with those issues.

However, according to UNEP (1994, p. 57), efforts should be concentrated on product stewardship and plastics recycling[59] and the phase-out of environmentally harmful products such as CFCs[60] and agrochemicals. For example, the use of agrochemicals is critical because "these substances can accumulate in the ground and in living organisms and their residues can affect water resources". Therefore, a revision is expected of the European directives on the quality of ground and drinking water (fixing maximum limits on the concentration of some substances in water) which has a major impact on the use of agrochemicals (EC, 1997, p. 7-27).

[59] DuPont has created a service for recycling polyester waste which started to be commercialized in 1996. The process was approved by the FDA in the US, consequently it may be used in food packaging after recycling (DuPont, 1996, p. 10).

[60] DuPont claimed the cessation of CFC production for sale in developed countries while introducing alternative products (DuPont, 1995, p.1).

Additionally, reduction in the use of pesticides[61] within the EU (until the year 2000) is currently under discussion.

Moreover, it is necessary to explain how chemical companies are reducing their contribution to global environmental imperatives (i.e., climate change, ozone depletion and export of hazardous wastes[62]). For example, chemical companies are both producers and consumers of CFCs. They are also responsible for carbon dioxide emissions via the use of fossil fuels as intermediate and final consumers of energy, and emissions of nitrogenous oxides and ozone (e.g., production of nitrogenous fertilizers). In sum, these issues indicate the chemical industry's direct involvement in global environmental issues.

International agreements regarding global environmental issues consequently have major implications for this industry. For example, the 1987 Montreal Protocol gave the developing world until 2010 to phase out ozone-depleting substances, but required industrialized countries to cease production in January 1996 (ILO, 1995, p. 27). Any change in this treaty "would have important implications for both the chemical industry, which has already developed substitutes for most of the ozone-depleting substances, as well as businesses which either own or make equipment that uses the gases"[63]. In theory, this agreement has reduced the amount of CFC on the market (from 1 million tonnes before the phase-out to 200,000 tonnes in developing countries, in addition to 20,000 tonnes sold illegally in the US and Europe).

However, some gaps in the Montreal Protocol[64] were fulfilled during a meeting of more than 100 governments in 1997. They agreed to tighten controls on chemicals that destroy the ozone layer, by setting a deadline (2005 and 2015, respectively in developed and developing countries) for phasing out methyl bromide. As well as this, an international trade registration system was adopted aiming to terminate the black market of CFC in Europe and the US[65]. This system will take effect from 2000 giving "police and customs greater powers to detect illegal imports and exports of CFC gases

[61] A report from the WWF stresses that taxation can play an important role in the reduction of environmentally harmful pesticides. This argument is illustrated by the pesticide reduction programmes introduced in Denmark, the Netherlands and Sweden (WWF, 1995).
[62] In 1989 the Basle Convention on the Transboundary Movement of Hazardous Wastes was adopted, placing a restriction on international trade of wastes. In 1994, the parties agreed to a complete ban of hazardous wastes from OECD to non-OECD countries (ILO, 1995, p. 27).
[63] Financial Times, 8 September 1997, p. 5.
[64] Financial Times, 19 September 1997, p. 3.
[65] Financial Times, 15 January 1995, p. 17.

used in refrigeration and air conditioning". However, Greenpeace and ICI officials have suggested that a more effective solution to smuggling would be to ban all sales of CFCs within the developed world[66].

More recently, global warming was discussed by world leaders (five years after the UNCED) at the UN climate summit in Kyoto (Japan, in December 1997). This meeting resulted in an international agreement, despite the US refusal to make strict emission-cutting commitments[67]. However, it is necessary to stress the burden that this agreement places upon industrial activities[68], though opinions are contradictory[69]. On the one hand, American business is concerned that energy-intensive industries (such as the chemical industry) relocate to developing countries, thus any agreement should include commitments from poor countries (which were exempted from emission targets in 1992)[70]. On the other hand, institutions such as the BCSD claimed that promoting energy efficiency is an opportunity to bolster the economy (as suggested by DeSimone and Popoff, 1997).

Altogether, it is recognized that over the last ten years the chemical industry has: (a) achieved important energy efficiency improvements; eliminated and reduced those most hazardous emissions beyond scientifically proven effect levels, (b) started to get involved in the management of post-consumer wastes, and (c) committed itself to a voluntary environmental reporting structure (UN, 1994a, p. 15). The progress in energy efficiency in the European chemical industry illustrates one of their achievements. In 1993 "energy consumption per unit of output was about 25% lower than in 1980", which was by no means related to oil prices (EC, 1997, p. 7-8).

Nevertheless, the industry continues to be targeted by legislation, such as the widespread recommendation of the use of BAT. For example, the chemical industry is

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[66] Financial Times, 19 September 1997, p. 3.

[67] In 1992, an agreement was reached in which greenhouse emissions (mainly carbon-dioxide from the burn of fossil fuel, coal and deforestation) should be cut back to 1990 levels by 2000. However, only Switzerland, Britain and Germany could meet this target. The US is responsible for more than 20% of world carbon-dioxide emissions and would hardly fulfill the commitment made in Rio (Economist, 11 October 1997, pp. 75-76).

[68] Prior to the Kyoto summit, the British chemical industries association agreed with the government that by 2010 it would cut carbon dioxide emissions from energy consumption by a total of 20 percent from 1990 levels, which will count as part of sectoral compliance with UK curbs resulting from the Kyoto Conference (Financial Times, 15 December 1997, p. 4).

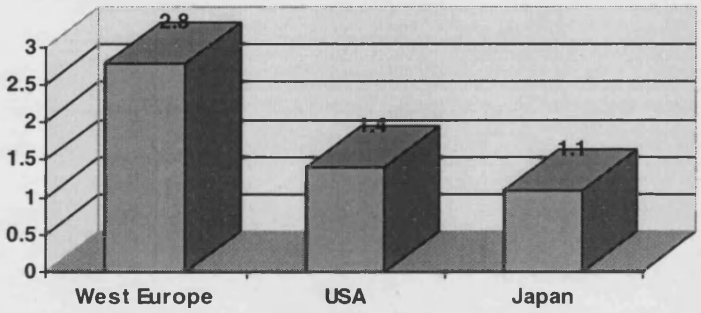
[69] Newsweek, 8 December 1997, pp. 12-19.

[70] Economist, 11 October 1997, pp. 75-76.

affected by a large number of European Union directives, agreements, research support programmes and other regulations[71] (Turner and Hodges, 1992; ILO, 1995, p. 28).

In such a context, it must be recognized that the preservation of the environment entails major costs, particularly for the chemical industry[72] (see figure 4.1 below[73]). These additional costs represent a loss of international competitiveness for the industry, thus "governments must know that if industry has to finance the costs" it must be profitable (UN, 1994a, p. 4).

Figure 4.1 - Capital spending on environmental protection per chemical industry in selected countries - 1992 (current US$ billions)



Source: Adapted from UN (1994, p. 28).

As regards speciality chemicals, environmental pressures have been translated into new products following high levels of R&D expenditures within the industry. It is suggested that the "current industry's interest in environmentally-friendly materials is not only induced by stricter rules and the pressure of public opinion". It is also a result of market changes in which consumers are buying more natural-based products. As a result, industries with direct interfaces with consumers are especially concerned with product developments that substitute existing polluting products (EC, 1997, p. 7-63).

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[71] Most relevant is the precautionary principle considering that it is a "policy principle in environmental matters which has great influence on the law making process" (EC, 1997, p. 7-8).

[72] The CEFIC states that in 1991 capital expenditures on environmental protection as a share of total expenditures from the chemical industry was respectively: 11.8 in Western Europe, 10.4 in the US, and 3.9 in Japan (ILO, 1995, p. 34).

[73] Unfortunately, there is no disclosure of similar data from the Brazilian chemical industry since environmental protection started to be incorporated after the launch in 1992 of the RC programme. However, the Brazilian market of environmental equipment and services achieved capital spending of US$ 1.8 billion in 1996 (that is, US$ 150 million in air pollution control, US$ 900 million in basic sanitation, and US$ 750 million in soil pollution control) (Folha S.Paulo, 1 June 1997, C-2, p. 4).

Additionally, the OECD has estimated that in 1990, the environment and services market amounted to US$ 200 billion (ILO, 1995, p. 35). Since then it has increased, reaching US$ 450 billion in 1996, of which the Europe represents US$ 180 billion, and the US accounts for US$ 150 billion. Similarly, the Brazilian market was estimated at US$ 30 billion per year[74] in 1996.

At this stage it must be said that the environmental impacts generated by the chemical industry are contingent upon the businesses' segments (as illustrated previously for agrochemicals and speciality). Moreover, the priority of some environmental impacts (rather than others) may be a consequence of regulatory pressures, which vary across countries creating difficulties for companies' environmental management.

4.3.1.2 - Environmental impacts generated by the selected cases

Considering the Brazilian chemical industry, Gutberlet (1996, p. 126) states that the association of chemicals producers listed the potential pollution problems from this sector as: (a) air emissions, containing gases and steam from chemical products, particulate pollutants, gases from the combustion of fossil fuel, heat and noise; (b) water contamination at ground and underground levels by effluents impregnated with acids, alkalis, oil and metals; and (c) wastes from coal, organic materials, thermoplastics, metallic scraps and glass.

The empirical findings have confirmed that these are the main environmental impacts generated by the Brazilian chemical industry. More specifically, CETESB provided information[75] regarding the selected companies located in São Paulo state. The document indicates that DuPont, Zeneca and BASF (that is, three sites in São Bernardo do Campo) were not penalized for events of non-compliance with environmental legislation. However, BASF's site in Guaratinguetá received two fines in June 1996 for the discharge of liquid effluents that breaches legal standards.

[74] Folha de S.Paulo, 1 June 1997, C-2, p. 4.
[75] Document from CETESB's Pollution Control Department (dated 04/12/96) reporting the events of non compliance (from January 1995 to November 1996) among the selected companies.

The cases have shown evidence of site-specific environmental impacts. First, Zeneca's manager[76] stressed that the Paulínia site is small, therefore the generation of wastes, consumption of energy and non-renewable resources are very low. There is an intensive use of plastic, which is recycled and/or incinerated. Besides this, there are control systems (end-of-the-pipe technology) for air emissions, water and effluents releases (prior to discharge into the river). In fact, most of the effluents are treated and re-used in the operational process.

Nevertheless, Zeneca has caused environmental impacts through the disposal of hazardous wastes in the soil contaminating both the soil and the underground water. As a result of a legal action against Zeneca, an agreement was made to remove the contaminated wastes and to clean up the soil in three years (from 1995 to 1998). Meanwhile, the subsidiary continues to analyse the underground water until it recuperates its former cleanliness.

According to the environmental authority[77], this event at Zeneca's subsidiary is an example of negligence in the handling of hazardous wastes. At the same time, it illustrates that the Brazilian legal system was able to obligate a company to restore the damage. However, the disclosure of Zeneca's environmental problems was made through a complaint from former site managers. The environmental authority[78] confirmed that the public attorney (representing the Ministry of Justice in Paulínia) started a civil inquiry after denunciation of environmental impacts by illegal wastes' disposal at the Zeneca site (since then this site is inspected monthly).

The CETESB's inspector[79] emphasized that there are three potential results of such civil inquiry, which are as follows: (a) abandon the process for the lack of evidence, (b) to sue the offender through a 'public civil action', and (c) to make an agreement, including a hearing with the offender and the environmental authority, that results in a 'Compromise Term' (as mentioned in section 3.3.2.1 of this thesis). This is a new judicial mechanism to enhance the recovery of degraded areas by offenders.

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[76] Interview at 'Zeneca Brasil S.A.' (on 19/09/96), with the occupational hygiene and environmental manager at the operational level of the Brazilian subsidiary (subordinated to the manager of technology and production). The interview was held at the Paulínia site (São Paulo state).

[77] Interview with CETESB's inspector responsible for Zeneca's site (on 24/10/96), at the regional office in Campinas (São Paulo state).

[78] Ibid.

[79] Ibid.

The 'civil inquiry' against Zeneca resulted in an 'Adjustment Term', which was signed between Zeneca and CETESB with the legal endorsement of the public attorney. Consequently, a three year plan devoted to the clean up programme[80] was inaugurated in October 1995 (though the accusation was made in September 1994). In sum, Zeneca's site[81] has been undergoing a large project of recovery, in which the soil is being processed (at a very high cost with financial and technical support from the headquarters) in order to separate the wastes for posterior treatment and/or incineration.

Moreover, the CETESB's inspector[82] added that the civil inquiry also questioned the 'active principles' of the pesticides manufactured by Zeneca, due to their high potential for environmental damage (throughout the production process and by its application at crops). Zeneca[83] confirmed that this is a 'pyrethroid insecticide' with multiple uses (in agriculture, public health and cattle farming), which is dangerous but lacks substitutes[84].

Additionally, Zeneca's site[85] had an accident with environmental consequences at the nearby swamp (on the shore of the Atibaia River). This accident was caused by a spill of rain water (impregnated with the same substance - brine with 12 percent of sodium chlorine - disposed illegally in the soil) accumulated at the reservoir. The effluents' treatment system had structural problems therefore this reservoir was inadequate. The spill happened in 1986, but only in 1994 was the vegetation recovered. More specifically, CETESB's inspector[86] confirmed that the swamp nearby the plant has been damaged by a substance from the agrochemical manufacturing. The inspector explicitly said that it was caused by negligence in the management of a toxic substance; the company however rectified the damage.

Surprisingly, the CETESB's inspector[87] stated that Zeneca is now concerned with pollution control. For example, the company participates in the 'Guariba Project'

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[80] Ibid.
[81] Interview at Zeneca's subsidiary, as stated in Note 76.
[82] Interview with CETESB's inspector (on 24/10/96).
[83] Interview at Zeneca's subsidiary, as stated in Note 76.
[84] The corporate report refers to product safety (e.g., stewardship activities on herbicides use) and improvement of formulation (e.g., water-based herbicide and microencapsulated crop products). However, there is no reference to this insecticide (Zeneca, 1995, p. 25).
[85] Interview at Zeneca's subsidiary, as stated in Note 76. The evidence of this accident came from aerial photos of the site.
[86] Interview with CETESB's inspector responsible for Zeneca's site (on 24/10/96).
[87] Ibid.

for the segregation and recycling of agrochemicals packaging[88]. This initiative that appeals to Zeneca's public image (that is, less costly and more visible) has some positive results on the post-consumption of hazardous wastes. The company has been complying with local regulations, reporting changes in the products voluntarily, and its final effluents are disposed of by SABESP with CETESB's authorization. Finally, Zeneca has a landfill site approved by CETESB for future wastes disposal, which represents a high investment made after the legal action.

Regarding BASF's subsidiary, its manager[89] stated that the community is unable to identify environmental impacts (which makes them more vulnerable to the industry's report of impacts). In reality, the potential environmental impact at BASF's subsidiary is posed by hazardous wastes. Therefore, the main concern is with the minimization of wastes (basically by elimination at the source) and the reduction of energy (focused on the efficient consumption of vapour and water).

Additionally, a survey made by Ernest & Young[90] in the São Paulo state, in which BASF participated, was mentioned as evidence of the subsidiary's priorities. This survey indicates the environmental challenges for the chemical industry, as follows: (a) training of employees, (b) reduction of energy and water consumption, (c) compliance with the legislation, (d) minimization of wastes, (e) recycling of materials, (f) installation of treatment equipment (end-of-the-pipe technology), and (g) implementation and development of environmental management systems (EMS).

Finally, DuPont's manager[91] avoided commenting on the environmental impacts of the subsidiary's operations. The main argument supporting the lack of impacts was the corporate principle that 'substances and/or processes that are technically and/or managerial out of control must be banned'. However, an accident that happened at the Barra Mansa site (Rio de Janeiro state) in early 90s resulting in

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[88] This initiative is sponsored by the Association of Agricultural Engineers of São Paulo state (AEASP) consisting of a campaign to promote the 'triple washing' of agrochemical containers and the releasing of the effluents wastes at the crop. The packaging wastes are collected to be recycled by a qualified (inspected and approved by CETESB) company, which produces electrical wires with the recycled containers (Gazeta Mercantil, 16 May 1996).

[89] Interview at 'BASF S.A.' (on 16/10/96), with the coordinator of safety and environment at the corporate level of the Brazilian subsidiary. The interview was held at the São Bernardo do Campo site (metropolitan area of São Paulo).

[90] Survey on industrial trends in the environmental area in the state of São Paulo, co-sponsored by the Secretary of State of the Environment and Ernst & Young (Ernst & Young, 1996).

[91] Interview at 'DuPont do Brasil' (on 11/09/96), with the safety, health and environmental manager at the corporate level of the Brazilian subsidiary. The interview was held at the South American headquarters in São Paulo city.

environmental impacts into the river has not been cited (information provided by FEEMA[92]). Moreover, DuPont's subsidiary has neither mentioned that CFCs are still manufactured in Brazil[93] (at the Goiabal site) nor the companies measures to phase-out, recover and/or dispose of this hazardous substance.

FEEMA's inspector[94] said that due to structural problems (in the agency) DuPont's site in Barra Mansa has not been often inspected. Nevertheless, it has a well-designed plan for dealing with emergency situations, avoiding any accidental discharge into the river, and an effluents' treatment system. These improvements facilitated the agency's activities, since the site has mechanisms to control the pollution generated. However, these changes were made after the accident in 1990, in which a spill of chlorine acid caused environmental impacts at the 'Paraíba' river[95].

In the face of these environmental impacts the selected cases have shown signs of environmental liability. It is interesting how differently each subsidiary handled these issues (such as in Zeneca's and BASF's cases). But most important is what environmental liabilities represented for their business (as in DuPont's case). For example, Zeneca (which was formerly ICI) was concerned in the 80s with the re-use of packaging impregnated by agrochemicals; it was therefore disposed of in the soil as a 'safe practice'[96]. In late 80s this practice became illegal, because the disposal of agrochemicals packaging in the soil started to require a pre-treatment. However, the company continued to dump material without pre-treatment for a while and is now removing the contaminated wastes and soil as the result of a legal action.

The environmental liabilities at Zeneca suggest that neither ICI's minimum requirement (i.e., the local legislation) nor the corporate guidelines resulted in a better environmental performance[97]. The Paulínia site was installed in 1978, therefore the

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[92] Interview with FEEMA's inspector (on 06/12/96) from the Division of Pollution Control at the central office in Rio de Janeiro city.

[93] The corporation specifically stated that a limited production continues only in Brazil at the request of the Brazilian government (DuPont, 1995, p. 6).

[94] Interview with FEEMA's inspector (on 06/12/96). The aim of this interview was to gather data on DuPont's site, which is inspected by the central office, because the control of large companies (located either in the capital or the interior of the state) is concentrated there.

[95] DuPont has another site in Uberaba, Minas Gerais state; consequently an attempt was made to identify any major environmental impact there in the last years. Therefore, an NGO which publishes an annual list of major polluters in this state was consulted. It was then confirmed that DuPont's site has never been among the companies listed (interview at AMDA, on 18/10/96).

[96] Interview at Zeneca's subsidiary, as stated in Note 76.

[97] Based on the commitment made at ICI's environmental policy, June 1992.

licensing of industrial activities had been introduced by the legislation[98]. However, ICI's corporate recommendation[99] for wastes disposal was not disclosed (and if the subsidiary should have followed it)[100].

Overall, there was a long interim period from the operation start-up in 1978 and the legal requirements in the late 70s, until the wastes were removed in 1996. Even assuming that ICI really stopped the disposal in the late 80s, there was no attempt to remove wastes prior to the legal action. Zeneca's manager[101] explicitly recognized that the company continued with the soil disposal for a period after the legislation was enforced.

Secondly, BASF reported that the Guaratinguetá site had an incident during the reform of the effluents' treatment system in 1996, in which some effluent was released into the river. As mentioned before, this event resulted in two fines from CETESB. Additionally, there was an accident in the transportation of raw material with serious consequences. That is, a chemical substance leaked from a truck after a crash and seeped into a stream of water and a lagoon nearby, which is the main source of water for a large company. Consequently, it was necessary to stop the company's operations until the water was decontaminated by a clean up process executed by BASF under the supervision of the environmental agency. In the end, BASF's response to the accident was immediate and satisfactory (as acknowledged by CETESB), which avoided a legal action.

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[98] At the federal level the regulation enforcing pollution control on industrial activities (Decree 1413, 14/08/75) and mechanisms of prevention and control of industrial pollution (Decree 76389, 03/10/75) were created in 1975. At the state level CETESB (created in 1973) was turned into the state environmental agency in 1975 (Decree 5993, 16/04/75), and the pollution control system (State Law 997, 31/05/1976) was promulgated in 1976 (Decree 8468, 08/09/76) confirming CETESB's competence and standards. Considering the latter state environmental legislation, Title IV is related to soil pollution, and Article 51 explicitly prohibits the disposal of hazardous wastes in the soil. Article 52 indicates the need for approval by the CETESB prior to any soil disposal, but special care should be exercised to protect the underground water. Finally, Article 53 says that hazardous wastes should be treated prior to final disposal.

[99] In the UK, new special waste regulations came into force by the end of 1995, replacing the 1980 regulations (Waste Management Paper 23, published in 1981). These regulations also implemented the 1991 Hazardous Waste Directive including the EC list of hazardous wastes.

[100] For example, Monsanto (American company) installed its Brazilian site in 1978 when only pre-treatment of effluents was required (by law 997, 31/05/75) prior to discharge at the public sewage system. Instead, corporate policy was followed and an effluents' treatment system was installed (Guedes, 1993).

[101] Interview at Zeneca's subsidiary, as stated in Note 76.

Additionally, BASF[102] is implementing the self-assessment proposed by CETESB at the Guaratinguetá site. Although there is no legal requirement enforcing self-assessment, this site is following the agency's request on a trial basis. More specifically, BASF's relationship with CETESB improved after the incinerator was installed, which is regarded as an adequate form of waste disposal. However, Greenpeace (1992) has questioned whether incineration of contaminated wastes causes dioxins emissions and the dispersal of contaminated ashes.

Finally, in a tactic rarely used in the Brazilian context[103], DuPont uses its good safety performance as a 'credibility attribute' in the market. It means that the lack of environmental liabilities is stressed as a business strategy to sell products and services with the guarantee of long term supply. Such an approach is very relevant when compared with the situation in which environmental liability has damaged the company's image (such as Union Carbide after Bhopal, Czinkota et al., 1992). Accordingly, DuPont's subsidiary has changed its approach regarding the externalities in the manufacturing process. In the past externalities were considered as wastes but it is now an opportunity for productivity improvement in which the goal is 'zero emissions' (DuPont, 1996).

In brief, these improvements in the productivity of the process reduces operational costs. The 'win-win rhetoric' at DuPont's subsidiary (that is, the policy that the incorporation of environmental concern is good business rationale) includes the avoidance of environmental liabilities, protection of the company's image, and most importantly, a concern with the renewal of operational licences. Local legislation is regarded by DuPont as a minimum requirement. However, there are also compulsory corporate standards, so the subsidiary decides if either legal or corporate standards are attainable. DuPont's manager[104] affirmed that this corporate principle may be understood as reactive behaviour; however, it is just the adaptation of the corporate policy to the local context.

Overall, the three companies have quite distinctive approaches towards environmental liability. It ranges from negligence (and legal pressure to clean up) at

[102] Interview at BASF's subsidiary, as stated in Note 89.
[103] A former environmental secretary in Rio de Janeiro affirms that Brazilian companies are unlikely to invest in environmental protection unless they have to. Besides this, the executive director of Greenpeace Brazil says that foreign companies in Brazil are not using the latest available 'eco-friendly' technology as they are in Europe and the US (Financial Times, 2 December 1997, p. 9).
[104] Interview at DuPont's subsidiary, as stated in Note 91.

Zeneca, to prompt responses (or preparedness for emergencies) at BASF, and avoidance (by setting strict targets) at DuPont. Nevertheless, safety was identified as an industry-related aspect deemed important by DuPont and BASF (there is no similar evidence from Zeneca), in which both companies have good safety records. But DuPont clearly has a leading role within the industry justified by its history as a gunpowder plant (e.g., the first written safety instruction is dated from 1811).

Moreover, DuPont's manager[105] emphasized that the corporate concept of safety includes occupational health and environmental issues. However, in the early 70s the occupational health division was created, and environmental issues remained part of the safety area. In the late 70s a new division was created for environmental issues. There are now three distinct areas, but safety is still the major concern, reflecting DuPont's leadership in this area[106].

CETESB's inspector[107] said that DuPont's site in Paulínia voluntarily brings environmental issues to be discussed with the agency, however there are no past environmental problems. The corporate SHE policy and the existence of exclusive staff to manage these issues facilitates pollution control from the agency. For example, DuPont had a project to relocate a packaging unit for herbicides (from the Barra Mansa's site) in Paulínia; they therefore requested CETESB's evaluation. Another example of proactive practice is the wastes classification and disposal, because companies usually try to classify as much wastes as possible as 'class II' (i.e., non toxic) to avoid the costs of adequate disposal. On the contrary, DuPont attempts to classify it as 'class I' (i.e., toxic) to avoid future liabilities. Besides, there are no excuses based on financial constraints to accomplish requests from CETESB.

Similarly, there is a great emphasis on the safety aspects of the operations at BASF's subsidiary, as a consequence of the industry's characteristics and historical concern from the corporation. Accordingly, the operational process[108] is considered as

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[105] Ibid.

[106] The Brazilian subsidiary has received several awards from the Brazilian Association of Safety and Accidents Prevention (ABSPA). Additionally, DuPont is selling safety services through a programme called 'STOP' (which emphasises risk and safety management). Finally, the corporation claims that by reducing pollution, changing products and processes, and selling environmental and safety services it has increased its revenue (Gazeta Mercantil, 3 December 1997, p. C-8).

[107] Interview with CETESB's official at the regional office in Campinas (on 14/10/96), in which the inspector responsible for DuPont's site in Paulínia was present to provide an overview of company performance.

[108] That is an explicit reference to engineering excellence, which is regarded as one of the German industry's 'traditional virtues'. However, this seemed to be neglected whilst 'quality circles' and other

the key element, because 'a risky operational process will affect the environment'. Therefore 'the process must be integrated with S&E issues to reduce potential risks'.

In conclusion, none of the cases have faced pressure from local NGOs because of environmental issues. However, such pressure towards other companies was identified, such as Rhodia (French chemical multinational). This case had particularly strong repercussions[109] in Brazil because the company had invested 'in creating an image of environmental quality', and was suddenly affected by environmental liabilities[110]. Additionally, it is suggested that CETESB was aware of the environmental liabilities, but did nothing to control the degradation[111].

In general terms, BASF's subsidiary[112] had some image problems in Brazil (specifically in the Rio Grande do Sul state) in the early 90s. The company was legally questioned by the public attorney on the registration of an imported product, which lacked a declaration of origin on the product label[113]. In effect, public attorneys are the most recent driving force in Brazil, challenging companies' practices (as suggested in chapter three).

4.3.1.3 - Environmental commitment from the chemical industry

Considering the distinct responses to similar environmental impacts, it is relevant to address a potential source of harmonization of practices in the chemical industry - the Responsible Care programme[114]. At a rhetorical level this initiative has

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management techniques from Asia and the US were being incorporated by the manufacturing industry (Economist, 18 March 1995).

[109] Greenpeace (1996) has published a report in Brazil on the effects of organochlorines in the human health, which is illustrated by a photo of a contaminated child in Cubatão (São Paulo state).

[110] Rhodia's site in Cubatão was closed by the local public attorney on June 1993 after medical examinations confirmed that employees were contaminated by 'chlorine-benzene' (Folha de S.Paulo, 9 June 1993, C-3, p. 3).

[111] Interview with official at the Environmental Department of FIESP (on 27/09/96).

[112] Interview at BASF's subsidiary, as stated in Note 89.

[113] The archives of the 'Curadoria do Meio Ambiente' (a public judicial agency for the environment) in São Paulo were consulted for legal cases against the selected companies (on 29/11/96). Only a communication from the public attorney in the Rio Grande do Sul state was found, suggesting an investigation of BASF's intention to manufacture an agrochemical in São Paulo that was being tested there.

[114] 'Responsible Care' was first adopted by the Canadian Chemicals Producers Association (CCPA) in 1985. Since then it has been adopted by chemicals' associations in another 39 countries (which account for approximately 86% of the world's chemical production). This initiative aims "to improve continuously environmental, health and safety performance" of chemical companies' operations and products in order to respond to public concern (ICCA, 1996, p. 4). At present, the growth and integrity of the RC is guided by the ICCA (the trade association representing chemical manufacturers

provided uniform environmental commitment among chemical industries located in different countries. This is a worldwide attempt at self-regulation coordinated by chemical industries associations. In the US, Britain and Germany the respective chemical associations (CMA, 1995; CIA, 1995b; VCI, 1996) have been reporting the benefits of this voluntary scheme to stakeholders[115]. In the Brazilian case, it is still impossible to evaluate performance improvement based on the RC due to lack of disclosure.

Briefly, DuPont and BASF corporations are committed to the RC sponsored by chemical associations in the US, the UK and Germany. Zeneca Group is also committed to the programme in the UK and the US. Therefore, it is arguably relevant to introduce the characteristics[116] of such programmes in the selected home (i.e., Germany, the UK and the US) and host countries (i.e., Brazil).

In Germany the RC was adopted in 1991 - with implementation from 1994 - to which all VCI members companies are required to commit themselves. The indicators of performance will be defined by the CEFIC, and companies have advisory panels and "open door days". Despite the recent implementation, the VCI has published sector-wide reports on environmental expenditures and emission levels for many years (CEFIC, 1995). Accordingly, UNEP (1994, p. 26) affirms that the VCI's recommendations on environmental costs were first published in 1973.

The first RC report (VCI, 1996, pp. 7-12) was published in September 1996, in which the VCI notes that from 1979 until 1994 there was a reduction in the discharge of suphur dioxide by 90 percent; nitrogen oxide by 72 percent, and volatile organic compounds by 84 percent. Moreover, from 1984 to 1994, the chemical industry spent DM 13.6 billion on environmental protection facilities; at the same time, operation costs for these plants were DM 57 billion.

In the UK the programme was adopted in 1989, and since July 1992 it has been a prerequisite for membership of the CIA. There are also thirty three local cells, liaison panels and former opinion groups throughout Britain. It has published indicators of performance and annual reports (since June 1993). Finally, the CIA (1995, p. 4)

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worldwide), as such, some fundamental features of the RC must be present in each national association's initiative (a brief progress report of each country is provided by ICCA, 1996).

[115] Despite explicit concern with the public, the RC's achievements are also widely used during negotiations with governmental authorities, as was reported by the official from the Chemical Industries Association in the UK (interviewed on 31/10/95).

[116] Based on data from CEFIC (1995) and ICCA (1996).

indicates that over £ 4.5 billion (on capital and operational costs) has been spent since 1990, of which £ 952 million was spent in 1994.

The CIA (1995b, p. 10) states that (a) discharges of Red List[117] substances "have been reduced by 83% since 1990 and there has been a 31% reduction in 1994", (b) disposals of wastes[118] off-site "have fallen by 24% since 1990", and (c) the Environmental Index (i.e., five components with the most critical impact on the environment per site) continues to be widely used.

In the US, the programme was adopted in 1988. Since the beginning has been prerequisite for membership of the CMA. There are more than three hundred local community panels, many company "open door days", and a national public advisory panel. It has published the indicators of performance and annual reports (since 1992) summarizing overall sector performance.

The CMA (1995, p. 23) claims progress since 1988 in reduction of: (a) air, land and water emissions by 49 percent, (b) disposal of EPA-permitted deepwells by 46 percent, and (c) off-site transfers for treatment and disposal by 56 percent. It is relevant to note that the EPA's Toxic Release Inventory (TRI) programme (established in 1987) became the CMA pollution prevention report (the same TRI data is submitted by member companies).

In conclusion, the RC is visibly more advanced in the US and the UK, where it has been systematically implemented and results are regularly disclosed to the public. In Germany, the RC was only implemented recently, therefore the indicators of performance are not available.

In Brazil, ABIQUIM[119] adopted a version of the RC programme in April 1992. A few months later, in July 1992, the association reported that 110 companies had signed the commitment[120]. In March 1996 the number of members increased to 118

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[117] Based on the Environmental Protection Regulations 1991 schedule 5 and the Trade Effluents Regulations 1990.

[118] Defined by the Special Wastes Regulations 1980.

[119] The RC must be sponsored by a nation's leading chemical trade association representing both domestic and multinational chemical producers. As such, ABIQUIM is the Brazilian chemical industries association coordinating the RC's implementation (ICCA, 1996, p. 24). The signatory companies (75% of the association's members) represent approximately 90% of Brazil's chemical sales. Besides this, the association is coordinating an initiative on waste management and the implementation of the APELL (Awareness and Preparedness for Emergencies at the Local Level) programme from UNEP (Gutberlet, 1996).

[120] Based on correspondence from ABIQUIM, dated 27 September 1992.

companies with a total of 156 members[121] (of which TNCs account for approximately 44% of total members). The process (not 'programme' as it is called in the US and Europe) is called "Atuação Responsável", and it is not obligatory for membership to ABIQUIM. In March 1995, the executive committee recommended to ABIQUIM's board of directors, that the RC should become an obligation for membership as soon as 90 percent commitment is reached (based on the total number of association's members).

The RC's health and safety committee has been discussing a new series of performance indicators to expand on the ones that have been used by the Brazilian industry for the past 10 years. The existing indicators are based on national legislation. In 1995, the association organized a national seminar on 'environmental protection', following the publication of the resource guide (for the implementation of the code of practice regarding environmental protection).

ABIQUIM's version of the RC consists of guiding principles (twelve principles), codes of practice[122], an executive leadership committee (constituted of 16 CEOs aiming to give political support), a public advisory committee[123] and a self-evaluation process. The commitment is signed by the chairman of the association's board of directors and the CEOs. The codes were prepared by working groups within the association, and implementation started by the members in January 1994. At present, there are no indicators of performance defined by the association, though the evaluation of performance started (in 1996) via annual self-assessment.

Since 1991, the association's external communications on SHE issues are made by the community advisory councils. At the company level there are some initiatives for the community such as "open door days". It deserves to be said that there is neither commitment to disclose indicators of performance in the future, nor incentive for companies to do so individually. The member companies share

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[121] Based on correspondence from ABIQUIM dated 12 March 1996. It includes a copy of the report sent to CMA in the US following a questionnaire from the ICCA's programme of self-assessment.

[122] There are six codes of practices as follows: Process Safety, Employee's Health & Safety, Transport and Distribution, Environmental Protection, Dialogue with the Community and Emergency Preparedness & Response and Product Stewardship. The environmental protection code is concerned with the reduction of pollution and hazardous wastes generated by the chemical industry. However, in case of impossible reduction and/or elimination of pollution ways of adequate management must be identified.

[123] The National Public Advisory Committee still remains to be created, however there are some Community Advisory Councils at regional, local and company levels which have been working since 1991 (ABIQUIM, 12 March 1996, p. 7).

experiences about the RC's implementation in the so-called 'local cells'. Because Brazil is a large country and chemical companies are located throughout the regions, the association created these local networks of companies to implement the RC and to work specifically on local projects.

As regards the environmental protection code, it has an implementation guide based on the 'Pollution Prevention Resource Manual' (from 1991) from the American CMA. However, modifications were made aiming to produce a guide compatible with current environmental management trends and the future norms from the ISO (ABIQUIM, 1995). Besides this, the association's official states that "a simple copy of the American RC or from any other country, would not be adequate for the Brazilian chemical industry due to the managerial and national cultures"[124]. However, the number of TNCs' representatives in the 'technical commission of the environment' (in which eight, out of nine, members are from multinationals) is evidence of their influence on the RC's implementation in Brazil. The managers from DuPont, BASF and Zeneca are members of this commission[125].

In short, ABIQUIM's official[126] affirmed that there is a clear variation, in terms of environmental management and performance among chemical companies; therefore, the investigation of few cases would not reflect the overall situation of the Brazilian chemical sector. This argument is relevant because it suggests that there is no industry-wide pattern for environmental issues. At least, it is a confirmation that the RC has not yet produced such a harmonization of practices.

More specifically, the Brazilian industry[127] is comprised of petrochemical companies (representing from 50 to 60 percent of the sector). Even after privatization, domestic capital is still dominant (with 80 percent of the companies) in this segment. The environmental performance of petrochemical companies is dependent on new

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[124] ABIQUIM's brochure: 'Conhecendo o Atuação Responsável', n.d.

[125] TNCs' representatives (approximately 44% of the association's members) seem to take the lead on this commission. More specifically, the other representatives are from Bayer, Gessy Lever (Unilever), Rhodia (Rhone-Poulenc), Hoechst, Ciba Geigy and White Martins (Brazilian company with technology from American Praxair) (ABIQUIM, 1995). However, the commission's representatives have changed since 1992 but there is no evidence that domestic firms were represented. Otherwise, ABIQUIM (1992) cited Brazilian companies as part of the so-called 'sub-commission of environmental management and total quality'. Besides, ABIQUIM (1994) reported representatives from five domestic companies and five MNCs in the 'environmental management working group'.

[126] Interview with ABIQUIM's official (on 04/09/96), who is also the senior manager responsible for the implementation of the 'Atuação Responsável', and the Brazilian representative (for the business community) in the international negotiations of the ISO (series 14000).

[127] Ibid.

technology. But these companies lack the resources and international connections to develop such technology. In some cases this problem was overcome by the existence of minor 'share participation' of foreign capital, which reflects the interest of TNCs in guaranteeing supply of basic chemicals. The other 40 percent of the chemical sector is constituted by 'multi-divisional' companies, in which the TNCs represent 80 percent of this segment. These companies have access to new technologies (of both process and management) to improve their EH&S performance derived from the headquarters.

According to ABIQUIM's official[128] there is only one industry-related factor relevant to explain environmental practices, that is, the characteristics of both product and manufacturing process. This is the principal single factor explaining the environmental management of companies in any industrial sector. However, what differentiates the environmental performance of TNCs' subsidiaries from domestic firm is the existence of environmental guidelines from the headquarters. Besides this, there is technological access, which includes local adaptation and/or further development by the Brazilian subsidiary. Finally, the strategic position of the Brazilian subsidiary (e.g., as the regional headquarters) is another important variable supporting environmental performance (in which higher responsibility results in better performance such, as in DuPont's case).

Additionally, it was argued[129] that European companies find the programme difficult to be implemented, because of its resemblance to an American management style. This argument was refuted by BASF's manager[130]; however, all agreed that domestic firms face difficulties in adapting their culture to the RC's guidelines. In BASF's case there are differences because the subsidiary follows corporate principles which could produce similar results.

Nevertheless, BASF's manager[131] claims that the subsidiary has been meeting demands from ABIQUIM. Despite the time consumed by bureaucratic tasks, the company is going through with both the RC's implementation and qualification for the ISO 9000 certification. However, the RC has made no difference to the S&E practices at the Brazilian subsidiary because it was not incorporated into BASF's organizational culture. This means that an EMS must reflect the 'company's culture' (which may be

[128] Ibid.
[129] Ibid.
[130] Interview at BASF's subsidiary, as stated in Note 89.
[131] Ibid.

another level of culture-based explanations) to be absorbed by the organization. Only one aspect of company's activities was affected by the RC, that is the relationship with the community. This finding has been replicated in the three chemical cases. As such it is a strong indication of the publicly-driven nature of the RC, which is designed to change the negative perception of the public towards the chemical industry[132].

In addition to this, BASF's manager[133] has identified another potential contribution of the RC's implementation, that is the concept of 'continuous improvement'. This is a new managerial tool that may improve the Brazilian subsidiary's practices. However such a process of 'continuous improvement' which started with the 'total quality management system' introduced recently has developed systematic planning and reviewing of operations to improve performance.

It is interesting to note that in four years since its adoption in Brazil, the RC has only changed companies' approach towards the community without changing their internal practices. As well as this, the ABIQUIM's official[134] accurately suggested that German companies lack environmental management following a systemic perspective. However, the argument that European companies have more difficulties with the RC may be misleading. For example, BASF and Zeneca claimed that they have accomplished the annual targets, though they are not exclusively committed to the programme. Another exception to this argument is Hoechst (German company), which is recognized as leading the RC implementation in the area of Suzano (São Paulo).

BASF's priority is total quality[135], therefore resources and efforts are concentrated on the certification. In such a context, BASF has similarities with Zeneca, since both are attempting to reconcile ISO certification with the RC's implementation. Besides, it is recognized[136] that the RC has substantial parallels with 'total quality management'. Therefore, BASF and Zeneca's subsidiaries may be following the right path in the incorporation of environmental management.

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[132] For example, the Financial Times (Survey, 27 October 1995, p. III) addressed the problem of image at the UK chemical industry and their response through the RC programme.
[133] Interview at BASF's subsidiary, as stated in Note 89.
[134] Interview at ABIQUIM, as stated in Note 126.
[135] Interview at BASF's subsidiary, as stated in Note 89.
[136] Interview with the official at the Chemical Industries Association (on 31/10/95) responsible for the RC programme in the UK. Moreover, the CBI (1995, p. 7) states that environmental management may be incorporated into business as part of TQM or by an integrated EH&S system. Additionally, the emergence of the ISO certification for environmental management, based on the experience of the ISO 9000 for quality management has certainly emphasized the similarities (Gazeta Mercantil, 24 April 1996, p. 6).

Otherwise, Porter and van der Linde (1995a/b) state that environmental concern is different from TQM because it is an issue coming from public and/or consumer pressures, which justifies governmental intervention. On the contrary, TQM was introduced, by market forces alone (mainly as a consequence of competition between American and Japanese companies).

Despite the lack of reference to total quality, the RC programme brought a strong industrial aggregation into the chemical association. However, it is easier for TNCs' subsidiaries to adopt the RC rather than for domestic firms[137] because the corporation has already incorporated the RC (mainly in the case of American companies). DuPont's case supported this argument when it was suggested that the 'Brazilian subsidiary just adapted the previous structure'[138]. But Zeneca's case refuted the proposal that the headquarters' experiences are shared.

In reality, the chemical industry has the most clear and widespread commitment towards environmental issues among Brazilian industries. Consequently, it was expected that governmental authorities would change their perception towards the chemical sector. Besides this, ABIQUIM has demonstrated willingness to participate in any discussion regarding new environmental regulation (another novelty from the RC). Surprisingly, DuPont's subsidiary deserves great merit for bringing the RC to Brazil. However, the company's influence goes further, since the 'Responsible Care Implementation Guide' (issued in 1992 by ABIQUIM) was based on a managerial model from DuPont.

DuPont's manager[139] argued that the CEO signed the RC programme in the US in 1988, therefore it should be incorporated by affiliates worldwide. Consequently, the Brazilian subsidiary copied some aspects after visits to headquarters. However, when the RC was launched in Brazil it was adapted to the local context. This is mainly because 'it is inappropriate to approach the community in Brazil similarly to the

[137] Nevertheless, there are examples of domestic petrochemical and chemical companies leading the incorporation of environmental management. For example, OPP obtained the ISO 14001 certificate in November 1996 for its three resin manufacturing plants (Gazeta Mercantil, 17 November 1997, pp. 2-3).
[138] Interview at DuPont's subsidiary, as stated in Note 91.
[139] Ibid.

gringos'[140]. Moreover, owing to cultural differences the institutionalization of the RC as a 'tupiniquim'[141] programme was favourable to the subsidiary.

DuPont's leadership[142] within the chemical association confirms the statement[143] about the TNCs dominance in the definition of the RC in Brazil[144]. Such influence facilitates future implementation in American subsidiaries due to compatibility with their corporate management style. In fact, some American subsidiaries are selling S&E services in the local market (such as DuPont, Dow and Monsanto). If leader behaviour is truly mimicked (as suggested by Beliveau et al., 1994), the local environmental management will be influenced by American companies. Consequently, the 'best available practices' will be defined by American companies perpetuating their dominance in the chemical industry.

In brief, the chemical association has been evaluating RC implementation through annual self-assessment; there is thus no third party evaluation over firms' performance. The only mandatory aspect is the percentage rate to be implemented annually for each guide (based on a deadline of five years for full implementation). In 1996 the members were supposed to present their first self-assessment for the 'environmental protection code'; however the result was not disclosed.

Accordingly, the RC is still lacking two guides of implementation for 'emergency response and community relationship' and 'product stewardship'. The latter will require a SHE management, disseminated throughout the operational process and an impact assessment of the final product after consumption. This is a subject-area, according to the BASF's manager[145], in which American companies have advantages because they have already harmonized internal practices based on their

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[140] 'Gringo' is a colloquial way that Latin American refer to people from the US instead of using Americans. It is related to the Mexican-American war in the period of 1846-48, during which the American soldiers wore a green uniform, and the combat started under the command 'Greens Go'. The expression was incorporated into the Spanish and Portuguese language as 'gringo' (phonetically the same as "greengo").

[141] Used in Brazilian Portuguese as an adjective related to the Indians of the 'Tupi' tribe, who lived near the Amazon river in Brazil. Its meaning here is specifically related to heritage from the indigenous people that nowadays constitute Brazilian culture.

[142] The Financial Times (27 October 1995, p. III) stated that "in many businesses in the chemical industry, SHE performance is measured against DuPont, the US chemical company, which is considered the leader in this area".

[143] Interview with official of the Environmental Department of BNDES (on 29/08/96).

[144] According to the president of the American Chamber of Commerce in Rio, foreign companies often 'take the lead in establishing industry-wide environmental norms' (Financial Times, 2 December 1997, p. 9).

[145] Interview at BASF's subsidiary, as stated in Note 89.

SHE management systems. Nevertheless, the American approach towards SHE issues is criticized by UNEP (1994, p. 28) because their EMS are not as broad as those from Scandinavian and German companies.

Finally, in the specific issue of community-company rapport there are some interesting findings. Until quite recently there was an absolute and widespread lack of concern from any industry towards the community. It started to change in the early 80s when social mobilization against industrial pollution emerged in specific industrial areas such as Cubatão (Lemos, 1995; Zulauf, 1994). However, there is no evidence of the local community demanding S&E improvement in the selected cases. Elsewhere, the Zeneca manager[146] said that the subsidiary never received any pressure from the local community. More specifically the site is located in an industrial zone, therefore there is no direct contact with the community.

According to DuPont's manager[147] the RC compromise has energized the company's dialogue with external stakeholders because it is more comfortable to be part of an industry-wide effort than an isolated case. It has encouraged the company to take the initiative in approaching the local community, expecting that such behaviour will demonstrate its commitment to performance improvement. The selection of community representatives was made through the company's "open doors" events (with an interest in attracting the community's leaders). At the same time there was fear that such openness could cause problems for the company.

In a more realistic way, BASF's manager[148] emphasized that the chemical industry must improve its relationship with the community because its sites affect the community[149]. This is the main point which lacks recognition from the industry, though the RC will formalize this approach through the establishment of the 'committee of consultative community' (already implemented by DuPont). Accordingly, from 1992 to 1996 two "open doors" events were promoted at BASF's site in Guaratinguetá.

Additionally, BASF's was the only case to provide evidence of socially responsible behaviour towards the community[150]. More specifically, in the early 90s a

[146] Interview at Zeneca's subsidiary, as stated in Note 76.
[147] Interview at DuPont's subsidiary, as stated in Note 91.
[148] Interview at BASF's subsidiary, as stated in Note 89.
[149] For example, in 1994 a new agrochemical unit installed at the Guaratinguetá site had the exhaustion system directed towards the community; this was redirected after complaints of excessive noise (Ibid.).
[150] Ibid.

health centre was created nearby the Guaratinguetá's site. The same municipality was assisted in the creation of a new fire brigade (a concern shared by BASF). More recently, BASF started to incinerate (free of charge) the wastes from four public hospitals[151].

4.3.2 - Economic and competitive aspects

4.3.2.1 - Technology-based explanations

First, it is relevant to mention that technological explanations for the business incorporation of environmental concern include technology of process, product, waste management and S&E management services. It is also important to note that technology is a key issue in efforts to reduce industrial pollution in developing countries (Miller, 1995). Consequently, transfer of technology is an issue which is constantly addressed by the UN (UNCTC, 1985 and 1990; UNEP, 1984) and international NGOs (such as Greenpeace, 1992 and FOE, 1992) in their efforts regarding environmental degradation and the transition towards 'sustainable development' (WCED, 1987).

According to DuPont[152] one of the driving forces, responsible for turning pollution control into a business opportunity is industry-related. That is, DuPont, like other multinationals, has competitive advantages based on technological development. Consequently, the company has always explored business opportunities based on its technological vanguard such as the present incorporation of environmental concerns (following a win-win approach in the long term, Willums and Goluke, 1992).

More specifically, DuPont collaborated[153] with the CFC phase-out in order to develop its technological capabilities further. As a consequence, DuPont invested more than US$ 500 million in the development of CFC substitutes (HFCs and HCFCs). However, the company is still waiting for return on its investments due to the

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[151] BASF's subsidiary has an agreement with the municipality in which staff were trained for adequate disposal and special packaging to collect the wastes is supplied ('Química e Derivados', December/January 1996, p. 34).

[152] Interview at DuPont's subsidiary, as stated in Note 91.

[153] This pattern of behaviour should not be easily repeated. In the case of global warming, companies like DuPont want hard evidence prior to targets to reduce carbon dioxide emissions. The International Climate Change Partnership, grouping 23 multinationals such as Dow and DuPont, accepted the existence of a threat but questioned the emphasis on short-term targets (Financial Times, 13 March 1996, p. 20).

slow percolation of substitutes into the market resulting in overcapacity. Besides, the market potential for substitutes is about one-quarter of the CFC market[154].

In the case of discrepancies between local regulation and corporate principles DuPont's subsidiary should follow the 'most reasonable solution' based on its 'technical-economic viability'. It also implies the commitment that, if available, technology generating less effluent than the legal standards will be used. On the contrary, if a new legal requirement is stricter than the technology available, DuPont will negotiate with the environmental agency. Accordingly, the environmental impacts of present operations will be compared with new standards, because the Brazilian environmental authority enforces standards on a case-by-case basis.

Nevertheless, it is DuPont's strategy to be ahead of the legal requirements to have the opportunity to rationalize investments. This is mainly because requirements imposed by the environmental agency carry deadlines that are not necessarily the most opportune for technological development, requiring larger investments in a short period.

Likewise, Zeneca[155] said that the expectation of high cost is especially true for the use of BAT. Therefore the business community avoids this kind of commitment[156], otherwise, commitments based on 'best practice' are to some extent under company's control. Besides this, it is easier for large companies since they have already developed competitive managerial systems. Accordingly, an emphasis on BAP instead of BAT, is an issue where business associations (such as the ICC) and TNCs will usually exercise their lobbying power to influence undesirable commitments (Gleckman, 1995; Eden, 1994).

Nevertheless, Zeneca has examples of product development (Zeneca, 1995, p. 25). For example, DDT[157] was used in the 80s to kill the insect that transmits malaria (an endemic disease in Brazil), but now the company has a 'pyrethroid insecticide'. More specifically, the products characteristics have been enhanced according to SHE concerns, which results in a powder insecticide enveloped in a 'hidrosoluble sachet'. This is therefore less harmful for the operator and the environment. This product is

[154] Financial Times, Survey, 27 October 1995, p. IV.
[155] Interview at Zeneca's subsidiary, as stated in Note 76.
[156] A similar argument was made by the ICC's director in the UK (interviewed on 07/12/95).
[157] Agrochemicals based on organochlorine (such as DDT) were banned in Brazil from 1985 (by the Ministry of Agriculture's regulation 329, 02/09/85).

exported to England, which probably explains its higher SHE standards. Finally, there is evidence that the subsidiary has received investment (Zeneca, 1995) for a new unit of agrochemicals (due to increasing demand), which started operations in 1996.

Accordingly, BASF's manager[158] said that old technology jeopardizes any attempts to improve S&E issues in the operational process. The closure of a specialty unit in Brazil was based on the impossibility of technological improvement. Another current case of old technology disrupting environmental performance is in the paint segment; however this process tends to be terminated. In fact, BASF Group has already developed technology to replace the solvent in solvent-based paints. As a result, there is a project to manufacture water-based paints in the São Bernardo site for the automotive industry[159]. The substitution of hazardous materials (such as solvents) has positive impacts on S&E improvement of processes and products.

Overall, the recent modernization of the Brazilian subsidiary has resulted in fewer environmental impacts (e.g., the installation of the incinerator). The new unit - manufacturing an agrochemical for use in rice plantations - at the Guaratinguetá site prompted a strong S&E concern (for its high operational risks and advanced technology). This unit has equipment controlling energy consumption and air emissions (within legal standards) during the operational process. Thus, it avoids the generation of wastes and effluents. The reservoir that used to be an intermediate part of the process of effluents' treatment (BASF, 1987) was disconnected. Instead it became an emergency basin to contain hazardous substances from an accident and/or contaminated water from a fire (avoiding a bigger accident such as at the Sandoz site, in Basel, Frederick et al., 1992, p. 456).

Finally, BASF has invested in the business of wastes incineration. This is the most relevant improvement in technological terms at BASF's site in Guaratinguetá[160] in the 90s. Since June 1994, the unique incinerator for hazardous wastes in the Paraíba Valley[161] has been in operation at BASF. The equipment (an investment of

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[158] Interview at BASF's subsidiary, as stated in Note 89.

[159] In the US, acquisitions in the paint segment of the chemical industry are a recent trend, driven by the process of globalisation, particularly in automotive markets requiring global suppliers (Financial Times, 25 September 1997, p. 5).

[160] Another unit (representing an investment of US$ 3 million) was built on this site to manufacture vitamins (for food and pharmaceutical industries) to be commercialized in South American countries (Gazeta Mercantil, 18-20 October 1996, p. C-2).

[161] Gazeta Mercantil, 29 January 1996, p. A-11.

approximately US$ 6,5 million) has burnt 3,100 tonnes of wastes from a total of 5,100 tonnes that the company has stored over the last thirteen years.

In 1996 BASF generated an average of 16 tonnes of hazardous wastes per month. The total volume has been reduced each year, compared to 40 tonnes per month of wastes in 1994. In the future, from 20 to 30 percent of the installed capacity will depend on the market, aiming to generate return on the investment and current operational costs of the incinerator. The incinerator has a mechanism for continuous monitoring of air emissions, and the new technology is assisting CETESB in the transition to environmental self-assessment. However, CETESB has defined time-consuming and bureaucratic requirements to control the wastes incineration. For example, the analysis of wastes prior to the transport for incineration, issuing the 'Certificate of Approval of Destination of Industrial Wastes'.

4.3.2.2 - Cost-based explanations

The three cases have indicated that the incorporation of environmental concern into current activities is cost-intensive. This evidence confirms Walley and Whitehead's (1994) argument that gains from investment in environmental improvements are at least achieved in the long term. However, the findings also suggested that proactive and incremental investment is better than massive investment required by the authorities, for example, in clean up programmes[162]. Moreover, the environmental burden of current operations is so high that it is impossible for Zeneca to make proactive investments to upgrade the site.

Accordingly, there is evidence that the EH&S management represent high costs (as suggested by UN, 1994a). In this case, the most interesting aspect of comparing ICI's policy statement with Zeneca's policy comes from its cost-related commitments. The ICI version stated that 'the environmental impacts will be reduced to a practicable minimum'. But Zeneca has made changes by stating that: "it will manage its activities ensuring that the environmental impact is reduced to a practicable minimum at an

[162] Similarly a Brazilian scholar affirms that companies without environmental management might be closed by strict legislation, social pressure and governmental intervention (Diário do Comércio e Indústria, 21 June 1994, p. 7).

acceptable cost to the Group and Society"[163]. Considering these statements, Zeneca's manager[164] claims that the current version 'is more pragmatic, making clear that the company will reduce impacts only if the costs are acceptable'. The 'corporate environmental policy should be feasible' otherwise 'the public will criticize the company for the lack of results'. Zeneca's policy statement implicitly contains the idea of 'best available practice' not necessarily at the highest cost. Consequently, if the cost to curb environmental impacts is too high, the business is unacceptable, and thus the company will stop that activity.

The feasibility of the corporate environmental policy is much more restricted by economic than ecological aspects. Therefore, the 'corporate environmental objectives' (setting quantitative targets) from ICI's policy were eliminated by Zeneca. There are no longer pledges of a uniform, worldwide pattern, targets and deadlines for pollution elimination and/or reduction. This is all in the name of cost-affordable, and consequently realistic commitments from the company[165].

The cost-related concern at Zeneca's subsidiary is illustrated by the local development of a recycling process to recovery the salt from effluents in 1996. The Brazilian site is the only affiliate to produce this hazardous effluent (though it is not clear if the raw material could be substituted and/or the process upgraded), which is now partly recycled and the salt is sold to Solvay (Belgium manufacturer from which Zeneca buys soda[166]). Finally, it was claimed that the recycling programme was induced by past environmental impacts caused by this effluent in the soil and nearby swamp[167].

The cost of environmental improvement became a key aspect of the performance evaluation of current facilities. Zeneca affirms[168] that there are cases in which is impossible to improve performance, thus the site is closed. In Brazil an

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[163] Based on ICI environmental policy, June 1992; and Zeneca Safety, Health and Environmental policy and management, 1994.

[164] Interview at Zeneca's subsidiary, as stated in Note 76.

[165] There is no disclosure of capital expenditures on environmental management. But it is recognized that Zeneca is exposed to environmental liabilities regarding its past operations, principally with respect to soil and ground water remediation costs, though these costs are unlikely to materially impair Zeneca's financial position (Zeneca, 1995, 1997).

[166] Zeneca's subsidiary did not mention a price-related explanation for the recycling. However there was an increase in the domestic and international demand of soda, consequently the price increased from US$ 100 to US$ 400 (Conjuntura Econômica, August 1995, p. 49).

[167] The final effluent wastes are sent to treatment at SABESP (in Barueri, São Paulo state), at a cost ranging from US$ 70 to US$ 100 for cubic meter.

[168] Interview at Zeneca's subsidiary, as stated in Note 76.

acrylic unit was closed because the cost-benefit analysis demonstrated that any improvement would made the business unfeasible. This confirms the cyclical feature of the chemical industry, in which revenue is continuously invested into technological upgrading of the operations (EC, 1997).

Likewise, BASF's manager[169] said that 'costs' are the main barrier for the incorporation of environmental issues at the Brazilian subsidiary. In broad terms, it is the economic burden[170] of making the necessary changes to improve performance by incorporating S&E issues. Environmental investments are directly dependent on the 'net income' obtained by BASF businesses in Brazil. Consequently, the amount of investments to be allocated to the S&E area will vary each year and/or by project. For example, the amount spent on the installation of the incinerator was never repeated since then. Overall, environmental improvement is not only 'cost intensive', but it competes for scarce resources distributed throughout the functional areas.

Finally, the cost-related explanations from DuPont's case are focused on technological innovation in order to anticipate future legal requirements. Of course, there is also concern about the reduction of environmental impacts (through clean up programmes such as the Superfund in the US) by way of the costs they represent[171], but this is mainly the case at the corporate level (DuPont, 1995b).

4.3.2.3 - Competitive aspects

According to Czinkota et al. (1992, p. 554) American companies "place major emphasis on obtaining quantitative data", which "allows for good centralized comparisons against standards and benchmarks or cross-comparisons between different corporate units". But these standards may also inappropriately indicate reward or punishment whilst neglecting other dimensions (mainly those behavioural and culturally-oriented, not to mention the economic fluctuations in distinct contexts).

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[169] Interview at BASF's subsidiary, as stated in Note 89.

[170] In 1996, BASF spent DM 223 million on capital expenditures for environmental protection. Besides, the operating cost (i.e., net costs) for the BASF Group's environmental protection facilities amounted to DM 1,621 million in 1996 (BASF, 1996b, p. 41).

[171] For example, in 1995 DuPont spent approximately US$ 30 million on environmental projects (including those required by law and its own goals) and estimated expenditures of US$ 400 million for 1996. Besides this, it states that the cost of compliance with environmental laws, regulations and internal programmes would not impact on the company's competitive and financial position (DuPont, 1995, p. 30).

Accordingly, DuPont's manager[172] called such a management perspective that of market-orientation. Even though the company has the best SHE indices within the industry there is benchmarking with competitors. The comparison is usually made with Dow Chemical (recognized for its 'excellent' performance in SHE issues), and Monsanto (which has a 'good' performance). There is no comparison with European companies because they do not have 'outstanding SHE practices', apart from the cultural differences which complicate the comparison. Finally, DuPont is often consulted within the Brazilian chemical industry on SHE management.

DuPont's leadership[173] in SHE issues has been acknowledged within the Brazilian chemical industry, in which DuPont is recognized as having the most advanced practices (setting the benchmark[174]). For example, BASF's manager[175] has cited DuPont as a leader in the chemical industry regarding SHE issues. But it is interesting to mention that DuPont's leadership is not a positive aspect, because BASF and DuPont compete in some segments. However, such leadership is not affecting BASF business in Brazil, though it may affect businesses worldwide.

More specifically, DuPont has its image linked to 'safety and environmental services' (DuPont, 1994). The S&E programmes were developed for internal use, but in late 80s the company realized the new market opportunity. Until 1988, DuPont had been disseminating a programme in a collaborative way within the industry. Since then, a business division has been created at the corporate level to sell its managerial instruments (e.g., a safety programme called STOP is now commercialized in Brazil). DuPont's collaborative approach within the industry is confirmed by Willums and Goluke (1992). Moreover, the authors state that DuPont Group has the best indices of accidents and incidents within the world chemical industry.

Nevertheless, BASF's subsidiary is among the best for transport safety, and a good example of workplace safety. In terms of environmental issues, BASF became a benchmark in the industry after the incinerator was installed. BASF's manager[176] has emphasized the fact that Hoechst and Bayer (both German chemical companies) have

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[172] Interview at DuPont's subsidiary, as stated in Note 91.
[173] Financial Times, 27 October 1995, p. III.
[174] In the Brazilian context, benchmarking regarding environmental issues is understand as a continuum and systematic process of evaluation, adoption and adaptation of the best methods and practices followed by leader companies in EMS (Gazeta Mercantil, 3 April 1996, p. 3).
[175] Interview at BASF's subsidiary, as stated in Note 89.
[176] Ibid.

incinerators in Brazil. The explanation for these investments in the biggest German companies is their competitive advantage in environmental technology[177] and the potential market[178] in Brazil. However, the installation of incinerators is an example of proactive action in Brazil (because there is no legal requirement for such technology of waste disposal).

The incineration business is not a widespread practice in Brazil. Consequently, there is a large potential market for companies that already have an incinerator in operation. The market opportunity is specifically for the disposal of hazardous wastes (legally called 'class I') because, according to the environmental agency[179], these wastes must be disposed of adequately, thereby excluding the use of landfill sites. Finally, Zeneca's case lacks empirical evidence of competitive aspects linked to environmental issues.

4.3.2.4 - Market-related explanations

BASF's case has generated a large number of market-related explanations for environmental improvements. However, there is no similar evidence in Zeneca's and DuPont's cases. More specifically, the BASF's manager[180] said that the technology for water-based paint had been available for a long time at the corporation, but it was not introduced to Brazil due to lack of demand. However, there is a new demand from the automotive industry in Brazil (thus a market opportunity was created due to the globalization and export-orientation of this industry). Schot and Fischer (1993) state that industrial consumers are pressuring suppliers to enforce environmental requirements.

Another aspect of product development in the paint business is the replacement of heavy metals from pigments, in which lead and chrome are responsible for the definition of paints' colours. Consequently, BASF Group is developing a substitute,

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[177] The worldwide leadership of German companies in environmental technology is recognized by Porter and van der Linde (1995a). Additionally, increasing participation of these companies in the Brazilian market is expected (Folha de S.Paulo, 1 June 1997, C-2, p. 4).

[178] The president of CETESB affirms that the greatest business opportunities in Brazil are related to hazardous wastes' management including incinerators and landfill sites (Gazeta Mercantil, 17 November 1997, special report, p. 1).

[179] Interview with official at the regional office of CETESB in Campinas, São Paulo state (on 14/10/96).

[180] Interview at BASF's subsidiary, as stated in Note 89.

because of the environmental consequences of manufacturing and applying paints containing metal substances. BASF's manager[181] claimed that the units would be substituted gradually until the Group terminated with the current operations worldwide (Choucri, 1993, stressed the creation of new markets for environmentally sensitive products).

These market-oriented explanations for new investments and technologies at BASF's subsidiary are relevant evidence of the former lack of environmental concern in Brazil. More specifically, BASF was never faced with "green pressure" from customers; a finding contrary to expectations (and/or wishful thinking from environmentalists, advertising and media professionals) of consumers' environmental awareness in Brazil (Wong et al., 1995, has found similar evidence in the UK).

Overall, in the Brazilian context S&E concern will not affect the buying decisions of industrial customers. These decisions are based on 'price, delivery time and more recently quality'. In sum, BASF's subsidiary has only a small percentage (7% of 1995 turnover) of exports to other South American countries; likewise it was never faced with S&E pressures from these customers.

However, there is some evolution regarding SHE issues within the chemical segment because clients are now requesting product sample and safety information (on environmental risk, correct usage and final discharge). The number of requests is so high that BASF has developed a data bank to answer potential clients. Apart from increasing S&E awareness from clients, the use of information technology is a new trend in managing customers' demands in the chemical industry. Consequently, the tool needed to deal with supply and demand cycles, new competitors, restructuring, more sophisticated customers and globalisation is not chemistry but information technology[182]. Considering that chemical companies 'cannot turn manufacturing plants off and on in response to customer orders', the use of information systems does help them to manage what they produce for different customers.

[181] Ibid.
[182] Financial Times, 25 September 1997, p. 3.

4.4 - Conclusions

The comparative analysis[183] based on the chemical sector may be summarized as follows. The RC is clearly an initiative aiming to harmonize the environmental approach of the chemical industry within national borders. The fact that it has been adopted (and sponsored) by chemical associations in many countries is evidence of their major concern to respond to external pressures. Specifically due to its international and rhetorical commitment, the RC is a key guideline (representing the attempts at self-regulation by the industry) to be investigated. As such it was used in the investigation of the implementation of corporate environmental policies in selected chemical cases. The main benefit of such a methodological decision is that the parameters of good environmental performance were set by the industry, not by the researcher. Therefore, it may increase the validity of the data presented since it draws conclusions from the cases' evidence in face of a parameter accepted by chemical companies.

At this point the similarity between the three cases - Zeneca, DuPont and BASF has emerged. It was confirmed that the major contribution from the RC programme (during the period 1992-96) has been the improvement of company-community relationships. Besides this, there is also the introduction of a 'systemic management approach' (which should be further developed). It has changed the companies' organizational structure aiming at the incorporation of EH&S issues (e.g., the creation of committees and/or work groups to implement each code of practice at the operational level).

The RC programme is, undoubtedly, a recent driving force in Brazil; it has already harmonized the rhetorical commitment of TNCs' subsidiaries. However, this does not mean that formalization of common practices has been achieved. In Brazil, companies have the autonomy to implement it according to their capabilities, up to a deadline defined by ABIQUIM. Any cross sectional analysis could mislead such an aspect of the RC progress in Brazil. Therefore, it is interesting to be able to compare

[183] The methodological approach followed for data analysis started with the elaboration of individual cases studies. This task included the organization of data by distinct sources and analysis within cases. The next step in the data analysis was the determination of the most relevant categories of data (that is, organization of the data by issues). Finally, the data categories across cases was compared, based on the similarities and differences between them (Miles and Huberman, 1994).

its evolution since it was launched in 1992 (Guedes, 1993). In brief, the RC programme has produced some common knowledge of what external audiences are expecting from chemical companies. The difficulties will emerge as a consequence of the need to translate the RC codes into organization language. Concerning this aspect it is interesting to note that DuPont's case is an exception, for the peculiar reason that the company has directly influenced the RC's adoption by ABIQUIM.

More specifically, two cases (DuPont and BASF) have strongly suggested that safety is a major concern for chemical companies. At the same time an increasing awareness of environmental issues has accompanied safety as the most relevant issue. Additionally, an environmental issue common to all cases is hazardous wastes, of which the most relevant points are: (a) lack of adequate treatment and disposal in the 80s (resulting in contamination at Zeneca), and (b) the current availability of incineration in Brazil (such as in BASF).

It is important to note other similarities across cases, specifically considering the environmental impacts generated by chemical industries. For example, it is quite evident that all subsidiaries are concentrated in 'end-of-the-pipe' measures to control industrial pollution. More specifically, Zeneca has a clean up programme to recover soil and ground water contamination. BASF incinerates hazardous wastes that have been stored for a long time. Finally, DuPont is reducing the generation of by-products in the operational process. In such a context, environmental incorporation is regarded as cost-intensive in all selected cases.

However, there was evidence of investments in technological and managerial skills to minimise environmental impacts in the Brazilian subsidiaries. The environmental investments are concentrated in current operations (because physical capital is immobile, as indicated by Leonard, 1988). Nevertheless, the assumption that technological improvements will solve environmental problems faster (Cairncross, 1995) is partially refuted in the case of Brazilian subsidiaries. This happens because investment and/or access to corporate technology are limited by the subsidiary revenue. The exception for large technological investments (e.g., Zeneca's clean up programme and BASF's incinerator) is the legal requirement of adequate treatment of wastes.

Consequently, the empirical findings suggest that the evaluation of TNCs' environmental performance must be site-specific, demanding that industry-based explanations are transcended. Warhurst (1994) has argued that environmental management is site-specific. Accordingly, investigation at Brazilian subsidiaries revealed that the type of process and product determine the approach to be followed. Besides this, in a continental country such as Brazil with decentralized environmental agencies, there is always the possibility of uneven pressure from the local community and/or authorities. Finally, the environmental performance of remote sites will also depend on the availability of qualified services (e.g. waste management, incinerator, etc.).

It has been indicated[184] that the local context is a relevant factor in explaining the environmental management of companies in Brazil. Especially relevant is the geographical location of the company and the nature of its relationship with the community. For example, Ferreira (in Ferreira and Viola, 1996) suggests that the recent democratic process in Brazil has resulted in innovative environmental initiatives by municipalities.

Moreover, the site location will directly influence the further implementation of corporate requirements requiring new investments. This latter argument is based on a successful experience in the Northeast of Brazil at the petrochemical complex of Camaçari (Bahia state). Zulauf (1994, p. 77) has indicated that this complex has nearly collapsed, due to lack of environmental control from the authorities and lack of concern from the companies, with serious health and environmental problems.

However, these companies are now more advanced in environmental issues than those located in the São Paulo and Rio Grande do Sul petrochemical complexes. The main reason for such performance is the existence of a special commission encouraging companies towards environmental self-assessment. Finally, there is an environmental management firm[185] exclusively responsible for all effluents' treatment and wastes incineration within the pole.

Needless to say that there are differences among the cases regarding the industry-related elements. Some aspects (such as technology and competitiveness)

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[184] Interview at ABIQUIM, as stated in Note 126.

[185] Cetrel is a privatized waste management company, which is now owned by the 52 companies (70%) in the complex and the state government (30%), with a revenue of US$ 30 million per year (Gazeta Mercantil, 17 November 1997, p. 3).

could be explained by the distinct positions of the selected companies in the world chemical industry, mainly by the corporate availability of S&E technology to DuPont and BASF. Consequently, subsidiary access to technical and managerial capabilities could explain the differences in their competitiveness and market-orientation in EH&S issues within the Brazilian context. At this point the differences become quite clear because each company (with its particular organizational characteristics and resources) has got distinct styles of environmental management (confirming that firms differ based on discretion, as suggested by Nelson, 1991).

Most important are the reported difficulties in dealing with some of the representation (i.e., meaning of environmental discourse, as discussed by Dryzek, 1997) of the environmental initiatives within the industry. It was suggested that European companies present a kind of 'rejection of green marketing and image concern'. More specifically, BASF's case has clearly confirmed such an assumption, becoming an exception to the dominant rhetorical commitment of the association. Zeneca lacks both the human resources to fully implement the corporate principles and special commitment to 'green marketing and image-related issues'. In contrast, DuPont has been investing time and resources in building an image of world leadership in SHE issues[186], which confirms Sorsa's (1994) and, Porter and van der Linde's (1995a) arguments that investment in environmental protection can create comparative advantage in sensitive sectors.

One proposition was introduced in the framework of analysis (presented in section 2.5 of this thesis) to address specifically the potential industry-related explanations (based on Porter, 1980; 1991; Beliveau et al., 1994; Gleckman, 1995; Pearson, 1985, among others), as follows: ***If industry associations have environmental guidelines, TNCs' subsidiaries have stricter implementation of corporate environmental policies.*** The findings (presented throughout this chapter) from the three case studies confirmed this proposition. However, the cases presented variances regarding the influence from the industry association on their environmental management.

It is possible to argue that high environmental impacts caused by chemical companies worldwide have resulted in industrial commitment. Thus their 'collective

[186] This is made explicit in DuPont's report (1992, p. 4) and Willums and Goluke (1992). For a critical view of such corporate positioning, see the Editorial, The Ecologist, Vol. 21, no. 3, May/June 1991.

action' seems to be based on a shared vulnerability regarding public opinion. The RC programme was launched with the specific purpose of responding to public concern about risks related to chemical operations (ICCA, 1996). Accordingly, there is evidence that Zeneca, DuPont and BASF are committed to RC initiative in Brazil with a similar purpose. There is, however, the recognition by major competitors and by the association that DuPont is the leading company in SHE issues in Brazil. Such leadership concerning the implementation of the RC practices worldwide (and specifically in the US) is mentioned in the corporate environmental report (DuPont, 1995b). However, there is some indication that DuPont has imported (slightly different from a process of mimicking behaviour suggested by Beliveau et al., 1993) its standards as the legitimate pattern of behaviour in the industry.

Finally, the discrepancies amongst the categories of data in the cases may be understood as inevitable consequences of the qualitative approach followed. The lack of evidence in one case despite evidence in another is a secondary consequence of the use of case studies (that is, some lack of control over the data gathered). In fact, the large amount of data gathered in each case was by no means a guarantee that all categories would be uniformly represented. The same methodological explanations (here introduced) are suitable for the next chapter which analyses pharmaceutical cases. Any distinctive aspect of the pharmaceutical industry (in methodological terms) will be duly addressed.

Chapter V - Case studies analysis - pharmaceutical sector

This chapter will discuss (employing the same industry life-cycle approach presented in the previous chapter) industry-related explanations for the implementation of corporate environmental policies in TNCs' subsidiaries. The chapter focuses on the pharmaceutical industry (its selection was justified in section 1.2 of this thesis). Consequently, it addresses the findings of three cases - Glaxo, Eli Lilly and Hoechst Marion Roussel - in this industrial sector. The chapter is organized into the following sections: first a profile of the pharmaceutical industry (globally and in Brazil), second a profile of the selected TNCs (including their Brazilian subsidiaries), and finally, industry-related explanations based on the data from the case studies. As mentioned in the previous chapter, the findings presented here are specifically of a regulatory and economic nature. Thus, it complements the chapter three (on the host country context) leaving other explanations to be discussed in chapter six.

In brief, it is expected that the variance from one industrial sector to another will illuminate the industry-specific explanations. Consequently, it is assumed that the minor environmental impacts (specifically when compared with the high impacts from the chemical industry) caused by pharmaceutical companies should result in lax environmental incorporation. More specifically, the selected cases should present weak corporate environmental policies and poor environmental performances. The existence of contrary evidence will indicate other (than the causal relation set by the research proposition, which was introduced in section 2.5) explanations for environmental practices in a sector with minor environmental impacts.

5.1 - Profile of the industry

This section will briefly present the main aspects and trends that characterize the world pharmaceutical industry. Additionally, it will introduce the main characteristics of the pharmaceutical industry in the Brazilian context. Similar to chapter four, the findings from the case studies in the pharmaceutical industry will be analysed in the light of these industrial characteristics.

5.1.1 - World pharmaceutical industry

In the 1930s the pharmaceutical industry was a commodity business. By the end of the 1950s, the pharmaceutical industry had transformed itself into a research- and advertising-intensive business which concentrated on specialties. According to Gereffi (1983, p. 169) "the vertically integrated company that combined drug discovery, production, and marketing functions in a single corporate network came to dominate the industry".

The structure of the pharmaceutical industry is similar to a pyramid (differing greatly from the structure of the chemical industry). At the top, there are twenty to twenty five big companies with large R&D operations. In the middle there are several hundred medium-sized firms exploiting their own research and other companies' products under licence. At the base there are thousands of small companies working in specialised fields or involved in biotechnology (EC, 1997, p. 7-39).

Consequently, the pharmaceutical industry is marked by strong inter-firm competition, in which no single company has a dominant position. The top ten pharmaceutical producers "represent somewhat over 20% of the world pharmaceutical market" (EC, 1997, p. 7-40). This industrial sector is also characterized by a high ratio of R&D expenditures to gross output (i.e., high-technology industry). Accordingly, this industry is more technologically-intensive (such as communications and semiconductors, computers and office machinery, and electrical machinery industries) than the chemical industry (OECD, 1992, p. 111).

In addition to this, Gereffi (1983, p. 173) states that pharmaceutical TNCs are diversified, with varying interests in other industries (e.g., veterinary products, vitamins and fine chemicals, nutritional products, agrochemicals, hospital and laboratory supplies and equipment), though strictly speaking pharmaceutical refers to 'ethical drugs' that usually require medical prescription.

In brief, the market for pharmaceuticals is customarily divided into two categories determined by the way in which the products are purchased. The first category is that of prescription drugs, that is, a class of products created by government regulations to be sold by medical prescription. The prices in this category

are largely regulated, therefore companies' competitiveness depends on the improvement of products as well as therapeutic innovation. The second category is that of non-prescription pharmaceuticals, which can be either purchased directly by the patient or prescribed by a physician. This category is commonly defined as 'over-the-counter' (OTC); fierce price competition is observed because OTC products are generally not regulated. Additionally, pharmaceutical products specifically for human use are divided in terms of brand and generic manufacturing.

This industry faces specific problems related to 'regime appropriability' (Teece, 1988, p. 48) that is aspects of the commercial environment, excluding firm and market structure, that govern an innovators' ability to capture the rents associated with innovation. The most important dimensions of such a regime, argues Teece (1988, p. 49) are the nature of the technology and the efficacy of legal mechanisms of protection such as patents, copyrights and trade secrecy. Likewise, Mintzberg and Quinn (1991, p. 383) have stressed that one factor affecting the profitability of 'ethical drugs' is the ability to manage the institutional environments, and the control over distribution, patent and copyright protection.

In practical terms, the pharmaceutical product protected by patent is marketed only by the original brand manufacturer. When the product loses its patent protection, competitors may market essentially identical products under a generic name, which are generally less expensive than their brand name analogues (EC, 1997, p. 7-24). For example, the UK has one of Europe's highest rates of generic prescribing, in which pharmacies dispense the unbranded version of a patent-expired drug rather than the original brand[1].

It is well-known that pharmaceutical research for product development represents a long and costly process, which requires on average from ten to twelve years before a substance can be finally approved and marketed as a product. Considering that the average total cost has far exceeded 250 million ECU, innovation is left mostly to bigger firms (EC, 1997, p. 7-39). Therefore, pharmaceutical companies must sell the new product to as many markets as possible under the patent protection, to recover their investments.

[1] Financial Times 24 April 1997, p. 2.

In Europe R&D is mostly entirely financed by the industry itself, which has effects on the proportion of active substances worldwide developed by European companies. For example, from 1975 to 1979, Europe developed 61 percent of the world's new medicines, declining to 48 percent between 1990-94. In the same period the US increased their share from 26 to 31 percent and Japan from 11 to 25 percent (EC, 1997, p. 7-39). In 1990, the R&D/turnover ratio for the 500 largest European pharmaceutical companies was 10.8 percent compared to Japan's ratio of 10.1 percent and the US's ratio of 9.5 percent (Ibid.).

Additionally, one of the fastest growing segments within the whole industry is applied biotechnology and R&D expertise in this area is concentrated in the US. However, chemical process still represents the majority of pharmaceutical manufacturing. More specifically, "bio-pharmaceuticals have been estimated to command more than 4% of world pharmaceutical products' sales" (EC, 1997, p. 7-24).

As a result, the acquisition and/or merger with biotechnology firms has been a popular tactic within the pharmaceutical industry[2]. The big companies are searching for new R&D ideas (as the patents on their existing drugs expire[3]) and the biotechnology companies need financial resources. Besides this, the pharmaceutical companies discovered that it is worth purchasing from small outside suppliers because their laboratories tend to suffer from internal conflict as they become bigger. As is stressed by Teece (1988, p. 57) in-house arrangements may facilitate control, but at the expense of being "costly in terms of managerial and financial resources".

In Europe this trend has been most striking in Germany, "where biotech companies had faced political neglect and public opposition on ethical and environmental grounds"[4]. In Britain - one of Europe's most important centres for

[2] According to Simpson et al. (1996, p. 166) "natural organisms' genetic codes contain the 'recipes' for chemical compounds of potential value in pharmaceutical products". However, the Biodiversity Convention that resulted from UNCED-1992 (already signed by the US) "guarantees states sovereignty over their generic resources and forbids their appropriation without prior informed consent". Therefore, organizations are now entering into commercial agreement with foreign pharmaceutical researchers, and the markets for transactions in indigenous genetic resources have emerged (Ibid., p. 167).

[3] The access to combinatory chemistry (to find new drugs) is the reason for recent acquisitions. For example, Glaxo's purchase of Affymax for US$ 539 million; Eli Lilly's acquisition of Sphinx Pharmaceuticals in North Carolina for US$ 75 million; and Marion Merrell Dow's (prior the merger with Hoechst) takeover of Selectide for US$ 58 million, in Arizona (Economist, 13 May 1995).

[4] Financial Times, 15 May 1997, p. 21.

R&D[5] - there is a rapid growth of biotechnology companies, though it has lost half of the large pharmaceuticals companies in the past three years to mergers and takeovers[6].

The influence of the regulatory climate is a relevant factor for the pharmaceutical industry (Turner and Hodges, 1992, p. 184). The regulatory agencies of Europe, the US and Japan have made an effort to co-ordinate standards for the approval of new drugs. Meanwhile companies will need large numbers of experiments for the drugs' approval in these markets, which is a key element of the industry's cost-structure (EC, 1997, p. 7-41).

The nature of pharmaceutical products (as a determinant of human health) has forced the industry to operate in a highly politicized environment, subject to governmental scrutiny and control. The governmental influence varies from one country to another, across many issues. It may include setting high standards for drug purity, safety and efficiency, or the location of pharmaceutical production within national frontiers (Ballance et al., 1992). In developing countries there are also economic considerations such as interest in increasing exports, minimizing imports, and improving employment prospects (Gereffi, 1983, p. 167).

In spite of its apparent risks, the pharmaceutical industry "is one of the most lucrative in the world, usually ranking first or second among all industries in profitability since the mid-1950s" (Gereffi, 1983, p. 190). Likewise, the EC (1997, p. 49) states that "firms producing pharmaceutical goods overwhelmingly dominate the ranking of the world's most profitable firms as they held in 1994 eight of the first ten positions in terms of net income to turnover ratio" (as illustrated in table 5.1 below). A lot of the success of drug firms derives from their ability to control entry (by patents and trademarked brand names), substantial seller concentration in therapeutic markets, the captive nature of the consumer, and the price insensitivity of doctors (Gereffi, 1983, pp. 191-192).

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[5] Such attractiveness is supported by: (a) the lower cost of employing research scientists, (b) the 'Pharmaceutical Price Regulation Scheme' governing the drugs prices since the 1950s, (c) the capital market encouraging the growth of biotechnology companies, and (d) the location in London of the 'European Medicines Evaluation Agency' since February 1995 (Financial Times, 5 December 1995, p. 19).

[6] Financial Times 24 April 1997, p. 2.

Table 5.1 - Top worldwide pharmaceutical companies per prescription sales (for human use, 1994, million ECU)

Companies	Country	Total sales
Glaxo Wellcome	UK	10,276
Merck	USA	7,916
Hoechst Marion Roussel	Germany	7,862
American Home	USA	6,242
Bristol-Myers Squibb	USA	5,860
Roche	Switzerland	5,247
Pfizer	USA	4,885
SmithKline Beecham	UK	4,651
Pharmacia & Upjohn	Sweden-USA	4,459
Eli Lilly	USA	4,412
Johnson & Johnson	USA	4,336
Takeda (1)	Japan	4,924
Sandoz(2)	Switzerland	4,070
Ciba(2)	Switzerland	3,753
Rhone-Poulenc Rorer	France	3,736

Source: Adapted from EC, 1997, p. 7-37. Notes: (1) includes OTC sales; (2) Ciba and Sandoz merged on March 1996 creating Novartis.

In the period from 1988 to 1994, pharmaceutical firms had faster growth in turnover and higher profitability than the rest of the chemical firms, because of the rising demand for health care products (EC, 1997, p. 51). Demand in the pharmaceutical industry (differing from the chemical industry) is little affected by cyclical changes in the larger economy. Rather, it is dominated by structural developments such as an ageing population, higher standards of living and technological progress in medical science (Ibid., p. 7-42).

The European Community has a relative dominance in human pharmaceutical production, consumption and exports relative to the US and Japan. Accordingly, Europe's share of nominal pharmaceutical production increased from 40 to 43 percent from 1985 to 1994. In the same period, the American share declined from 38 to 31 percent, though the American nominal production increased by more than 50 percent in absolute terms. Consequently, the American market share was lost to Japan, since its production more than doubled (EC, 1997, p. 7-36). There is a similar pattern in nominal consumption from 1985 to 1994, in which the European market share increased from 37 to 40 percent, at the same time that the American share declined

from 39 to 31 percent and the Japanese share increased from 24 to 29 percent (Ibid., p. 7-37).

However, the most important movement has been the growing internationalization of markets in which the pharmaceutical exports from the Triad have more than doubled between 1985-1994. Japanese exports nearly tripled in absolute terms showing that the Japanese industry has altered its traditional focus on the domestic market. The governmental budgetary cutbacks in this area made this industry look for business alternatives abroad (through acquisitions in the US and Europe and new production units in Asia). Altogether, the main challenges for the pharmaceutical industry are, as follows: (a) enhanced competition at world level due to the emergence of new technology, (b) downward pressure on prices and profits from governments trying to reduce their health spending, (c) rising R&D costs, and (d) increased market harmonisation (Ibid., p. 7-40).

Consequently, the world's largest pharmaceutical companies may follow two strategies in response to these challenges. The first strategy involves the acquisition of other drug companies to achieve market share in complementary segments (e.g., Glaxo's purchase of Wellcome and Roche's acquisition of Syntex). The second strategy is the purchase of drug distributorships (such as accomplished by Merck, SmithKline Beecham and Eli Lilly).

This distinct consolidation process has changed the nature of competition. It is said that during 1994 and 1995 there have been around US$ 70 billion worth of mergers and acquisitions in an industry with a yearly turnover of just US$ 200 billion[7]. This novelty took place in both European and American markets, in which the industry's giants have done most of the takeovers (see table 5.2 below). Finally, the most important mergers were between similar-sized companies, such as the American companies Pharmacia and Upjohn (in 1995), and the Swiss companies Sandoz and Ciba (in 1996).

[7] Economist, 26 August 1995, and Financial Times, 25 March 1996, p. II.

Table 5.2 - Major acquisitions in the world pharmaceutical industry (1994-1995)

Purchaser	Target	Cost
Glaxo	Wellcome	$14.8 billion
American Home Products	Cyanamid	$ 9.7 billion
Hoechst	Marion Merrell Roussel	$ 7.1 billion
Roche	Syntex	$ 5.3 billion
Rhône-Poulenc Rorer	Fisons	$ 2.7 billion
BASF	Boots Pharmaceuticals	$ 1.3 billion

Source: Adapted from the Financial Times, 25 March 1996, p. II.

In spite of that, there was one group of firms - the big chemical companies that own large drug assets[8] - that were left behind by dedicated drug firms, such as Merck and Glaxo, during the 80s. More recently, drug firms have moved into the health care and biotechnology businesses; other conglomerates have separated their chemicals from pharmaceuticals business[9]. Otherwise, pharmaceutical businesses have been acquired by large chemical companies (e.g. Bayer's acquisition of SmithKline Beecham's OTC business in the US in 1994; Hoechst bought Marion Merrell Dow in 1995; and BASF's purchase of Boots Pharmaceuticals in 1995)[10]. Moreover, the largest drugs companies in Germany are also its top chemicals companies, which are Bayer, Hoechst and BASF[11].

In conclusion there are two distinct strategies taking place: (a) the Anglo-Saxon strategy of concentrating on fewer core businesses, and (b) the continental European companies decision to retain diverse interests (such as Rhone-Poulenc, BASF, Hoechst and Bayer). However, Sandoz had demerged its chemical business - Clariant - prior to merging with Ciba (in 1996) following the Anglo-Saxon strategy. The new company - Novartis - became the world's second biggest pharmaceutical in sales and the world's biggest company in agrochemicals. The table 5.3 shows the market share of the world largest companies.

[8] Economist, 28 January 1995.
[9] For example, ICI demerged its bioscience business creating Zeneca; Dow Chemical sold its pharmaceutical business - Marion Merrell Dow; and Eastman Kodak sold Sterling Health to SmithKline Beecham (Financial Times, 8 March 1996, p. 17).
[10] Financial Times, 25 March 1996, p. II.
[11] Financial Times, 20 January 1995, p. 39.

Table 5.3 - Worldwide pharmaceutical sales by market share

1996

Company	*Market share (%)*
Glaxo Wellcome	**4.7**
Merck	3.5
Hoechst Marion Roussel	**3.5**
Bristol-Myers Squibb	3.1
American Home Products	3.0
Pfizer	2.9
Johnson & Johnson	2.9
Roche	2.6
SmithKline Beecham	2.5
Ciba*	2.5
TOP 10	31.2
Rhône-Poulenc	2.2
Bayer	2.1
Eli Lilly	**2.0**
Sandoz*	1.9
Schering-Plough	1.9
Astra	1.8
Abbott	1.8
Pharmacia & Upjohn	1.7
Sankyo	1.6
Takeda	1.6
TOP 20	49.8
Total**	$ 205 billion

Source: Financial Times, 25 March 1996, p. 1.
Notes: * Ciba and Sandoz merged with a market share of approximately 4.5%,
** worldwide sales of prescription drugs.

More recently, the drug sales in ten of the world's biggest markets rose by 7 percent in the first-quarter of 1997, compared with the same period in 1996. Nevertheless, the Japanese pharmaceutical industry will face tough operational conditions as a consequence of health care cost-cutting. Additionally, health care reforms will reduce purchases in Europe (mainly in France and Germany)[12]. This sector was once provider-oriented, but is becoming increasingly payer and consumer driven[13]. Consequently, the profitability levels of pharmaceutical companies in Europe started to be affected between 1993-94 by cost containment measures adopted by European governments to control health care costs (EC, 1997, p. 61).

[12] Financial Times, 9 June 1997, p. 4.
[13] Financial Times, 24 April 1997, p. 3.

The larger companies, such as Glaxo, Hoechst, Roche and Novartis, can cope with the changes in the health care industry (in both the US and Europe), but many other will face difficulties[14] (e.g., German, Italian, French and Japanese medium sized companies). In the American market, increased competition made manufacturers discount the prices of the drugs they sold to hospitals and managed-care organizations. Besides this, American drug firms have increased profits by controlling costs[15].

European companies, such as Glaxo Wellcome and Novartis, achieved strong positions in the US and managed to offset the effects of weak European demand[16]. The strategy was to penetrate the US market by the increasing use of direct-to-consumer advertising, which is permitted in the US but not in Europe. Despite the costs of such a form of advertising, Glaxo credits the success of one of its "blockbuster" drugs to direct-to-consumer advertising. These campaigns, via television or newspapers, are highly effective in the US because they inform prospective patients of the availability of treatment for some diseases (namely, patients who usually request doctors to prescribe the drug).

Finally, there is the understanding among European and American companies that self-medication is the fastest-growing segment of the pharmaceutical industry. Therefore, some European companies are "producing generic versions of their own branded products in an effort to retard the decrease in revenue" that will occur through the loss of patent protection (EC, 1997, p. 7-40).

According to Gereffi (1983, p. 189), "these structural aspects of the industry are powerful forces in conditioning, shaping, and constraining the actions of firms, governments, and social groups, but ultimately they do not fully determine or explain behavior". In order to understand the impact of the pharmaceutical industry and the response it has generated, it is necessary to look at the interaction of TNCs with the host countries. This task will be accomplished in the next section by addressing the pharmaceutical industry in Brazil.

[14] Economist, 26 August 1995.
[15] Economist, 30 September 1995.
[16] Wall Street Journal, 8 August 1997, p. 9A.

5.1.2 - Brazilian pharmaceutical industry

To clarify, the world pharmaceutical industry has a relatively small number of large companies, which are faced with governmental demands. In the specific case of a developing country this relationship may be conflictive, because of the dependence on foreign companies for the supply of reasonably priced drugs, so that the benefits of pharmaceuticals could reach the population (Gereffi, 1983, p. 167-168). Consequently, the motives for intervention through price control are similar in industrialized and developing countries. However, the fact that TNCs dominate the markets in developing countries so completely, has resulted in unique problems (Ballance et al., 1992, p. 164).

Additionally, there are other issues for which pharmaceutical TNCs have been continuously criticized such as the appropriateness of products and technologies, and marketing practices. Moreover, artificial manipulation of transfer pricing[17] is more common in the pharmaceutical sector than in any other industry as a means of avoiding taxation. There is an excessive gap between 'transfer and market prices', according to Gereffi (1983, p. 195), which creates special expectations from public authorities.

In the 1950s the outward investments of pharmaceutical TNCs was directed at Western Europe, the Commonwealth countries, and the relatively advanced nations in Latin America (such as Mexico, Brazil and Argentina) (Gereffi, 1983, p. 179). Consequently, there was a significant shift in the pharmaceutical industry, in which local production - based on active ingredients imported - was beginning to substitute the direct importation of finished pharmaceutical products. However, most of the production of active ingredients has remained concentrated in some developed countries (such as the US, Japan and Germany).

The developing countries continued to depend on imports (mainly from the US, the UK, Switzerland, France, and Germany) for the majority of their drugs needs (Ibid., p. 181). These imports consist of finished drugs, bulk drugs in final dosage form for repackaging, chemicals for dosage formulation, and chemical intermediates that

[17] Transfer prices refer to intra-firm sales between TNCs' affiliates worldwide which may be manipulated through over-pricing or under-pricing of pharmaceuticals intermediates. In the first case, the profits of the selling subsidiaries are increased; in the second, additional funds from seller to buyer are transferred (Ballance et al., 1992, p. 164).

require further processing (Ibid., p. 182). Accordingly, Brazil is among the developing countries able to manufacture a broad range of active ingredients from intermediate and raw materials, and also able to accomplish local R&D on new and adapted pharmaceutical products and processes.

However, the domestic industry is oligopolistic and largely controlled by TNCs' subsidiaries, including local firms operating with technology licensed from international companies (Ibid., p. 188). More specifically, foreign firms account for 85 percent of the private market of drugs, and 40 percent of governmental purchasing. The rest of the market is shared equally by state laboratories and domestic firms (UNCTC, 1984, p. 91), in which government purchasing policy has been used to encourage local industry.

The amount of FDI substantially increased from 1957 to 1977; when the Brazilian pharmaceutical industry went through a major period of denationalization. Indeed, thirty-four of the largest domestic firms were acquired by TNCs (Evans, 1979). The government attempted to increase competitiveness by abolishing patent protection for pharmaceuticals in 1969. A decade after this measure the ten largest national drug companies had increased their market-share by almost 10 percent. However, in 1978 and 1979 more national firms were acquired by TNCs. The evidence denied the argument that the absence of patents would reduce attractiveness to foreign investors; FDI in the Brazilian pharmaceutical sector rose from US$ 113 to US$ 646 million in the period 1971-79.

In 1996 Brazil passed a strong patent bill[18] and therefore, it has attracted 'promises' of US$ 1.2 billion in pharmaceutical investment[19] until the end of the century. The assumption that patent protection will attract more foreign investment is a bargain instrument utilized by TNCs (and their home governments) over developing countries. As a result of an agreement at the WTO[20], developing countries have until

[18] Brazil has been pressurized since 1989 by GATT's Uruguay round of negotiations (which include the discussion of trade-related aspects of intellectual property rights), and the American threat of trade retaliations (based on Section 301 of the trade law) (Conjuntura Econômica, March 1996, pp. 28-29).
[19] Wall Street Journal, 13 December 1996, p. 1.
[20] Since the completion of the GATT negotiations in December 1993, which also created the WTO, country-members are supposed to pass and enforce laws protecting copyrights, patents and trademarks under threat of legal action at the WTO (Economist, 17 February 1996). Moreover, the agreement on trade-related investments measures (TRIMs) obligates members of the WTO to ban rules such as those forcing foreign companies to use local inputs. However it does not grant foreign companies the 'national treatment', that is, the right to be treated as local firms (Economist, 10 June 1995). Surprisingly, Brazil

the year 2000 to enact and enforce intellectual-property protection, despite American threats to impose trade sanctions for copyright piracy[21]. Finally, there is no guarantee that it will work for other developing countries, though it has worked in Brazil[22].

According to the BNDES (1988, p. 84) the Brazilian pharmaceutical industry has around 80 foreign companies of a total of 600 companies (including state-owned laboratories). However, the TNCs' subsidiaries have approximately 80 percent of the total pharmaceutical market (including animal and human medicines). The market share of foreign subsidiaries in Brazil has always been high, ranging from 78 percent to 88 percent in the late 70s. The table 5.4 shows the current participation of foreign companies as 73 percent of the industry.

Table 5.4 - Brazilian pharmaceutical industry - participation per origin of capital

Industrial sectors	*Domestic*	*%*	*Foreign*	*%*	*State*	*%*
	1995	1996	1995	1996	1995	1996
Pharmaceutical	37	**27**	63	**73**	-	-

Source: Exame, 'Melhores e Maiores', July 1997, p. 11. Note: * share based on total sales from the 20 biggest companies.

Overall, the position of domestic firms was weakened by the fierce competition from foreign subsidiaries which maintain ownership close to 100 percent equity (UNCTC, 1984, p. 87). The competitiveness of TNCs' subsidiaries is based on: (a) their considerable financial and technical resources, (b) their product differentiation and heavy promotion expenditures, which ensured their domination of the market despite the lack of patents protection, (c) their transfer pricing policy, which is commonly used to over-invoice the import of raw materials and intermediates, and finally (d) the dependence of local firms on imported supplies of raw materials and intermediates (UNCTC, 1984, p. 88).

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has eliminated the distinction between foreign and national firms during the Constitutional Review of 1994.

[21] Economist, 18 May 1996.

[22] There is evidence of new investments in Brazil. For example, Knoll - BASF pharmaceutical division - will invest US$ 30 million to double its production and marketing new products (Gazeta Mercantil, 27 November 1996, p. C-1). Another example is Glaxo Wellcome's investment of US$ 111.3 million in a new site in Rio (Informativo CRQIII, December/January 1996, pp. 6-8).

More specifically, product differentiation is used by large firms to assert and maintain their domination over particular markets. In Brazil it represents an average of 22 percent of total sales (including sales representatives, free samples, and medical literature[23]). An impressive amount (up to 32.8 percent) of the personnel employed by TNCs' subsidiaries is concerned with promotion and sales (UNCTC, 1984, p. 89). More recent investigation into the cost structure of the industry has indicated that production cost varies from 29 to 35 percent; and distribution and sales costs varies from 27 to 28 percent[24].

Additionally, TNCs are further concentrating their operations on specific categories, aiming to achieve and/or maintain leadership. More specifically, fourteen TNCs' subsidiaries represent 41 percent of total revenue in Brazil. There is only a Brazilian company - Aché - among the top 15 with a share of 4.72 percent. The remainder is shared by four hundred private and foreign laboratories[25] (see table 5.5 below).

[23] Ballance et al. (1992, p. 253) has indicated similar figures for the cost structure of pharmaceutical firms in Brazil, which are respectively 35% for manufacturing and 21% for marketing in 1984.
[24] Informativo CRQIII, December/January 1996, pp. 6-8.
[25] Ibid.

Table 5.5 - Top ten pharmaceutical companies in Brazil

1994*

Company	*Participation (%)*
Roche	4.75
Aché	4.72
Bristol Meyers	4.58
Biogalênica	3.88
Eli Lilly	**3.40**
Schering Plough	2.90
Boehringer de Angeli	2.85
Hoechst**	**2.67**
Merrell LePetit**	**2.56**
Sandoz	2.42
Rhodia Farma	2.34
Prodome	2.28
Wyeth	2.23
Abbott	2.17
Sanofi	2.10
Total (15 top companies)	45.84
Others (400 companies)+	54.16

Source: Informativo CRQIII, December/January 1996, p. 8.
Notes: * Data from ABIFARMA (total revenue in 1994 was US$ 6.5 billion),
** Hoechst and Merrell LePetit merged in 1995, becoming the largest company in Brazil - Hoechst Marion Roussel (approximately 5.23%),
+ Including Glaxo Wellcome.

Despite the potential attractiveness for FDI, the recent patent law has damaged the Brazilian industry even further. Therefore, a vast majority of domestic companies support the position of state laboratories against the new patent law. Their argument is that developed countries only passed patent laws for pharmaceuticals after they had already developed technology to manufacture the drugs needed.

The pharmaceutical TNCs' interest in emerging markets[26] in Asia and Latin America reflects the cost-containment that is reducing drug sales in previously attractive markets in Europe and North America. For example, Brazil is among the world's ten largest pharmaceutical markets with a total revenue of approximately US$ 6.5 billion in 1994[27]. Finally, the top twenty companies account for approximately US$ 4.9 billion (or 75%) of the industry's total revenue. The table 5.6 shows that six

[26] Wall Street Journal, 31 January 1997 p. 11A.
[27] Informativo CRQIII, December/January 1996, pp. 6-8.

Brazilian companies are among the largest, however most of them manufacture generic product and/or products licensed from foreign companies.

Table 5.6 - Ranking* of top twenty companies in the Brazilian pharmaceutical industry - 1996**

Company	Sales (US$ million)	Number of employees	Origin of capital
1 - Hoechst Marion Roussel	554.0	1,388	German
2 - Aché	525.5	2,246	Brazilian
3 - Roche	469.7	1,490	Swiss
4 - Bristol-Myers Squibb	425.0	1,467	American
5 - Boehringer de Angeli	331.6	1,067	German
6 - Schering-Plough+	299.8	1,135	Brazilian
7 - MSD	296.2	n.a.	American
8 - Eli Lilly	232.7	931	American
9 - Sanofi	231.7	n.a.	French
10- Glaxo Wellcome	194.3	744	English
11- Merck	185.7	n.a.	Swiss
12- Rhodia Farma	180.8	780	French
13- Abbott	170.7	n.a.	American
14- Prodome	150.2	581	Brazilian
15- Tortuga	135.0	657	Brazilian
16- BD	119.0	1,521	American
17- Lab. Americano	103.7	n.a.	American
18- Searle+	97.6	538	Brazilian
19- B. Braun	85.8	n.a.	German
20- União Farmacêutica	84.7	598	Brazilian

Source: Adapted from Exame, 'Melhores e Maiores', July 1997, p. 158.
Notes: * classified by gross revenue, ** includes pharmaceuticals for human and animal health, + licensed products, n.a. = not available.

In 1981, Brazil initiated a number of measures designed to tighten up drug regulatory procedure. More specifically, an 'Interministerial Group on the Pharmaceutical Industry' was set up with the aim of developing the national pharmaceutical industry, by taking active measures to reduce the import of drugs (UNCTC, 1984, pp. 91-92). Nevertheless, the current situation is said to be far from satisfactory, because the inspections from the Ministry of Health concentrate on the products manufactured within the country. Thus imported products are not inspected

(though legally they should be); this constitutes discrimination against local production[28].

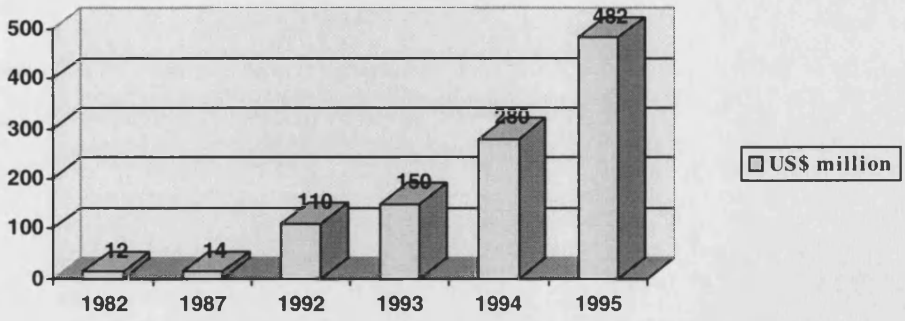
More than a decade later, is possible to say that these measures have failed. Besides this, the import of active principles and intermediates is still around 80 percent of total national needs. Current governmental interference in the pharmaceutical industry is restricted to a programme from the Ministry of Health, which includes a list of 138 drugs and the management of 17 laboratories maintained by federal and state governments in Brazil. The state-owned laboratories produce mainly generic drugs for the national health system.

Regarding the local production of raw materials (though the data is scant), the industry is still heavily dependent on imports. More specifically, up to 80 percent of active principles are imported, and a large amount of intermediates[29]. Most relevant is the lack of technology at private and state laboratories for producing drugs for endemic diseases.

Imports had been subject to governmental control (through import licences). However, deregulation in early 90s brought some negative effects on the Brazilian trade balance. Additionally, domestic companies have been affected by competition from cheaper products imported from India and China. For example, the import of pharmaceuticals was approximately US$ 12 million in 1982, but in 1995 it reached around US$ 482 million (see figure 5.1 below). More relevant evidence comes from the net revenue, which has increased from $ 3.5 billion in 1990 to $ 6.5 billion in 1994. However, the volume of commercialized products remained the same for the period 1990-94 at approximately 1.8 billion units.

[28] Ibid.
[29] Ibid.

Figure 5.1 - Brazilian import of pharmaceuticals



Source: Informativo CRQIII, December/January 1996, p. 8.

In other words, economic liberalization in Brazil did not result in new investments in the pharmaceutical sector. In fact, the reduction in import tariffs has consolidated TNCs' leadership in this segment of the industry by increasing their import instead of producing them locally. In addition to this, TNCs' subsidiaries are restructuring their operations in Brazil and other Latin American countries, which has resulted in lower levels of local production[30].

As well as the above, the end of the price control regime in 1993 resulted in a high increase in pharmaceutical prices (400 percent on average, with some cases varying from 400 to 1,130 percent, based on 1990 prices[31]). Considering that these prices did not completely depreciate, there is evidence that a small number of producers had generated higher prices. Besides this, the profit margins of Brazilian subsidiaries are determined by the parent; the tariff reduction was therefore not deducted from the product price resulting in a larger profit margin.

Consequently, a recurrent issue is the need for a governmental policy to discourage imports, giving incentives to local technological development and production. One simple solution is the implementation of Decree 793 (from 1993). This law aims to motivate the marketing of generic pharmaceuticals instead of the current marketing of brand pharmaceuticals[32]. Moreover, it has the potential to decrease self-medication and drug prices (by reducing advertising and marketing

[30] Ibid.
[31] Ibid.
[32] Ibid.

expenditures[33]). However, its implementation depends on government action through preferential purchase and the use of generic medicines throughout the national health system.

In conclusion, is important to mention that there is no reference to environmental issues regarding pharmaceutical operations in the literature analysing this industry in the 80s and early 90s (such as Gereffi, 1983; UNCTC, 1984 and Ballance et at., 1992). This lack of evidence may be a consequence of low environmental impacts from pharmaceutical companies. Nevertheless, the empirical findings regarding the industry's environmental impacts will be addressed later in this chapter (in section 5.3.1). Meanwhile, it is necessary to provide an overview of the selected pharmaceutical companies, and this is the purpose of the following section.

5.2 - Profile of the companies

This section will provide a profile of the selected pharmaceutical companies, which includes an overview of the corporation - on a worldwide basis - and an overview of the Brazilian subsidiaries. In terms of the Brazilian context, it is relevant to say that the subsidiaries are not operating in all business areas of their corporations. According to Ballance et al. (1992) this is exactly one aspect that differentiates the pharmaceutical industry in industrialized countries (with diversified manufacturing and advanced research) from the same industry in developing countries (manufacturing specific products).

5.2.1 - Corporate overview

The first selected pharmaceutical company is Glaxo Wellcome, a British group focused on the discovery, development, manufacture and marketing of medicines (Glaxo, 1994). The company started with baby food in the early 1900s which were commercialized in Britain, India and South America. The company entered the

[33] As a consequence of the widespread use of self-medication by the population, physicians and pharmacies are equally important as targets for drugs promotion. It was estimated that between 50 and 75 percent of the drugs are commercialized without prescription in Brazil (UNCTC, 1984, p. 89).

pharmaceutical business in 1927 by introducing a vitamin D fortified formulation, and in the 30s it introduced vitamin-fortified milk[34]. During the World War II the company produced penicillin and anesthetics, but in the mid-1950s Glaxo diversified, acquiring veterinary, medical instrument, and drug distribution firms. In the 1980s Glaxo sold its non-drug operations and concentrated on pharmaceuticals. In 1981, the company launched Zantac in the US market becoming the leader in anti-ulcer drug sales by achieving a 53 percent market share.

Since then one product - Zantac - accounts for about 43 percent of the company's revenue. The patent expired in 1997 (as well as its antiviral "blockbuster") and Glaxo has been spending heavily on R&D and diversification of its drug offerings. Besides this, Glaxo, established (in 1993-94) new manufacturing operations in Argentina, Australian Egypt, Germany, Japan, Singapore, Spain, and the UK, following a strategy of commercial expansion.

Glaxo is the biggest pharmaceutical company in Europe, and after acquiring Wellcome (a world leader in antiviral medicines worth US$ 14.8 billion) in 1995, it became the world's largest drug maker. However, its overseas sales account for almost 90 percent of the revenue (Stopford, 1992, pp. 567-569), and of this the US is the largest market (43 percent of total revenue in 1994) for Glaxo products.

A determination to focus on prescription drugs led Glaxo to sell its stake in the joint venture with Warner-Lambert for US$ 1.5 billion in 1996. Finally, the Group invested £ 30 million in information technology systems to improve its internal supply chain in order to respond quickly to consumers demands[35]. In addition to this, Glaxo aims to expand its business in fast-growing, emerging markets of South America, Africa and the Far East[36].

In sum, the Group sells its products in about 150 countries, and has production facilities in 31 countries and 70 subsidiaries. The major competitors are Bristol-Myers, Novartis, Eli Lilly, American Home, Roche, Hoechst Marion Roussel, Merck, Pfizer, and SmithKline Beecham. The tables below provide an overview of the Glaxo Group,

[34] Hoover's Handbook of World Business, 1997, p. 224.
[35] Financial Times, 3 September 1997.
[36] Glaxo's chief operations officer responsible for North and South America said that more flexible marketing strategies are needed, which mean "developing as well as pricing new drugs differently in different parts of the world" (Wall Street Journal, 31 January 1997, p. 11A).

where it is possible to see the importance of the US as the single most important market.

Table 5.7 - Corporate worldwide overview - Glaxo Wellcome

	1993	1994	1995	1996
Turnover (£ million)	4,930	5,656	10,490	8,341
Profit Bef Tax (£ million)	1,675	1,835	3,635	2,676
Number of employees	40,024	47,189	52,419	53,808

Source: Financial Times, Major UK Companies Handbook, 1997, p. 342.

Table 5.8 - Worldwide sales* per business division

Glaxo Wellcome - 1996

Drug division	(%)
Respiratory	**22**
Gastro-intestinal	**20**
Viral infection	**18**
Bacterial infection	**11**
Central nervous system	**11**
Other	**18**
Total	**100**

Source: Glaxo Wellcome, Annual Review, 1996.

Table 5.9 - Worldwide sales* per geographical area

Glaxo Wellcome - 1996

Area	(%)
Europe	**32**
North America	**46**
Asia Pacific (includes Japan)	**15**
Latin America	**4**
Other	**3**
Total	**100**

Source: Glaxo Wellcome, Annual Report, 1996.

The second selected pharmaceutical company is American-based Eli Lilly, which in 1876 installed its first plant (a process of coating pills with gelatin) in Indianapolis[37]. Later in 1923, Lilly introduced insulin and during the 20s and 30s, it

[37] Hoover's Handbook of American Business 1997, p. 524.

created products such as Merthiolate (an antiseptic), Sconal (a sedative), and treatment for anemia and heart disease.

In the 70s, Lilly diversified, buying Elizabeth Arden (cosmetics) and IVAC (medical instruments). In 1982 Lilly become the first company to market a biotechnology product, introducing Humulin (licensed from Genentech), which is identical to human insulin. In 1986 Lilly acquired Hybritech, a biotechnology company, for more than US$ 300 million, and the next year Elizabeth Arden was sold.

In 1992, Lilly bought drug maker Beiersdorf GmbH and surgical products maker Origin Med-systems. Two years later Lilly acquired McKesson's pharmacy benefit management business[38], and PCS Health Systems (the largest drug benefit manager in the US for US$ 4 billion). In 1995 Lilly sold Hybritech to Beckman Instruments for a price estimated to be less than US$ 10 million. Finally, in 1996 an agreement was made with Merck to co-develop disease- and health-management programmes for patients with diabetes.

The company is well-known for its insulin, but its top-selling drug is the antidepressant Prozac (which is the unique drug marketed in the US for both depression and obsessive-compulsive disorder since 1994). It has also produced treatments for animal diseases and products for animal food production (subordinate to the Elanco division[39]).

In short, Lilly has a very strong presence in the US[40] (approximately 57% of total sales). However, the corporation has been making investments in its worldwide pharmaceutical operations aiming to increase sales outside the US (Lilly, 1996). According to Lilly (1993) the 80s was focused on the world's largest pharmaceutical markets (that is, Europe, Japan and Canada). The 90s will have targeted developing countries (such as India and China). Among the major competitors are Bayer, Bristol-Myers Squibb, Norvatis, Glaxo Wellcome, Hoechst, Merck, Pfizer, Roche, American Home, Pharmacia & Upjohn, Zeneca and SmithKline Beecham. The tables below summarize Eli Lilly's main figures, as well as its focus on the US market and main pharmaceutical areas.

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[38] Lilly announced that it was turning from a drug into a 'disease-management' firm aiming to achieve R&D savings and profits (Wall Street Journal, 24 July 1997, p. 6).

[39] Elanco was a joint venture with Dow Chemical manufacturing agricultural products. However, in 1997 Lilly sold its stake (for US$ 1.2 billion) to Dow (Ibid.).

[40] Malnight (1995) states that Lilly is a traditionally ethnocentric firm, which has recently initiated a process of globalization.

Table 5.10 - Corporate worldwide overview - Eli Lilly

	1993	1994	1995	1996
Sales ($ mil.)	5,199	5,712	6,764	7,347
Net income ($ mil.)	480	1,286	2,291	1,524
Number of Employees	26,200	26,400	28,500	29,200

Source: Eli Lilly, Annual Report, 1995, 1996.

Table 5.11 - Worldwide sales per business division

Eli Lilly - 1996

Business	(%)
Central nervous system	**36**
Anti-infections	**20**
Endocrine	**18**
Animal health	**8**
Gastrointestinal	**7**
Health care management	**5**
Cardiovascular	**4**
Other	**2**
Total	**100**

Source: Eli Lilly, Annual Report, 1996.

Table 5.12 - Worldwide sales per geographical area

Eli Lilly - 1996

Area	(%)
US	**58**
Europe, Middle East and Japan	**31**
Other regions	**11**
Total	**100**

Source: Eli Lilly, Annual Report, 1996.

The third selected company is the pharmaceutical division of Hoechst - Hoechst Marion Roussel created in 1995. Hoechst was founded in 1863 in a German village of the same name to produce dyes[41]. Then it moved into the pharmaceutical field, producing diphtheria vaccines and analgesics (1890s) and a medicine to cure syphilis (1910). In 1923 the company managed to isolate insulin and acquired German dye and fertilizer producers. During the period 1925-1952 the company was part of the I. G. Farben cartel with other German chemical companies such as BASF and Bayer.

[41] Based on Hoechst, 1990, 1991b, 1992, 1993b and 1994c.

Taking into consideration that most of the Hoechst plants have survived the war, the expansion was fast in the postwar period including the incorporation of plastics, fibers and petrochemicals businesses.

In the 70s Hoechst acquired majority control of Roussel Uclaf (French pharmaceutical and cosmetics company). The company had success in pharmaceuticals, particularly with diuretics, diabetic medications, antibiotics, and polio vaccines. In the 80s Hoechst emphasized expansion in the US market, by acquiring Celanese (chemicals) located in New Jersey in 1987, and later acquiring the controlling interest in Celanese Mexicana (the largest private chemical company in Mexico). In 1993 Hoechst bought a 51 percent stake in the US drug maker Copley Pharmaceutical (generic drugs). The expansion in Europe was accomplished in 1992 by buying the powder coatings group of Beckers (Sweden), and the fiber activities of Chemiefaser Guben in eastern Germany.

Considered the world largest chemical manufacturer[42] (and Europe's biggest chemicals and drugs group), the Hoechst Group concentrates on the following businesses: dyes, plastics, pharmaceuticals, agrochemical, fibers, paints, and industrial gases. It has operations in 120 countries in which the major competitors are: Akzo Nobel, BASF, Bayer, Dow, DuPont, Eli Lilly, Glaxo Wellcome, ICI, Merck, Monsanto, Rhône-Poulenc, Roche and SmithKline-Beecham. The tables below provide an overview of Hoechst Group, which confirms its concentration in Europe and the organization of business in independent companies.

Table 5.13 - Corporate worldwide overview - Hoechst

	1993	1994	1995	1996
Sales (DM million)	46,047	49,637	52,177	50,927
Operating profit (DM million)	1,476	2,318	3,591	4,013
Number of employees	170,161	165,671	161,618	147,862

Source: Hoechst, Annual Report, 1994, 1996.

[42] Hoechst has been forced to end the production of the controversial abortion pill (developed by Roussel Uclaf and sold in France, Britain and Sweden), after US anti-abortion activists announced a boycott through newspapers advertisements. This is the first time that "a leading pharmaceuticals company had given up the rights to a drug which was judged by regulators to be safe and effective" (Financial Times, 9 April 1997, p. 32).

Table 5.14 - Worldwide sales per business division

Hoechst - 1996

Affiliates/Activities	(%)
HMR/pharmaceutical	**25.6**
Speciality chemicals	**13.8**
Celanese/chemicals	**12.7**
Trevira	**11.2**
AgrEvo/agrochemicals	**7.1**
Plastics	**5.5**
Messer/industrial gases	**4.6**
Herberts/paint	**4.6**
Ticona	**2.6**
Behring/diagnostics	**1.8**
Hoechst Roussel Vet/ agriculture products	**1.5**
Other	**9.0**
Total	**100**

Source: Hoechst, Annual Report, 1996.

Table 5.15 - Worldwide sales per geographical area

Hoechst - 1996

Areas	(%)
Europe	**58**
Americas	**36**
Africa, Asia, Australia	**12**
Intra-group	**(6)**
Total	**100**

Source: Hoechst, Annual Report, 1996.

In 1994, the corporation indicated its objective to strengthen cooperation between Hoechst and Roussel Uclaf in regional joint ventures (Hoechst, 1994a, pp. 23-24). Accordingly, joint ventures in Italy and the UK were established, and mergers in Belgium, the Netherlands, Portugal and Greece. Additional joint ventures were planned in Brazil, Argentina, Venezuela and Mexico. However, in early 1995 Hoechst acquired the American drug company Marion Merrell Dow and Dow Chemical's pharmaceutical business in Latin America (for US$ 7.1 billion) subsequently renaming it Hoechst Marion Roussel (Hoechst, 1995, p. 29). Hoechst had for a long time, the majority of shares in Roussel Uclaf (57%) and the remainder was fully acquired (for

US$ 3.5 billion) in December 1996 to consolidate the pharmaceutical division (Hoechst, 1996a, p. 3).

In short, after these acquisitions the worldwide integration of pharmaceutical activities into HMR became the major challenge and was accomplished by the end of 1996. The new company - HMR[43] - is the fourth largest drugs producer[44] in the world (after Novartis, Glaxo Wellcome and Merck), headquartered in Frankfurt (Germany). The table 5.16 provides an overview of HMR.

Table 5.16 - Worldwide overview - Hoechst Marion Roussel

(DM million)	1994+	1995	1996
Sales	9,577	11,530	13,020
Operating profit	1,386	532	2,249
Number of employees	-	-	45,160

Source: Hoechst, Annual Report, 1995, 1996. Note: + position as a division of Hoechst Group.

The new pharmaceutical division is directly subordinated to Hoechst Group, since it was disconnected from the chemical business within the group[45]. The Group planned to separate the drugs business as an independent company in early 1997 (with shares to be negotiated in the stock market in the US), however this has been postponed.

5.2.2 - Brazilian subsidiaries

In terms of the ranking of the biggest private companies in Brazil, the selected cases are positioned as follows: HMR is first in the industry classification, and 113th amongst the biggest[46]; Lilly is 8th in the pharmaceutical sector and 324th in the general ranking; and Glaxo is 10th within the sector and 364th in the general ranking. The table 5.17 compares their sales in Brazil.

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[43] Hoechst Group is committed to concentrating its activities on life sciences, therefore, HMR agreed to sell the Rugby Group (generic drugs) to Watson Pharmaceuticals in the US. The HMR's CEO said that "participation in the generics drugs business is not part of our core business strategy" (Financial Times, 27 August 1997, p. 18).

[44] HMR makes pharmaceuticals for treating hypertension and angina pectoris, for allergies and infections, and it has a majority stake in Copley Pharmaceuticals (generic drugs) in the US.

[45] Financial Times, 15 March 1996, p. 1.

[46] Among the 500 biggest private companies, per sales in 1996 (Exame, 'Melhores e Maiores', 1997).

Table 5.17 - Overview of selected Brazilian subsidiaries - 1996

Company	Sales (US$ million)	Number of employees
Hoechst Marion Roussel	**554.0**	**1,388**
Eli Lilly	**232.7**	**931**
Glaxo Wellcome	**194.3**	**744**

Source: Adapted from Exame, 'Melhores e Maiores', July 1997, p. 158.

The Brazilian subsidiary of Glaxo is constituted by one site located in Jacaré - Rio de Janeiro city. The subsidiary's operations include the manufacturing, packaging and commercialization of products. Therefore, there are products imported (in bulk form) to be finished locally, and products imported ready for final consumption. The latter will be locally packaged and distributed.

These imports are said to be a consequence of the impossibility of diversifying local production with the current technology; besides this, there was no scale of production that would justify local manufacturing (as suggested by Gereffi, 1983). Likewise, the ABPI's official[47] suggested that Glaxo should have only 'secondary production' at the Brazilian subsidiary, because all 'primary manufacturing' is concentrated in industrialized countries. Nevertheless, some raw materials will be produced in Brazil. More specifically, the Brazilian site manufactures the final stages of 'primary production' with basic inputs imported from England. The headquarters centralizes the purchase of raw materials that are used by many subsidiaries.

The Brazilian subsidiary exports to Argentina, Paraguay, Uruguay, Venezuela, Peru and Ecuador, however the growth of exports to South American markets is limited by the small capacity of production. Nevertheless, there is a plan for expansion as the subsidiary received an investment of US$ 111.3 million for a new site in Brazil, which will still be located in the Rio de Janeiro city. This site will be among the most modern factories of the Group's worldwide[48]. Consequently, it represents a telling sign of the relative importance of the Brazilian market (see the main figures in the table below).

[47] Interview with official from the Association of British Pharmaceutical Industries (on 20/03/96).
[48] Informativo CRQIII, December/January 1996, p. 8.

Table 5.18 - Brazilian subsidiary - Glaxo Wellcome

Net Income (US$ 1,000)	1993	1994	1995
Domestic	61,241	76,892	95,043
Export	450	1,482	3,070
Total	61,691	78,374	98,113
	1993	**1994**	**1995**
Number of employees	735	748	756

Source: ABIQUIM, 1996, p. 146. Note: this publication is updated every two years and there is no other reliable source.

Finally, Wellcome had a site located in the Cotia (São Paulo state) as a joint venture with Zeneca's pharmaceutical division. This partnership was sold to Zeneca, but Glaxo's products will still be manufactured there until 1999 (when the new site begins its operations).

The commercialization of pharmaceutical products in Brazil from Eli Lilly started in 1930. Later in 1944, a commercial office was created in Rio de Janeiro city. It was only when the Brazilian process of industrialization was more mature that the first site (for pharmaceutical secondary manufacturing) was installed in São Paulo (Morumbi site) in 1953. The Elanco division[49], that is the business of animal health products, was created in 1962. In 1977, the Cosmópolis site started its operations, including manufacturing of 'primary pharmaceuticals', animal and agriculture products (i.e., herbicides).

In 1993 the company spent US$ 10 million on installing an incinerator. The industrial director claims that 'the company decided for this kind of equipment because it was best available technology to dispose wastes'. The company invested more US$ 1 million in a new equipment for the incinerator (see table 5.19 for investments at the subsidiary). Therefore, it increased the capacity of treatment of solid and liquid wastes[50] by 64 percent in 1997. The acquisition of the incinerator was also justified by its potential to provide services to third parties (offered by the spare capacity of the equipment). At present the incinerator is processing 8 million litres per year of waste (half from Elanco and half from other companies in the region, such as Zeneca and Shell Chemical).

[49] This joint venture with Dow Chemical was sold in 1997 (Wall Street Journal, 24 July 1997, p. 6).
[50] Gazeta Mercantil, 29 January 1996, p. A-11.

Table 5.19 - Eli Lilly do Brasil - Investments (US$ 1,000)

	1991	1992	1993	1994	1995
Environment, increased capacity & modernization of facilities	23,000	33,000	39,000	45,000	55,000

Source: Eli Lilly do Brasil, December 1995.

In 1996, the Brazilian subsidiary ranked as the eighth largest among the corporation affiliates. Moreover, the Morumbi site was classified as 'Class A' (the highest grade) by the corporation. This means that medical research will be undertaken locally with the purpose of enabling the simultaneous registration of new products in different part of the world (a new trend in the world industry). Finally, Lilly's main figures are illustrated in the table below.

Table 5.20 - Brazilian subsidiary - Eli Lilly

Sales (US$ 1,000)	**1993**	**1994**	**1995**
Domestic	116,000	136,000	180,000
Export	3,000	13,000	14,000
Total	119,000	149,000	194,000
	1993	**1994**	**1995**
Number of employees	938	1,102	1,336

Source: Eli Lilly do Brasil, December 1995.

Finally, the Hoechst Group started its operations in Brazil in 1949. At present, the Brazilian business includes industrial chemicals, fibres, pharmaceuticals, agrochemical, paints and resins. There are three site in the São Paulo state, that is Osasco, Suzano (chemical and pharmaceutical units) and Ermelino Matarazzo, and participation in a petrochemical company (polyethylene producer) in the Triunfo complex (Rio Grande do Sul state)[51]. The table 5.21 illustrates the operations of the Hoechst Group in Brazil.

[51] Folha de S.Paulo, 18 September 1994, pp. 2-10, and Hoechst, 1994b.

Table 5.21 - Brazilian subsidiary - Hoechst*

Net Income (US$ 1,000)	1993	1994	1995
Domestic	370,140	465,569	500,891
Export	69,957	74,926	64,852
Total	440,097	540,495	565,743
	1993	**1994**	**1995**
Number of employees	4,958	4,838	2,811

Source: ABIQUIM, 1996, pp. 151-152. Notes: this publication is updated every two years and there is no other reliable source, * there was no data exclusively for the pharmaceutical division, because the separation of chemical and pharmaceutical businesses in Brazil was accomplished in 1996.

In Brazil, the merger between Hoechst and Marion Merrell Dow took place in November 1995, when the Santo Amaro site was incorporated into the Hoechst pharmaceutical division. Besides this, there was another site in Rio de Janeiro city (from Roussel), but it was sold in 1996. According to the HMR newsletter[52] the Brazilian subsidiary is at the top of the industry ranking. More specifically from January to September 1996 the net income was US$ 244 million (with the sales in September 1996 around US$ 27.7 million). Such volume of sales accumulated in 1996 and made HMR the largest pharmaceutical company with a 5.4 percent market share; HMR achieved total sales of US$ 540 million in 1996.

Additionally, HMR has invested US$ 120 million in a new factory in the Suzano site[53]. Consequently, the Brazilian subsidiary will be transformed into one of the two regional manufacturing centres within Latin America to export products within the region. As a result of this investment, the Santo Amaro site (former Merrell-LePetit) will be returned to Dow, because it was not included in the merger. More precisely, the site estate belongs to Dow while the machinery installed there belongs to HMR. Consequently, the Suzano site has an expansion project in course (with a deadline for starting the operations in the year 2000). In short, all pharmaceutical manufacturing will be concentrated in Suzano, which now represents 61 percent of the total manufacturing in Brazil (29% is made up by the Santo Amaro site and 8% of the products are imported).

[52] HMR's newsletter 'Linha Aberta', year 1, number 8, October 1996.
[53] Gazeta Mercantil, 3 December 1996, p. C-1.

5.3 - Industry-specific explanations

5.3.1 - Environmental impacts and liabilities

5.3.1.1 - Environmental impacts caused by the pharmaceutical industry

According to Ives (in Ives, 1985) there are some difficulties in identifying the major environmental impacts (e.g., air emission, wastes and effluents) generated by the pharmaceutical industry. This is mainly because the most important issues are health and safety-related, such as: (a) safety and occupational health at workplace, (b) use of toxic substances and generation of toxic wastes, (c) changes in biological organisms through biotechnology, (d) tests on animals and/or human, and (e) animal medicaments (i.e., hormones) that later will cause health problems in human (through the food chain).

In developing countries the commercialization of products that have been banned or restricted for sale in industrialized countries and/or home countries is especially controversial. In such cases the disclosure of TNC's production of toxic substances worldwide should be applied to pharmaceuticals as well (including the degree of toxicity and side effects for consumers). Finally, Ives (1985, p.5) criticizes the US policy (by the FDA) which endorses drugs banned in the domestic market as suitable for export.

As far as products' characteristics are concerned, they may be able to explain environmental commitment at industry level. Hazardous substances in medicines may be fatal to consumers. Therefore, the impact of pharmaceutical products in animals and humans is a polemical issue. In sum, the industry is criticized because employees are at constant risk and humans suffer from the side effects of drugs.

Lilly's subsidiary[54] responded to these criticism with the argument that the population is wealthier today because of the pharmaceutical industry. Nevertheless, earlier discoveries (such as insulin in 1920 and later penicillin), were made from substances with unknown side effects. Since the main objective was to save lives and/or mitigate suffering, side effects were balanced alongside the benefits. At present, AIDS drugs are the best example of such cost-benefit analysis (as they cannot cure but

[54] Interview at 'Eli Lilly do Brasil' (on 23/09/96), with the industrial director of the Brazilian subsidiary, who is also responsible for SHE issues. The interview was held at the Morumbi site (São Paulo city).

only prolongs life). These 'unknown' side effects of medicines are taken as the inherent risk of the industry, since knowledge in medical science is incomplete at best.

Based on the findings from the selected cases, it is possible to affirm that environmental impacts by pharmaceutical firms are mainly the result of two elements - the technological pattern of the site and the existence of primary pharmaceuticals manufacturing. Thus environmental impacts are site-specific, and as such, will differ from case to case (confirming Warhurst, 1994). In conclusion, cross-case similarities can be reported exclusively in reference to theoretical abstractions regarding pharmaceutical manufacturing.

It must be stressed however that sparsity of literature will result in a more descriptive than analytical report of the empirical findings. For example, Glaxo Group states the potential environmental impacts from pharmaceutical primary and secondary manufacturing[55]. The Brazilian subsidiary has a small primary and medium sized secondary production, as such it has potential environmental impacts. In reality, Glaxo's subsidiary[56] discharges the water from the process (including the liquid wastes from tanks washing) into the public sewage system without prior treatment.

In brief, it was argued that the current site lacks the area to build an effluents' treatment system. In fact, the site has twenty five years worth of operations and does not comply with the urban zoning legislation (that is, law 466 from 1981). The site is located in a residential area without industrial pollution control (for the release of effluents), an illegal situation which has persisted for at least sixteen years. Finally, despite the impacts caused by current operations, Glaxo is monitoring the water at the location of the new site aiming to prevent future environmental liabilities.

Another major challenge for the Glaxo subsidiary is the prevention of accidents[57]. The industrial director[58] claimed that accidents are induced by employees' attitudes and their resistance to wearing personal protection equipment. This attitude jeopardizes the overall task of occupational medicine. But at some point it was

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[55] The by-products of such operations are: gases, dusts, odours and vapours from ferments, vessels, tanks, scrubbers, filling lines, incinerators and boilers, noise and visual impacts, spent catalysts, washings, solvents, filter media, packaging, reject products and protective clothing (Glaxo, 1992, p. 4).

[56] Interview at 'Glaxo Wellcome do Brasil' (on 01/10/96) with the industrial director of the Brazilian subsidiary, who is also responsible for safety and environmental issues at the site located in Jacaré (Rio de Janeiro city).

[57] Such concern is clear in the subsidiary's safety manual (Glaxo, n.d.).

[58] Interview at Glaxo's subsidiary, as stated in Note 56.

recognized that the site is very old, thus its own structure makes prevention of accidents very difficult. For example, the old machinery lacks concern for environmental protection and requires many technological adaptations. Moreover, it is not always possible to improve the safety and environment performance of old equipment by the use of end-of-the-pipe technology.

Consequently, only relocation to the new site will solve these technological limitations that increase the potentiality of accidents at the subsidiary. Therefore, this site will be closed in 1999. According to FEEMA's inspector[59], the licensing process of the new site (in Jacarepaguá, Rio de Janeiro city) is in progress, in which the major requirement is the effluents' treatment system.

FEEMA's official[60] explained that the regulation on urban zoning (from 1981) has allowed companies to remain in residential areas if their pollution emissions are controlled. A period was granted by the environmental authority for the necessary adaptations. Therefore, companies that refuse to incorporate pollution control systems must be relocated to an industrial area. Glaxo had these options, that is to control industrial pollution or to relocate. The main explanation from FEEMA[61] for such long process of negotiation was the fact that companies usually threaten the authorities with closure of the site thereby increasing unemployment (which confirms Zulauf, 1994)[62].

Glaxo's director[63] affirms that long negotiation with FEEMA was based on the possibility of installing an effluents' treatment system at the current site. Later, the subsidiary's decision to relocate was based on the following factors: (a) non-compliance with corporate safety principles, (b) economic stability in Brazil, (c) availability of resources, and (d) lack of space to build a facility for effluents' treatment. Besides these factors, the current site is located in a very poor residential

[59] Interview with FEEMA's inspector responsible for Glaxo's site (on 06/12/96).
[60] Interview with FEEMA's official in the Pollution Control Division (on 02/10/96).
[61] Ibid.
[62] Although there are no specific cases reported by the media, Zulauf (1994, pp. 76-77) classified these cases as 'urban companies' (from textile, food and chemical sectors), which have real difficulties in installing effluents' treatment due to the lack of space. These companies are reactive towards legislation with a predominant and recurrent pattern of environmental degradation. Finally, they usually threaten authorities with termination of their operations, but in some cases the environmental improvements are genuinely unfeasible due to financial problems.
[63] Interview at Glaxo's subsidiary, as stated in Note 56.

area, which represents higher risks of fire and contamination in an already vulnerable environment[64].

Negotiation with the environmental agency has been a recurrent issue for the Brazilian subsidiary. In the early 90s, primary manufacturing was questioned by FEEMA because the chemical process was supposed to be extremely polluting. It was another polemic negotiation, which was caused by two factors. First, the agency lacked knowledge of the operational process based on industrial secrecy. Second, the 'company representative had paid an agent to get the licence illegally'[65], which constitutes a typical situation "in a society full of mediations". According to Amado and Brasil (1991, p. 55) "these mediators are, in fact, institutionalized 'jeitinho'. That is why there are some laws that simply do not apply". Moreover, excessive bureaucracy in Brazil "causes the displacement of objectives, a certain accommodation and disharmony between the written rule and the behavior it induces". Consequently, the main concern is to avoid or ignore legal requirements (Ibid., pp. 48-49).

In terms of the selected companies located in São Paulo state, CETESB has provided some information[66] indicating that Eli Lilly and HMR were not penalized for events of non compliance with the environmental legislation[67]. More specifically, Lilly's director[68] said that the main concern at the Cosmópolis site is with liquid wastes because of the potential impacts of chemical substances on the river. It was explained that accidents with liquid wastes are more critical due to their immediate effects. However, there is also the potential that solid wastes disposed in the soil will contaminate the underground water (if not constantly monitored). Accordingly, CETESB's official[69] affirmed that Lilly has no major environmental impacts; neither

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[64] The former environmental secretary in Rio de Janeiro argued that many urban environmental problems are, indeed, the result of population pressures and inadequate planning; but industries continue to be responsible for serious air, soil, and water pollution (Financial Times, 2 December 1997, p. 9).

[65] It is recognized that "as long as regulations are lax and enforcement is inadequate, there will be companies trying to get out of environmental responsibility in Brazil". Accordingly, companies typically bribe officials' to have authorization for environmental-related requirements (Financial Times, 2 December 1997, p. 9).

[66] Document from CETESB's central office in São Paulo (dated 04/12/96) which covers the period from January 1995 to November 1996.

[67] Lilly (in Morumbi) and Hoechst (in Suzano) sites were included in the Tietê Project in 1991. Lilly should be connected to SABESP's effluents' treatment system. Hoechst installed a system to control the effluent's pH and made an agreement with SABESP for effluent collection and treatment (CETESB, 1995).

[68] Interview at Lilly's subsidiary, as stated in Note 54.

[69] Interview with CETESB's official at the regional office in Campinas, São Paulo state (on 14/10/96).

the incinerator nor the Elanco unit manufacturing herbicides (both located in the Cosmópolis site) received negative evaluation from the environmental authority.

Overall, it was stated that 'the pharmaceutical industry causes less potential damage to the environment than to employees' (confirming Ives, 1985), suggesting that contamination will happen by lack of control over manufacturing practices. Moreover, there is no guarantee of contamination avoidance in the industry because there is no homogenous behaviour among pharmaceutical companies.

In Lilly's subsidiary corporate principles are more important (and stricter) than local requirements, though local legislation is taken into consideration. There was also the argument that these corporate requirements will influence local authorities. For example, CETESB's technicians were invited to participate in the installation of the incinerator at Lilly's site in order to acquire knowledge of the new technology. This is a practice beyond legal requirements, thus, a case of overcompliance claimed by the subsidiary. CETESB[70] stated that Lilly's site has its pollution emissions under control, but this was not a case of overcompliance.

Considering the environmental impacts caused by HMR's sites[71], it was stated that air emission is not a problem. However, the product packaging will generate a large amount of solid wastes. Besides this, liquid effluents may produce some environmental impact as well, given that any operational mistake may contaminate the effluents. In such a case the effluents will be impregnated with 'active principles' in small quantities that will produce a negative effect on the river's water.

Additionally, HMR's manager[72] said that there are specific requirements imposed by the operational licensing at CETESB. First, is the obligation to pay (it is paid by organic volume discharged per thousand litres) SABESP for collecting and treating the effluents (a service that is not already in operation). Secondly, is the obligation to report (every three months) the generation of solid wastes[73], since there

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[70] Ibid.

[71] Interview at Hoechst Marion Roussel (on 07/11/96), with the EH&S and engineering manager of the Brazilian subsidiary at the operational level (who is also responsible for governmental relations regarding operational aspects). The interviewee was formerly the SHE manager of Dow Chemical located in Salvador (Bahia state), transferred to Marion Merrell Dow site in Santo Amaro (where the interview was conducted, in São Paulo city) prior to the merger with Hoechst.

[72] Ibid.

[73] CETESB collects data regularly on the generation and disposal of wastes from all industries in the São Paulo metropolitan area, which generates more than 180,000 tonnes per year. In 1992, a summary of hazardous wastes was disclosed. The pharmaceutical industry produced 138 tonnes, which is minor

are hazardous and non-hazardous wastes at the HRM's sites. It is relevant to emphasize that these requests from CETESB are evidence that the agency is, to some extent, controlling industrial pollution. Finally, waste management at HMR focuses more on the possibility of inadvertent ingestion of products disposed in landfills than on their potential environmental impacts. As with any other medicine it may be toxic if taken indiscriminately; wastes are therefore incinerated at Hoechst Chemical.

Surprisingly, Glaxo's director[74] blamed the legislation for the current difficulties of waste management in Brazil. For example, there is a legal obligation to dispose of wastes within the same state where they were generated (to avoid the transfer of hazardous wastes to states that lack mechanisms of adequate disposal). Moreover, there are strict legal requirements for wastes disposal through incineration (confirmed by Lilly's case).

In total, environmental management in the pharmaceutical industry focuses on safety issues. Based on the findings, safety concern has been replicated in all cases. However, the safety approach varies from one company to another. For example, it is possible to note that Glaxo has a very traditional approach in which safety statistics (measured by hours/days lost with accidents) is the key criteria for evaluating performance.

Interestingly, Glaxo's director[75] argued that in the past the focus was exclusively on fire prevention. In the subsidiary's safety manual (Glaxo, n.d.) such a focus is still explicit. Besides this, the corporate policy for HS&E issues is subordinated and managed by the 'Group Risk Management' (Glaxo, 1992). Overall, it was identified a concern with occupational health and accidents in the Brazilian subsidiary. Nevertheless, environmental concern is solely identifiable by the use of end-of-the-pipe technology to control air emissions and noise.

In other words, environmental performance is measured by the number of accidents rather than by the prevention of environmental impacts. The absence of accidents is explicitly considered at Glaxo's subsidiary, as an evidence of control over SHE issues. As an example of outdated business thinking (as suggested by Zulauf, 1994), Glaxo is keen on accident statistics as a standard of efficiency without due

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when compared with the chemical industry that generated 88,952 tonnes (Gazeta Mercantil, 29 January, 1996, p. A-11).

[74] Interview at Glaxo's subsidiary, as stated in Note 56.

[75] Ibid.

concern for its effluent releases. Moreover, Glaxo's subsidiary[76] received an award in 1995 for the achievement of one year without accidents, which was used as evidence that corporate principles had been implemented. This is a valid indicator of performance for safety, however this award is not a guarantee of good environmental performance.

Overall, some pharmaceutical companies usually associate 'good manufacturing practices' (GMP) with safety practices. These industrial recommendations were initially related to the manufacturing, processing and packaging of pharmaceuticals, but later included medicinal chemicals to make sure that drugs are safe, efficient and stable (Ballance et al., 1992, pp. 141-146). In practical terms, GMP is concerned with the use of appropriate individual safety equipment, filters to collect powder during manufacturing, and measures to safeguard simultaneous production of drugs against the danger of cross contamination.

Lilly's case reveals a more proactive approach towards safety issues. For example, Lilly's subsidiary[77] participates in a voluntary initiative launched by the business community in Paulínia[78]. The scheme was developed by a group of companies (e.g., Petrobrás, Rhodia, Elanco, Zeneca and others) with the purpose of preventing and/or combating accidents. Therefore, equipment was acquired to create a private fire brigade. The main justification for the initiative is that accidents in this industrial complex may cause great problems (such as explosions, hazardous spills and emissions) if not promptly stopped.

Finally, HMR considers that safety depends on the overall improvement of performance at the subsidiary which will in turn minimize risks. In fact, safety is the unique area which already has performance indicators which are reported to the headquarters since the merger. The HMR's manager[79] mentioned that the level of accidents at the workplace used to be high in Brazil. In recent years, it is decreasing as

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[76] From the Brazilian Association of Safety and Accident Prevention, which is not an environmental award. For example, the Brazilian Association of Sales and Marketing Representative selects the best cases of environmental management since 1993 (Estado de S.Paulo, 25 September 1995, p. B10). The most recent winners of its 'Top Ecology' award are: ABIQUIM, Cetrel, SABESP, Degussa, Hering, Malwee, OPP, Petrobrás, TetraPak and Unibanco (Gazeta Mercantil, 17 November 1997).

[77] Interview at Lilly's subsidiary, as stated in Note 54.

[78] The petrochemical complex of Paulínia was legally created in October 1996 by federal law, though it already has a large concentration of companies. However, it received investments of US$ 4.8 billion for expansion (Gazeta Mercantil, 17 October 1996, p. C-3).

[79] Interview at HMR's subsidiary, as stated in Note 71.

a consequence of high investment (in equipment and human resource development) to prevent accidents within the industry.

In terms of environmental issues, the Santo Amaro site received an award from the governmental authority[80] when the project to recover the Tietê river was launched. However, the project required the installation of a facility to control the 'pH' of liquid effluents discharged into the river, and another facility for effluents pre-treatment on this site. The company's system must be connected to the collector duct from SABESP[81]; however, the connection was not accomplished until 1996. In conclusion, the lack of both control of 'pH' and pre-treatment of effluents until the early 90s may be considered as a major environmental impact from this site, as well as a sign of poor environmental management at Marion Merrell.

5.3.1.2 - Environmental commitment from the pharmaceutical industry

Based on the empirical evidence, the minor environmental impacts justify the lack of environmental concern in the pharmaceutical industries associations. However, this industry lacks an initiative similar to the Responsible Care programme in the chemical industries. More specifically, the industry associations (in the UK, the US and Brazil) admitted the lack of guidelines for the improvement of their members' environmental practices, and the recurrent justification for this was the industry's minor environmental impacts.

For example, the British association (ABPI)[82] stated that its members are signatories of the RC programme from the CIA. Therefore the association has no immediate need for programmes related to environmental issues. Moreover, the ABPI's official said that the environmental impact caused by the pharmaceutical industry is more a consequence of the use of chemicals (e.g., solvents) during 'primary

[80] This site was formerly Merrel-LePetit and as such received a certificate from the São Paulo Secretary of State for Water Resources for its participation in the project to recover the Tietê river (in 30 November 1993). Besides this, HMR's manager received an award for his environmental activities at Dow Chemical ('1992 President Environmental Care Awards).

[81] SABESP has invested approximately US$ 3.5 billion (from 1995 to 1998) to rationalize the use of water, reduce wastes and to preserve the springs. The sewage collection increased from 64% of the population in 1994 to 79% in 1997 in the metropolitan area of São Paulo. The sewage treatment increased from 25% (in 1994) to 46% (in 1997) of the collected amount, and it should reach 60% in 1998. Finally, from 1998 the treated sewage will be re-used by the industry at lower prices.

[82] Interview with official from the Association of British Pharmaceutical Industries (on 01/04/96).

manufacturing'. This manufacturing stage is done in the UK, and is an activity that pharmaceutical companies usually concentrate within industrialized countries, major markets and/or home countries.

The second phase of pharmaceutical processing, that is, 'manipulation', has insignificant environmental impacts (e.g., due to the disintegration of tables). This is the activity often located in developing countries, for the formulation of products to be commercialized in domestic markets (such an argument confirms the dependence of developing countries on imports of active principles, as suggested by Gereffi, 1983 and Ballance et al., 1992).

Likewise, the American association (PhRMA)[83], which represents the American pharmaceutical industry worldwide, states that its major concern is public policy advocacy for the industry within major markets. Similarly, the PhRMA has no policy and/or guidelines relating to environmental issues.

In the Brazilian context, the industry association (ABIFARMA)[84] affirmed that it has not been working with its members on environmental issues. Once again, the minor environmental impact generated by the industry was used to justify this lack of concern. Likewise, the Brazilian subsidiaries confirmed that the industry association has never made reference to environmental issues. Besides this, they understand that the association's major role is the political representation of the industry's interests in governmental spheres.

More specifically, Glaxo's director[85] stated that there are meetings at the industry association to discuss technical issues related to GMP, but environmental issues are not addressed. The reason for such lack of concern was that companies' managers and business representatives are not environmentally driven (considering that this is a new social and political issue in Brazil). For example, Glaxo's subsidiary has no interest in being certified by the ISO 14000 or BS 7750 (though the corporation recognizes certification as useful[86]) because the marketing opportunities in Brazil are insignificant as a consequence of the certification.

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[83] Based on a letter from the Pharmaceutical Research and Manufacturers of America (dated 19/03/96).
[84] Based on a letter from the Brazilian Association of Pharmaceutical Industries (dated 03/04/96).
[85] Interview at Glaxo's subsidiary, as stated in Note 56.
[86] The corporate newsletter emphasizes the relevance of systematic environmental management (such as BS 7750 and the European Community's EMS). Moreover, the affiliates should develop their own EMS based on these initiatives (Glaxo, 1994b).

Likewise, Lilly's director[87] said that the industry association has neither pressurized the member companies for better SHE issues nor issued guidelines to be followed to this end. In the Brazilian context, the association has political power to represent the companies' interests, but lacks resources to monitor their behaviour. More specifically, the Brazilian association lacks resources and interest in controlling companies practices on secondary matters because its major task is to lobby for its members' interests (e.g. for the approval of the patent law). Finally, HMR's manager[88] affirmed that since the pharmaceutical industries association lacks any strategy for EH&S issues the subsidiary was never pressurized by them.

Despite the lack of commitment from the pharmaceutical industries associations, most of the large pharmaceutical TNCs have primary manufacturing sites where chemicals substances (e.g. solvents and highly inflammable substances such as alcohol) are handled. Therefore, the RC scheme has members from the pharmaceutical industry. More specifically, Glaxo is a member of the initiative in the UK and Germany, but not in Brazil. Eli Lilly is a signatory of the programme in the US and Brazil, because of their primary pharmaceutical manufacturing and chemical operations. Hoechst is committed to the RC sponsored by chemical associations in the US, the UK, Germany and Brazil. However, HMR's subsidiary has not committed itself to the RC in Brazil.

Lilly's director[89] recognized that after the RC's implementation there were changes in the perception of the community towards the company and vice versa. The "pharmaceutical industry is a big window at which to throw stones"; therefore, the RC will improve the company's public image. However most important is the novelty of the business-community relationship in the Brazilian context. Consequently, the subsidiary promotes "open doors" events for employees' families and the local community, at the Morumbi site. Similarly, the chemical cases have indicated that the RC is improving the companies' relations with the community as well as their public image.

Apart from these findings from Lilly, concern with local communities is not among the priorities of the selected subsidiaries. Furthermore, there is no shared

[87] Interview at Lilly's subsidiary, as stated in Note 54.
[88] Interview at HMR's subsidiary, as stated in Note 71.
[89] Interview at Lilly's subsidiary, as stated in Note 54.

agreement among the cases of what should be their responsibilities towards local communities. Nevertheless, social responsibility is a key element of pharmaceutical industry relationships with the public[90]. Moreover, pharmaceutical companies are particularly prone to being recognized by their social responsibility rather than environmental performance. However, the initiatives mentioned by the corporate reports are not in existence at the Brazilian subsidiaries. Consequently, it is plausible to argue that such social concern is usually intense in the home countries (and/or community where the headquarters is located[91]), which emphasizes the political role of the headquarters even further.

Glaxo's director[92] confirms that the Brazilian context lacks environmental concern, thus companies and employees are just reproducing their context[93]. However, there are no special guidelines from the headquarters, though Glaxo's site is surrounded by a shanty town. The lack of special guidelines for affiliates located in developing countries was also found in Lilly's and HMR's cases, confirming findings from UNTCMD (1993). Moreover, Lilly's director[94] affirms that "Brazilians do not believe in safety measures". It is necessary to patrol their behaviour, for example, over the use of personal protection equipment, because "they are extremely rebellious"[95].

Considering that there are no external guidelines to be followed by pharmaceutical companies, the corporate policies become the most relevant guidance for environmental incorporation at subsidiary level. Some aspects of these EMS are industry-specific, such as waste management and/or recycling programmes. There is evidence of such practices in all cases. For example, Glaxo's subsidiary has recycling programmes for glass and paper[96]. However, the most interesting example of waste management concerns a respiratory product (in aerosol form containing CFCs). More specifically, after filling the products some gas is left in the containers and it must be

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[90] Lilly (1995a) and Lilly's subsidiary provide examples of benefits for the Indianapolis' community sponsored by the corporation. In Glaxo (1995) there are references to worldwide charitable work from Glaxo's affiliates. Finally, Hoechst (1996b) introduced a magazine called 'Change' aiming to demonstrate its engagement on social, ecological and economic responsibility worldwide.

[91] For example, Glaxo became a sponsor of the government's initiative to protect endangered species throughout the UK. Glaxo's official says that "species with a medical link would clearly be of interest to us, and the leech clearly falls into that category" (Financial Times, 2 September 1997, p. 9).

[92] Ibid.

[93] This kind of institutional isomorphism is generally used as an excuse for more environmental degradation (Financial Times, 2 December 1997, p. 9).

[94] Interview at Lilly's subsidiary, as stated in Note 54.

[95] A more elaborate discussion on Brazilian management style is made by Amado and Brasil (1991).

[96] Interview at Glaxo's subsidiary, as stated in Note 56.

removed prior to packaging incineration. Consequently, the wastes are sent to the US resulting in a very expensive procedure[97]. The subsidiary acknowledged the existence of incineration services in Brazil, but the companies running them refused to burn packaging with CFCs wastes.

As a consequence of the high costs of incineration, Lilly is concerned with the reduction of the volume of wastes generated by the manufacturing process. Some reduction has been achieved by diminishing the use of acids and changing raw materials for less toxic substances. Lilly's director[98] stated that wastes impregnated with acids and nitrogen have recently been transformed into fertilizers. Finally, there are recycling programmes at HMR for wastes of PVC, aluminum, cardboard, paper, fuel, glass and wood[99]. However, wastes that have been in contact with 'active principles' during the packaging process will be incinerated at Hoechst's chemical division in Suzano.

In contrast to Glaxo's opinion, HMR's manager[100] claimed that environmental awareness is increasing in Brazil[101]. Thus, 'in the past MNCs brought the technology, concepts and policies that the local employees thought to be exaggerated', because the corporate requirements were far beyond the local experience. More recently, globalization has helped to disseminate good and bad practices from experiences in other countries, which also helped to raise the Brazilian employees' concern with environmental issues.

Additionally, HMR's manager[102] states that it is still difficult to implement the corporate 'basics principles' fully in the Brazilian site. However, it has changed dramatically in the last ten years from the decentralization and total autonomy of the subsidiaries to a more restrictive type of management. Today, the corporations are much more concerned with their operations in Brazil[103], because there is "the

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[97] Glaxo (1992, p. 14) states that high priority is being given to the development of an alternative propellant.

[98] Interview at Lilly's subsidiary, as stated in Note 54.

[99] Interview at HMR's subsidiary, as stated in Note 71.

[100] Ibid.

[101] The Brazilian Foundation for Sustainable Development (FBSD) was created in 1992 as a consequence of the UNCED in Rio. This initiative is basically sponsored by large domestic companies, which have gained credibility at national and international level (at the UN) for its projects in alternative energy, biodiversity conservation and the promotion of exchange between public and private sectors (Estado de S.Paulo, 7 April 1995, p. A2).

[102] Interview at HMR's subsidiary, as stated in Note 71.

[103] The Brazilian automotive industry (which is dominated by TNCs) is discussing a project of car recycling in conjunction with governmental environmental agencies and universities. Another interesting

possibility that their bad practices in developing countries will appear in the international media". The main reason for such change is the TNCs' high concern with their image (a similar argument is made by Turner and Hodges, 1992).

5.3.2 - Economic and competitive aspects

There are some findings explicitly related to the structural (and basically economic) aspects of the pharmaceutical industry, namely, technology, costs, competition and market. These findings will be addressed throughout this section.

5.3.2.1 - Technology-based explanations

Firstly, it was discovered that most of the environmental impacts at current operations of the selected subsidiaries are caused by the technological limitations of the operational processes. However, the manufacturing of pharmaceuticals requires some special concern in order to avoid contamination. Glaxo's subsidiary claims that the corporate environmental policy is completely based on 'world pharmaceutical concepts'[104] (that is, the manufacturing guidelines from the WHO[105]). Ballance et al. (1992, pp. 141-148) affirm that the WHO has developed an international set of recommendations for good manufacturing practices in the pharmaceutical industry.

For example, when the basic input is a powder it is necessary to protect the employees and to control dust emissions into the atmosphere. This contamination is avoided at Glaxo's subsidiary by the exhaustion system and the use of personal protective masks. Similarly, wastes from the compression of tablets will be incinerated, though they may release solvent vapour during tablet coating processes (Glaxo, 1992). The wastes from the manufacturing of cream and liquids are difficult to

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case comes from recycling initiatives from the subsidiaries of Unilever, Tetra-Pak, Danone and Mercedez-Benz (Cempre News, No. 37, March, 1998).

[104] According to Glaxo's newsletter (1994b, pp. 1-2) more than a corporate environmental policy is needed to improve performance; an EMS should therefore be established by affiliates with the support of the 'Group Environmental Protection Manual'.

[105] See WHO (1987) 'Certification scheme on the quality of pharmaceutical products moving in international commerce and text of good manufacturing practices' (PHARM/82.4, Rev. 3), Geneva: WHO.

segregate (that is, the liquid effluents from the washing of tanks[106]). This water becomes an industrial effluent that must go to the decanter tank (to attenuate the active principles of the raw materials) and later it is sent to the treatment system. Overall, Glaxo's subsidiary[107] has emphasized that the environmental impacts of its operations is low, though the site has neither effluents' treatment nor an incinerator.

The technological pattern of the Brazilian subsidiaries is claimed to be similar to Lilly's other affiliates[108], because the corporation has only 'one standard worldwide'[109]. In 1996, a corporate meeting of 'site heads' from all affiliates was held in Brazil, which is evidence of the high local standards. More specifically, the Brazilian subsidiary undertakes both stages of pharmaceutical production. The primary manufacturing is done at the Cosmópolis site, where Lilly made an investment of US$ 10 million in 1993 for the installation of an incinerator[110] to dispose of both liquid and solid wastes. There is also special treatment for gas emissions made by a "scrubbers" system. The waste of this washing process - soda - will be burnt in the incinerator. Besides this, there is a biological treatment system for sewage prior to discharge into the river. The Cosmópolis site manufactures a large amount of antibiotics and herbicides, and both have a high risk of contamination. Therefore, there are monitoring points throughout the site to check potential contamination. In conclusion, the subsidiary claims that the manufacturing processes have adequate control to avoid environmental degradation[111].

According to HMR's manager[112] the key element constraining better environmental management is the technological pattern of the site. Besides this, access to technological solution will influence and enhance the effective implementation of the corporate requirements. However, the Brazilian pharmaceutical industry is mostly

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[106] Glaxo (1992, p. 10) provides some recommendation of 'best practices' that all affiliates should follow. For example, sites with primary production will produce at least "10% of organic material, salts and inorganic filtering materials" which require effluent controls. In secondary production plants the "liquid wastes are usually discharged, under licence, into local sewage systems and treated by municipal water companies". However, these are 'minimum standards to be improved upon wherever possible'.

[107] Interview at Glaxo's subsidiary, as stated in Note 56.

[108] Interview at Lilly's subsidiary, as stated in Note 54.

[109] There is a managerial tool called 'Lilly Team Excellence' representing the corporate philosophy (Lilly, 1993, p. 7) of total quality management, which reflects the strategy of achieving global presence and critical capabilities (including organizational effectiveness and biotechnology expertise).

[110] Gazeta Mercantil, 29 January 1996, p. A-11.

[111] These pollution control mechanisms at Lilly's site were confirmed by CETESB's official (on 14/10/96).

[112] Interview at HMR's subsidiary, as stated in Note 71.

made up of old machinery, so there are limits to environmental improvements. At HMR there is 'a combination of old machines (installed 20 years ago) and last generation machines' (e.g., to inspect products automatically). The subsidiary received investments to modernize the Suzano site until the year 2000.

Accordingly, new technology has been introduced at HMR's subsidiary during recent years to improve the EH&S performance, which automatically generated a lower level of wastes. The operational process also became more rational with less employees exposure to 'active principles'. This is evidence that an 'aggressive and risky process' must be improved by technological change. If technological change is unachievable then employees are protected with personal equipment. In sum, HMR's manager[113] stated that both sites in Brazil have manufacturing processes designed to avoid employees contaminating the product, consequently they are presumed immune from contamination.

A similar explanation was given by Glaxo and Eli Lilly regarding employees, though HMR and Lilly have more modern and larger sites than Glaxo. Most important is the replication of the findings, that is the main impact of pharmaceutical manufacturing is related to occupational health. The fact that Brazilian employees are less qualified (as asserted by Glaxo and Lilly) and consequently require special protection, is not the main point. More comprehensive and plausible explanations were given by HMR. The risks and impacts of pharmaceutical manufacturing may be controlled at the level of the operational process, therefore the employees exposure is reduced.

The same technological access is required for waste management in the subsidiaries. However, the lack of resources limits the technological upgrading. For example, Glaxo's director[114] mentioned that the Brazilian subsidiary has no resource to invest in an incinerator, which represents an investment of approximately US$ 15 million. Therefore, the wastes generated by the manufacturing of tablets and creams from Glaxo are sent to Bayer's incinerator (German chemical company). At the new site the procedures for wastes segregation will be changed, considering that the plant lay-out does not permit easy access to the manufacturing area. At the current site this is possible, increasing the potential of contamination.

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[113] Ibid.

[114] Interview at Glaxo's subsidiary, as stated in Note 56.

The incinerator at Lilly[115] has an automatic monitoring system, which will release gases only if they are within the acceptable standards. However, there are some restrictions on the type of wastes to be incinerated. The company is not burning 'heavy metals or substances containing phosphorous and chlorine' in order to avoid environmental liabilities related to the release of dioxin and/or the disposal of contaminated ashes (as criticized by Greenpeace, 1992). Additionally, the incineration represents a high investment, which requires a high volume of waste to become profitable. Consequently, Lilly stored three thousand tonnes of waste (in a warehouse approved by CETESB) for five years prior to the incinerator start-up in 1994, which was fundamental in justifying the investment. The subsidiary has been using 60 percent of the incinerator capacity and selling 40 percent to other companies.

The Hoechst Group initiated the incineration of hazardous wastes[116] in Brazil in 1987. It is alleged to be the first incinerator installed in the chemical industry and the first for solid wastes in Brazil (Hoechst, 1994b, p. 5). The incinerator was built to destroy the wastes stored by the Suzano site and other Brazilian sites. Later the wastes incineration became a new business, in which 50 percent of the burning capacity is reserved for external users (totalling 100 clients). This equipment is licensed by CETESB to burn all types of hazardous wastes[117]. Therefore, Hoechst[118] is responsible for the analysis, elaboration of documents for transportation, packaging and the final destination of the ashes (disposed of at the landfill of 'Ecossistema' in São José dos Campos, São Paulo).

As regards product development, Glaxo's report (1994a, p. 16) makes reference to 'investment in the development of CFC-free propellants for use in respiratory treatments'. The new propellant and the gas filling equipment would be available from 1997, thus Glaxo Group will schedule the change of equipment among the affiliates because it represents a large investment. The Brazilian subsidiary will probably receive the new technology when the new site is activated in 1999.

Based on the literature (Evans, 1979; Gereffi, 1983; and Ballance et al., 1992), there are no R&D activities in subsidiaries located in developing countries. This

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[115] Interview at Lilly's subsidiary, as stated in Note 54.

[116] Gazeta Mercantil, 29 January 1996, p. A-11.

[117] According to CETESB the wastes are classified as Class I - hazardous, Class II - contaminated by toxic substances, and Class III - inert (Gazeta Mercantil, 29 January 1996, p. A-11).

[118] Gutberlet (1996, p. 135) has indicated that Hoechst has been spending approximately US$ 12 thousand per year on its internal environmental programmes.

assumption has been corroborated in all cases. However, there are laboratories for the development of process and product in both sites of HMR. Moreover, Lilly's case has a surprising finding since the current status of the subsidiary has been changed to include clinical trials (though it has been developing industrial routes since 1994). Since the patent law was passed in 1996, partnership between local scientists and companies has started to flourish for applied research. For example, Lilly has contracted two scientists to develop medical research aiming to secure the approval of new products by governmental authorities. In effect, Lilly aims to achieve simultaneous approval for new products in many countries, because this is an essential and expensive part of drug development[119].

This simultaneous launching of new products in distinct markets is a key aspect of the globalisation in the world pharmaceutical industry. It aims mainly to accelerate the return on R&D investments (since the bulk of the revenue will come from being first or second to market a new compound). At present, large firms are able to accomplish a worldwide launch in only three years (in the past they required eight to ten years). Ballance et al. (1992, p. 124) stated that Glaxo was one of the pioneers by undertaking a worldwide launch (of its anti-ulcer pill) rather than focusing on just a few national markets. The product became Glaxo's best-selling product reaching US$ 24 billion in 1989.

Another critical issue in the pharmaceutical industry is biotechnological development. It is claimed that biotechnology enjoys the benefit of making chemical substances without major environmental impacts (though UNTCMD, 1993, says that there is scarce evaluation of the environmental implication of biotechnology applications). In the past the industry usually manufactured a large quantity of raw materials to produce a small quantity of products with a substantial amount of by-products. Now it is necessary to develop highly sophisticated molecules to combat novel diseases. Therefore, biotechnology[120] is regarded as the next most promising source of innovation within the pharmaceutical industry.

There are allegations that European and American laboratories have been registering patents of substances from Amazon plants; also that these companies are

[119] For example, "in America it takes, on average, £ 86 million and just over nine years to go from the first human test of a substance to final regulatory approval" (Economist, 1 February 1997).

[120] Eli Lilly stressed that biotechnology is one of the areas of expertise that the company will concentrated on to provide specifically tailored solutions for health care needs (Lilly, 1995c).

exploring indigenous knowledge in their research without paying royalties to local communities, thereby contravening the UN Biodiversity Convention signed in 1992. In the past, the revenue gained from the genetic manipulation of plants' seeds or active principles was exclusive to those who commercially explored it[121]. Under the new rules the profits should be shared with local communities. It is also claimed that drugs based on substances from Amazonian species account for US$ 32 billion per year in the world market[122].

5.3.2.2 - Cost-based explanations

According to Ballance et al. (1992, p. 127) the cost structure of pharmaceutical companies in developing countries "appears to vary with the country level of development and size of the home market". In larger and comparatively sophisticated markets (such as Brazil) manufacturing accounts for 50-60 percent of total costs and the marketing costs are also somewhat high (from 15-30 percent of total).

Despite the lack of specific reference to environmental costs in the literature, it is possible (based on the cases' findings) to state that environmental improvements represent additional costs for the subsidiaries. In Glaxo's case, the new site represents the biggest investment ever made in a Brazilian subsidiary (it will cost US$ 111.3 million[123], more US$ 30 million in equipment). At the same time, the Glaxo Group is closing down 17 factories worldwide. More specifically, Glaxo's director[124] stated that the fact that the technology was obsolete did not justify the investment in itself. However, the abolition (in 1993) of governmental price control for pharmaceutical products was a political factor supporting this investment in Brazil.

In short, the investment was not made on environmental grounds. Eventually pressure from the Brazilian environmental agency was another source of pressure, since the current site could have legally been closed since the late 80s. On the other hand, the site could be closed by the headquarters (because it was not complying with corporate principles). Altogether, the site was neither complying with Glaxo's GRM,

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[121] For example, Bristol-Myers-Squibb developed a drug for high blood pressure (generating US$ 2.5 billion per year) based on the effects of the poison of a native snack from Brazil (Veja, 10 July 1992, pp. 74-76).
[122] Folha de S.Paulo, 1 June 1997, p. 2.
[123] Informativo CRQIII, December/January 1996, p. 8.
[124] Interview at Glaxo's subsidiary, as stated in Note 56.

GMP and quality policies nor with local legal requirements. In such a context the deal with FEEMA was crucial, because it gave more time to relocate Glaxo's site. In sum, the threat to close the site was used (as a bargaining counter) by all sides involved in the long negotiation.

Eli Lilly has a distinct cost-related approach. For example, Lilly's director[125] stated that waste's reduction is a major concern because it incurs costs. In the early 90s, wastes were irrelevant but at present 'they are important because any extra cost may challenge the company's competitiveness'[126]. Waste's reduction is mainly achieved through the improvement of process efficiency[127], which will contribute to reducing the costs of adequate disposal (that is, incineration). Such a perspective is very similar to the 'win-win approach' that less waste means more productivity and less costs for disposal (Smart, 1992; Schmidheiny, 1992).

In conclusion, the improvement in environmental performance is a consequence of the cost reduction approach. Additionally, there are new investments[128] planned for the Cosmópolis site, which will inadvertently result in better environmental performance. Corporate policy has determined that any new project must already have incorporated S&E concern. For example, the current projects are focused on increasing productivity, reducing costs and the number of work hours lost through accidents. This will be accomplished without the use of substances that harm the environment (such as solvents, brine and CFCs). Consequently, the project will be more expensive now than it would be ten years ago.

Finally, the main cost-related concern at HMR regards manufacturing efficiency. This means a production process with well-adjusted technology and low externalities, which will consequently reduce production costs and potential liabilities. The HMR's manager[129] stated that, despite environmental improvements, that such approach may achieve low costs, was paramount for the company's competitiveness.

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[125] Interview at Lilly's subsidiary, as stated in Note 54.

[126] The same argument about cost competitiveness is made by both the corporate report (Lilly, 1995a) and the subsidiary's report (Lilly, 1995b).

[127] The corporation states that environmental liabilities and litigation represented a figure of US$ 342 million in 1995 (Lilly, 1995a, p. 43). Given that the company was designated as responsible for clean up sites under the Comprehensive Environmental Response, Compensation and Liability Act (known as Superfund) in the US. In 1992, a total of US$ 139,400 was spent on the 'asbestos abatement program' and other environmental and legal matters (Lilly, 1993).

[128] The subsidiary's report (Lilly, 1995b) has indicated investments (US$ 55 million in 1995) on the environment, to increase operation capacity and modernization.

[129] Interview at HMR's subsidiary, as stated in Note 71.

The implementation of corporate environmental policy is constrained by the need for investment to meet strict standards[130]. The investment aiming to achieve "fine tuning" in the manufacturing process must also be justified in business terms, though environmental improvements may place the company ahead of its competitors. Porter and van der Linde, 1995a, suggest that an environmentally friendly process is a competitive advantage. However, there is no need to be far ahead of competitors because each step forward may represent a higher cost.

Other cost-related factors for HMR's subsidiary are energy price, availability of resources, and low labour costs (which tends to be less qualified in Brazil reducing productivity). In summary, these are also the advantages of being located in Brazil, since companies are not installed there as a consequence of lax environmental legislation. However, such a lax regulatory context will prevent technological innovation (resulting in improvement of the environmental performance in the core markets) from being made in Brazil. This lax context results in another cost-related factor, since the Brazilian subsidiary will require lower investments. In short, HMR provided a very clear overview of cost-related aspects and their implications for the environmental performance of TNCs' subsidiaries in Brazil.

5.3.2.3 - Competitive aspects

In brief, Glaxo's director[131] stated that large pharmaceutical companies have very "good environmental policies, which have a specific focus on safety and prevention of accidents". On the other hand, domestic firms lack such concern, therefore 'foreign companies tend to lead in this area'. Regarding Glaxo's findings, such leadership is probably at corporate (and rhetorical) level since the Brazilian subsidiary has a poor environmental performance. Besides this, it became clear that the environmental practices of major competitors, such as Roche (Swiss company) and Merck (German company), include well-defined plans with an emphasis on accident prevention and fire combat.

[130] Hoechst Group invested DM 265 million in environmental protection measures in 1995. At the same year the operational costs of environmental protection were around DM 1,470 million (Hoechst, 1996c).
[131] Interview at Glaxo's subsidiary, as stated in Note 56.

It was affirmed that Glaxo's new site will be visibly superior when compared with local competitors. It is said to have state-of-the-art technology, incorporating the most modern concepts available within the industry. For example, EH&S concern is already integrated into the manufacturing process (e.g. including air emissions control, waste management and an effluents' treatment system). Overall, it is claimed to be a major investment among the pharmaceutical companies located in Rio. However, other pharmaceutical companies have also been investing recently in the modernization of their Brazilian businesses (such as Zeneca[132], Hoechst[133] and BASF[134]).

HMR's subsidiary[135] is the largest laboratory in Brazil, and its competitors are Bristol Meyers Squibb (American), Roche (Swiss) and Aché (Brazilian company); though the company competes with small laboratories in specific products lines. The subsidiary claims to be 'one step beyond the competitors' in EH&S issues. This stems from the fact that the chemical industry is susceptible to large accidents and risks. Consequently, the pharmaceutical companies that are linked with chemical operations achieved some expertise in EH&S issues (specifically the managerial ability to control the risk of operations).

On the contrary, exclusively pharmaceutical companies have an incipient concern when compared with those aggregated to chemical groups. However, some aspects of EMS in chemical operations do not suit pharmaceutical processes; others are appropriate though not yet widespread within the industry. Therefore, HMR has expertise to go beyond the purely pharmaceutical companies. The current HMR approach towards EH&S issues originated in the chemical divisions of both Dow and Hoechst[136]. Marion copied from Dow Chemical and Hoechst pharmaceutical was managed in conjunction with the chemical division. Thus, the HMR subsidiary will incorporate the best aspects of Marion Dow's legacy into a German structure.

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[132] Zeneca's pharmaceutical division has been investing in Brazil since the demerger from ICI in 1993 (interview at Zeneca Agrochemical, on 19/09/96).

[133] HMR is investing US$ 120 million in a new factory at the Suzano site (Gazeta Mercantil, 3 December 1996, p. C-1).

[134] BASF's pharmaceutical division - Knoll - received US$ 30 million to modernize and expand its operations in Rio (Gazeta Mercantil, 28 November 1996, p. C-4).

[135] Interview at HMR's subsidiary, as stated in Note 71.

[136] ABIQUIM's official said that Dow has good environmental practices and Hoechst is leading the regional coordination of the RC's implementation from its site in Suzano (interviewed on 04/09/96).

Amongst the foreign pharmaceutical companies in Brazil, Glaxo's subsidiary is one of the few straight pharmaceutical companies. Glaxo focuses on pharmaceutical standards and as such it claims to have one of the best safety records within the industry. However, there are many diversified subsidiaries with joint chemical and pharmaceutical activities (such as Bayer, BASF, Hoechst, Rhodia, Novartis and Eli Lilly). Generally, a difficulty for companies with chemical and pharmaceutical businesses is to segregate the environmental impacts of each operation. Safety activities are usually directed towards the higher risks, that is, on the chemical operations.

Overall, this is the main industry-related difference between Glaxo and the other pharmaceutical cases. This reinforces the relevance of the research stratified sample, which comprises firms with clearly distinct characteristics. This latter aspect has elaborated the evaluation of industry differences, since the selected cases display diversity among large pharmaceutical companies. Besides this, they clearly represent the Brazilian reality, which resembles the world pharmaceutical structure of a few large companies of which some are part of chemical groups.

To restate, the initial criteria was to investigate companies operating exclusively in the pharmaceutical sector. However, in the Brazilian context most companies have interfaces with both chemical and pharmaceutical sectors (such as Lilly and Hoechst). Therefore, it was impossible to select purely pharmaceutical companies. According to Gereffi (1989) only a few American companies started as exclusive producers of 'ethical drugs'. At present pharmaceutical companies have diversified businesses (including OTC drugs, toiletry products and animal medicines).

In sum, the EH&S standards are integrated in companies with chemical and pharmaceutical businesses. If on the one hand, this may result in stricter environmental guidelines, on the other it may neglect specific pharmaceutical requirements (such as those regulated by the WHO). These issues should be further explored considering that Glaxo (a genuine pharmaceutical company) has the poorest environmental performance among the three cases.

The influence of chemical on pharmaceutical practices was emphasized by the findings for Lilly[137]. It was indicated that DuPont (chemical company) sets the

[137] Interview at Lilly's subsidiary, as stated in Note 54.

'benchmark' for SHE issues in Brazil. DuPont's outstanding practices are justified by the following aspects: (a) its history as a manufacturer of explosives, thus safety has always been a major concern, (b) its strict practices in Brazil, such as the emergency barriers in the motorway near the explosive site, and (c) the site manager living at the plant to guarantee safety performance.

Concern with leading practices from the chemical sector may be related to Lilly's herbicide unit at the Cosmópolis site. However, it is relevant to note the lack of leadership in SHE issues among pharmaceutical companies. It is claimed that domestic firms have neither concern about employees nor with the environment[138]. The difference between domestic and multinationals lies in the background of the headquarters.

It is interesting to emphasize this assumption about multinationals' performance in Brazil[139] because this a very common comment from TNCs' subsidiaries, government authorities and media. However, there are exceptions across industries in both types of companies: domestic ones (e.g., Cetrel, Petroflex, Vale do Rio Doce, Aracruz, Bahia Sul and Hering) with good performance[140], and TNCs with poor performance[141] (e.g., Rhodia and Bayer).

5.3.2.4 - Market-related explanations

The marketing behaviour of a selected subsidiary must be analysed in face of the peculiar characteristics of the local market. For example, there is a strong emphasis on selling medicines by brand name and without prescription. Glaxo's subsidiary[142] suggests that these aspects facilitate the commercialization of pharmaceutical products in Brazil. On the other hand, the economic instability of the Brazilian economy was indicated as one of the factors limiting investments at Glaxo (e.g., the new site was

[138] Such a claim was confirmed by government authorities regarding small and medium companies in Brazil (Gazeta Mercantil, 27 November 1996, p. A-1). However, there is no evidence specifically on large pharmaceutical companies, such as Aché, Prodome, and Tortuga.

[139] Nevertheless, a survey from Price Waterhouse affirms that only 15% of the biggest companies in Brazil have environmental management. Among those mentioned for having an EMS most are multinationals such DuPont, Volvo, Sandoz, IBM, with the exception of the Brazilian mining company - Vale do Rio Doce (Exame, 24 April 1996, pp. 66-67).

[140] Schmidheiny, 1992; UNEP, 1994; and 'Saneamento Ambiental', no. 37, 1996, pp. 46-47.

[141] Informativo CRQIII, December/January 1996, p. 5, and América Economia, January, 1998, p. 22.

[142] Interview at Glaxo's subsidiary, as stated in Note 56.

postponed due to lack of financial resources). It was after 1995 with the economic improvement in Brazil, that the Latin America affiliates became more important for the corporation. In the end, it was mainly this market-related aspect that justified the new site project[143].

In Lilly's case the majority of its production is sold in the domestic market (around 92%), but since 1994 exports have been increasing (from 5% to 8% in 1996) to Latin America countries and Japan. Despite the common focus on the domestic pharmaceutical market (an orientation shared by Glaxo and HMR), Lilly has developed other interests in the local market. There is specific interest in the opportunities for waste management in Brazil, and the customers for incineration services are multinational companies[144]. This is a very interesting aspect of the incineration business[145], because TNCs have invested in technology to burn their wastes and consequently to provide similar services to other companies. However, local firms are neither in the business of incineration nor able to use those available, because of the high cost it entails.

Likewise, the Brazilian domestic market is responsible for the consumption of approximately 90 percent of HMR's subsidiary production. A small proportion (from 5 to 10%) of the production is exported to other Latin American markets. As a consequence of the merger, HMR's current subsidiaries in South America will be restructured in the near future to rationalize regional manufacturing. Additionally, HMR's manager[146] emphasized that a fundamental change took place between government and industry. After a long period, the price control regime was abolished in 1993. Thereafter, the company has concentrated more on restructuring and on market aspects of the business.

Overall, the only case to present evidence of concern with consumers was HMR. After the merger of Marion and Hoechst it developed a 'minimum requirement' for pharmaceutical operations within HMR. During this process it eliminated the references to chemical operations. For example, in the pharmaceutical case the concept of EH&S must include the final consumer. Moreover, it is necessary to be aware,

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[143] According to Glaxo (1997, p. 5) Brazil now represents the Group's tenth largest market.
[144] Interview at Lilly's subsidiary, as stated in Note 54.
[145] The market of hazardous waste management is already dominated by TNCs' subsidiaries, such as Hoechst, Novartis, Elanco, BASF and Bayer (Gazeta Mercantil, 29 January 1996, p. A-11).
[146] Interview at HMR's subsidiary, as stated in Note 71.

during the manufacturing process, that any mistake may result in a serious and expensive problem outside the company.

The fact that pharmaceutical companies have products for final consumers is a key aspect in explaining their EH&S concern. This aspect is not so relevant for the chemical industry as its products will be re-processed by other manufacturers. In such a case the products will reach the consumer after having passed through many forms of inspection. On the contrary, medicines will go directly from the manufacturing site to consumers.

5.4 - Conclusions

The pharmaceutical sector's survival depends on a continuous stream of innovation, requiring a large injection of financial resources to underwrite R&D and a regulatory climate that facilitates innovative processes. This is mostly because when the patent protection expires the generation of revenue quickly declines as generic imitations are launched (EC, 1997).

Such a brief summary of the pharmaceutical industry's characteristics enhances the dynamic context in which pharmaceutical companies operates. However it over simplifies the interfaces of this industry with other industries, and the social and political consequences of their actions in face of their products' nature. It is evident that most of the concern with industrial analysis in the pharmaceutical sector is directed towards regulation of product protection by patents (which is a truly distinctive characteristic of this sector). This approach may be criticized for its emphasis on the sector's critical factor (i.e., patents) without questioning the by-products and/or potential impacts of pharmaceutical manufacturing (such as suggested in section 5.3.1.2; the industry associations concentrate on lobbying for its members and not on their EH&S performances).

Based on the industry profile and empirical findings presented earlier in this chapter, it is possible to draw some conclusions. Firstly, considering that other industries produce higher levels of pollution, the pharmaceutical industry has been exempt from environmental pressures. For that reason, pharmaceutical companies may

have maintained 'rhetorical' commitment towards environmental issues, but lack the practical side of their pledge (confirming Gleckman, 1995 and Levy, 1995). Moreover, UNTCMD (1993) suggests that pharmaceutical TNCs have innovative environmental policies and programmes as a consequence of the availability of financial resources; this assumption was refuted by Glaxo and HMR, but confirmed by Lilly.

For example, the pharmaceutical cases issued formal statements on environmental matters. However, none of the subsidiaries have staff exclusively responsible for environmental issues (as is common practice among chemical industries). It is usually the industrial director (e.g., Glaxo and Lilly) that is the individual responsible for the implementation of corporate environmental policy. The environmental impacts caused by their operations (primary and secondary manufacturing in all subsidiaries) are considered by both companies and environmental authorities as minor problems[147]. Consequently, there is no industry association commitment and/or pressure upon its members regarding environmental issues (such as in the chemical industry, which refutes Pearson, 1985). This fact also suggests that there are policy implications for those situations in which the pharmaceutical industry is regarded as a segment of the chemical industry. There are close interfaces that will be implicated in their major environmental impacts. Nevertheless, there are other EH&S issues very peculiar to pharmaceutical manufacturing (such as occupational and consumer health), which should be addressed separately.

At this point, is relevant to mention that are structural similarities between the chemical and pharmaceutical sectors in the Brazilian context. Briefly, both industrial sectors - chemical and pharmaceutical - are oligopolistic and dominated by TNCs' subsidiaries. Besides this, these subsidiaries are all diversified companies (thus intensive in technology and capital). Finally, these are mature industries which have had their structural organization extensively analysed in the literature (UN, 1994; ILO, 1995; EC, 1997; Ballance et al., 1992 and Gereffi, 1983), though environmental issues are not addressed in the pharmaceutical sector.

[147] CETESB informed that the pharmaceutical industry is responsible for 0.08% of hazardous wastes generated in the metropolitan area of São Paulo (Gazeta Mercantil, 29 January 1996, p. A-10).

It is possible to argue that the lower (especially when compared with chemical operations) potential environmental impact in the pharmaceutical sector has led to less concern. At least such an argument has been constantly used to justify the lax environmental commitment and lack of specific staff in the cases. Paradoxically, it is primary manufacturing that will elevate the preoccupation with risk and safety. It is also recognized in all instances that the health of employees and consumers is at stake. Consequently this is regarded as a major impact of pharmaceutical operations.

As mentioned in the previous chapter, one of the proposition defined in the framework of analysis (Porter, 1980, 1991, 1995; Gleckman, 1995; Pearson, 1985; and Beliveau et al., 1994) was specifically devoted to potential industry-related (such as technology, costs, market, and competition) explanations for the implementation of corporate environmental policies in TNCs' subsidiaries. More specifically, the proposition was: ***If industry associations have environmental guidelines, TNCs' subsidiaries have stricter implementation of corporate environmental policies.***

Overall, the lower potential of environmental degradation resulted in less media, public and NGOs attention towards this industrial sector. Consequently, there is a causal relationship between low impacts and lack of commitment from the pharmaceutical industries associations. However, there is no evidence to suggest that the association commitment would improve the companies' environmental performance. In view of this evidence, this proposition should be re-written according to the pharmaceutical cases, as follows: ***The industry sectors with a high (or low) potential of environmental degradation (that is, by volume of pollutants) will result respectively, in strict (or lax) implementation of corporate environmental policies in TNCs' subsidiaries.***

Surprisingly, but still indirectly related to the proposition's assumption, the most obvious difference among the pharmaceutical cases comes from the combination with chemical operations. This is specifically the case with HMR and Lilly, therefore concern with primary operations is higher in these companies when compared with Glaxo (a genuine pharmaceutical company). HMR and Lilly are also more concerned with environmental impacts and operational risks. Additionally, both companies have a more proactive view towards safety (the industry's major focus); this included a

voluntary emergency scheme supported by Lilly's site in Paulínia, and investments in new technology aiming to reduce operational risks at HMR.

In general terms it proved difficult (but interesting) to compare Glaxo with the other cases. The current state of the site is very poor (the environmental authority affirmed that it should be closed) and environmental management has been introduced only recently, resulting in a comparison of extremes (even though the company announces major investments in the Brazilian subsidiary).

In such a case, it is relevant to comment on the fact that the use of a small (stratified) sample based on polar (or opposites) types is suggested by Glaser and Strauss (1967); besides it was empirically applied by Pettigrew (1990, p. 267) and discussed by Eisenhardt (1989, p. 537) among other examples of case studies research. The latter states that "given the limited number of companies cases which can usually be studied, it makes sense to choose cases such as extreme situations and polar types in which the process of interest is 'transparently observable'". Therefore, as was followed in this research, the theoretical sampling assisted in the replication of some findings. Finally, Yin (1994) has recommended this method for imposing variance within the sample thereby increasing reliability in case studies research.

In conclusion, there are no common points among the cases' approaches for EH&S issues, apart from the same pharmaceutical external guidelines for 'good manufacturing practices'. Moreover, HMR has the biggest market-share and Lilly is the 8th biggest pharmaceutical companies in Brazil. Glaxo, however, was not among the largest pharmaceutical companies until 1995, which suggests that the subsidiary was a marginal business (representing 0.6% of the Group sales in 1995[148]) within the corporation. More recently the subsidiary received investments for a new site which has already changed its ranking in the Brazilian pharmaceutical market (that is, tenth in the ranking by total sales in 1996[149]).

As far as the three cases are concerned, the most unexpected findings came from Eli Lilly. The company's high EH&S concern and practices are impressive when compared with the other cases. There is some evidence that Lilly is concerned with its public image. As well as this there is strong influence from its chemicals operations

[148] Glaxo Group sales was US$ 15,850 million in 1995 (Hoover's Handbook of World Business, 1997, p. 225), and Glaxo's subsidiary sales was US$ 98.1 million in 1995 (ABIQUIM, 1996).
[149] Glaxo is among the major British companies in Brazil with US$ 194.3 million in sales in 1996 (Exame, 'Melhores e Maiores', 1997, p. 95).

within the whole company. There is also clear interest in exploring market opportunities in the waste management business. Finally, there are empirical findings that are not industry-related (both in their nature and in comparison with the other cases), therefore other potential explanations will be discussed in the next chapter.

Chapter VI - Case studies analysis based on the interdisciplinary model

The main objective of this chapter is to address the research propositions that were used as 'rivals' to industry-related explanations (discussed in chapters four and five of this thesis) for the implementation of corporate environmental policies in TNCs' subsidiaries. Consequently, this chapter will answer the research question (in a complementary way), since the industry-related explanations were not sufficient to explain the incorporation of environmental issues by the Brazilian subsidiaries of foreign owned firms.

The present discussion is based on the comparative analysis of findings from six case studies. The first section focuses on explanations related to the countries of origin and corporate management of the selected cases. The following section will re-evaluate the research design in order to discuss the methodological implications of the empirical data. In this latter section research propositions will be addressed and relevant evidence will be summarized. Finally, the last section presents the conclusions of this thesis and suggests aspects that deserve further research.

6.1 - Comparative analysis

The research design (introduced in section 1.2 of this thesis) set out a pattern of analysis focused on cross-country and cross-industry comparisons. After the empirical phase of research was completed, the data analysis was organized into categories; this was partially accomplished in the previous chapters. More specifically, chapter three described and analysed the contextual conditions in Brazil. Chapters four and five described the characteristics of the selected industries and economic and regulatory aspects that have affected the implementation of corporate environmental policies in the Brazilian subsidiaries.

The present section has among its objectives: (a) to complement the previous explanations of corporate environmental policy implementation, (b) to refute any simplistic view from the literature that has indicated either that corporate environmental policy is explained by single factors such as regulatory policy or the

technological and economic characteristics of the industry, and (c) to reinforce some aspects from the previous analysis. This dialectical position is particularly reliant on empirical investigation which claims that similar and divergent findings are also the result of different perspectives used by the researcher: "when one adopts a different perspective with which to view ostensibly the same organizational phenomena, one simply focuses on different things" (Gioia et al., 1989, p. 503).

In conclusion, it is expected that the empirical findings presented in this section will support the assumption that the origin of the subsidiaries is a relevant aspect of their environmental policies and practices. Accordingly, the national and management aspects of environmental practices are based on findings from two companies in each country of origin. Consequently, any generalization from them should be carefully understood as analytical generalization (as such this stratified sampling is supported by the literature without jeopardizing the objectives of this research, Eisenhardt, 1989; Miles and Huberman, 1994 and Yin, 1993).

Otherwise, if such an assumption is not supported by the findings the implementation of corporate environmental policy will be a result of other variables, such as industry character (basically representing economic factors) and/or the host country character (representing a regulatory factor, since no social pressure affecting Brazilian subsidiaries was identified).

6.1.1 - Explanations grounded in the home countries

This thesis assumed that the regulatory policy of the home country would be a major driving force in the definition of corporate environmental policy. Consequently, aspects of the regulatory context in the countries of origin should be identified in the implementation of corporate environmental policies in the subsidiaries, based on the influence of the so-called national character. Considering the broad scope of analysis followed in the attempts to explain corporate policies, the discussion that follows in this section will stress cultural and economic embeddedness in order to explain differences among national contexts.

Vernon (1993, p. 14) has emphasized "the power and persistence of national characteristics that are likely to distinguish the respective roles" of the US, Japan and

the European Community in future environmental negotiations. Moreover, Vernon suggested that the understanding of "the history, institutions, and values of national decision-making processes may prove especially critical" (Ibid., p. 42) in the enforcement of international agreements. UNTCMD (1993, p. 38) states that "a close relationship between regulation in the home country of the corporation and corporate EH&S practices" was repeatedly established by the findings of its benchmarking survey. More specifically, "sixty two per cent of the respondents indicated that the development of EH&S laws and regulations in the home country had motivated changes in environmental policies and programmes" (the same source of influence was found in American companies, by Flaherty and Rappaport, 1991).

National character is a construct emerging from literature in the psychology[1], anthropology[2] and sociology fields. Approaches are broadly divided into culture-centered and personality-centered (the latter is not taken into consideration by this thesis). Following an anthropological perspective (based on cultural anthropology in which the nation-states are often the primary unit of analysis), Milton (1996) suggests that cultural theory is a valuable resource for the environmental cause. More specifically, Milton (Ibid., p. 55) stressed that "environmental knowledge varies among cultures, and the description and analysis of this diversity, are important resources in the quest for environmental protection and improvement".

Benton and Redclift (in Redclift and Benton, 1994, p. 3), state that "the opposition between nature and culture (or society) made room for social sciences as autonomous disciplines distinct from the natural sciences, and undercut what were widely seen as the unacceptable moral and political implications of biological determinism". From a sociological perspective, the distinction between what is human and what is nature allowed the creation of the social sciences. At present the link between these scientific fields must be re-established.

In brief, the culture-centered approach focuses on habits, practices, norms and values peculiar to a culture structure. Milton (1996, p. 63) stressed that culture consists of perceptions as well as interpretations situating humans within the world. Moreover,

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[1] See Alex Inkeles and D. J. Levinson's "National Character", in Lindzey and Aronson's Handbook of Social Psychology, 2nd edition, vol. 4 (Addison-Wesley, 1969).

[2] See Margaret Mead's "National Character", in the reader by Sol Tax, Anthropology Today (University of Chicago Press, 1962).

"it is indeed the case that we could not survive without it, for it is what makes the world meaningful to us".

In political science national character is also based on cultural explanations. According to Stoessinger (in Little and Smith, 1991, p. 27) national character patterns are a fact, but "their uniqueness and their significance in supporting national unity vary from nation to nation". National character is often addressed in international relations by studies following a realist perspective. This happens basically through its specific focus on nation-states and their representation of power. As such national character is an intangible source of power available to the nation-state. Stoessinger (Ibid., p. 26) states that this is surely one of the most perplexing concepts. Accordingly, "few social scientists would deny that certain cultural patterns occur more frequently and are more highly valued in one nation than in another". Paradoxically, at the same that "national character seems to be an indisputable factor" the literature lacks agreement on what "cultural patterns" are.

According to Erramilli (1996, p. 233), "classical trade theory explains the direction and composition of international trade based on the resources endowments of individual nations". More recent theoretical approaches (e.g., Porter, 1990) explain national competitive advantage as being created by the interplay of economic and strategies factors. Additionally, Hampden-Turner and Trompenaars (1995, p. 4) stress "that culture of origin is the most important determinant of values. In any culture, a deep structure of beliefs is the invisible hand that regulates economic activity. These cultural preferences, or values, are the bedrock of national identity and the source of economic strengths and weakness".

In specific relation to MNCs, Doz (1986) affirms that the home country becomes a sanctuary market because of the high percentage of companies' sales there. Such a phenomenon has consequences in the philosophy of management followed by TNCs. More specifically, this is illustrated by the 'ethnocentric' type (Perlmutter, 1969) of multinational company, in which emphasis is placed on the cultural values of the home country.

Among the potential explanations for such behaviour is the fact that the size of the domestic market will determine a high and/or low percentage of sales. For example, in European-based companies the domestic sales may be less than 10 percent

of overall sales. The same figures for US-based companies are about 50 percent (Czinkota, 1992, pp. 299-301). On the other hand, such figures also constitute evidence that the importance of the 'world market' will vary from one TNC to another. In sum, table 6.1 illustrates such an argument for the selected cases.

Table 6.1 - Selected transnational corporations per sales - 1996

Industrial sectors and firms	*Home country (% of sales)*	*Total sales (US$ million)*	*Foreign sales (US$ million)*	*Foreign sales (%)*
1- Chemical				
Zeneca+	UK (9%)	8,903	8,102	91
DuPont++	US (52%)	43,810	21,029	48
BASF+++	Germany (27%)	28,032	20,463	73
2- Pharmaceutical				
Glaxo Wellcome*	UK (8%)	13,012	11,971	92
Eli Lilly**	US (58%)	7,347	3,086	42
Hoechst***	Germany (21%)	29,268	23,121	79

Sources: + Zeneca (1997), ++ DuPont (1996), +++ BASF (1996), * Glaxo (1997), ** Lilly (1996), *** Hoechst (1996), in which the HMR's sales accounts for 25.5% of total group sales.

The relative importance of the home market should place higher or lower emphasis on the local constraints faced by TNCs (e.g., the environmental regulatory policy). The empirical evidence from the American cases (DuPont and Lilly) has confirmed Doz's (1986) suggestion that characteristics of the country of origin permeate the TNCs' management when the home market is responsible for a large portion of corporate sales. Doyle et al. (1992, p. 432) states that American subsidiaries in the UK have a classic home country orientation, mainly in "their reliance on US managers and their centralized control systems". In sum, "they retained an ethnocentricity more typical of companies at the early stage of internationalisation" (as indicated by Perlmutter, 1969).

The British cases (Glaxo and Zeneca) have not produced clear evidence of influences from their home countries because the UK is not a sanctuary market (as shown in table 6.1). The German cases presented more ambiguous evidence because their home market is an important market but not the largest. However, German society has tight links between employees and industry (defined as "meso-economy"

by Hodges and Woolcock, 1993) which enhances the relative influence of the home context. For example, BASF's chairman affirmed that the company "continues to manufacture its products in Germany in spite of the high costs and strict environmental regulations"[3].

Finally, evidence from the British and German cases refuted the UNTCMD's (1993) results in which home legislation was indicated as the main constraint for TNCs' environmental management (Glaxo, Eli Lilly, BASF and Hoechst were among the respondents of this survey). It also justifies the benefits of case studies in evaluating TNCs' environmental management; because a quantitative approach (in which findings are aggregated) is inadequate to indicate the specific behaviour of each category investigated.

Overall, this section does not simply aim to conclude that there are differences between TNCs due to their origin, but to explain why these differences exist and if there are any links with their patterns of behaviour towards environmental issues. Consequently, the empirical findings presented in the subsequent section show the differences between the selected companies based on specific characteristics of their home countries. The table 6.2 illustrates the context in terms of corporate governance in the selected countries.

[3] However, BASF will manufacture more chemicals abroad than at home (Economist, 10 May 1997).

Table 6.2 - Benchmarking of selected business environment

	Concentration of ownership	Strategic role of boards	Strategic information	Rate of return on investment
United States	Dispersed, but some consolidation through institutional ownership.	Majority of boards are dominated by managers.	Excellent diffusion of public information.	Companies are recognized as profit maximising organizations.
Germany	Vested in founding families and concentrated in enterprises. Proxy rights are concentrated in the hands of banks.	Supervisory boards exercise only an overseeing role. Real managerial functions are exercised by management boards.	Large share-holders and proxy holding banks are fully informed.	Profit (return on capital) is considered necessary, but is not recognised as the overwhelming objective of resources allocation.
United Kingdom	External fund management which stresses risk diversification, liquidity and short-term performance.	Greatest influence is exercised by executive directors.	Liquidity and capital gains to stock market; company strategy to emerging stable ownership.	Profit maximisation is recognized as a prerequisite of economic efficiency.

Source: Adapted from OECD, 1997 (pp. 174-175, pp. 178-179 and pp. 182-183.)

6.1.1.1- British origin

Glaxo[4] and Zeneca[5] have provided vague evidence regarding the influence of the regulatory policy from the home country on the subsidiaries' practices. Based on the empirical findings, it may be said that the two British companies have maintained a poor environmental performance. Moreover, there are no specific targets regarding the incorporation of environmental issues. More specifically they have been reported as not complying with Brazilian environmental legislation. Consequently, their sites have been causing adverse environmental impacts (as mentioned in chapters four and five).

Additionally, both subsidiaries lack a corporate administration level in Brazil, in such a case the corporate environmental policy is adapted and implemented directly at operational level. It was also recognized that their sites are technologically obsolete.

[4] Interview at Glaxo's subsidiary (on 01/10/96).
[5] Interview at Zeneca's subsidiary (on 19/09/96).

Finally, in both cases it became clear that the subsidiaries' financial situation is the only issue really controlled by the headquarters. This aspect is confirmed by Carr (in Papadakis and Barwise, 1997, p. 107). The author states that "British short-termism reflects a preponderance of strong financial control style companies over-reliant on high 'comfort factor', financial hurdle rates, and is generally less proactive, less strategically focused".

As expected, there are some differences between the two British companies. Among the most obvious are their location in Brazil, and the industrial characteristics. Both cases presented environmental liabilities, but Zeneca has a more qualified and committed staff (though very small). Glaxo's staff is less qualified for environmental issues though the corporate commitment is more ambitious. The companies have distinct positions within their segments. At present Glaxo is the 10th biggest pharmaceutical company, but Zeneca is second in the ranking of the agrochemical segment. Nevertheless, it was suggested that both are emerging from a very retroactive phase in terms of financial results, restructuring of the business, reinvestments and/or access to new technology.

More specifically, Glaxo claims that corporate environmental policy has an international scope and background. At the same time it is related to very structural (thus homogeneous) factors such as the GMP norms regulating pharmaceutical manufacturing. However, it should be mentioned that the analysis was complicated in both cases by the huge discrepancies between policy statement from the headquarters and implementation at site level.

Moreover, the environmental commitment from Glaxo Group (Glaxo, 1992, pp. 15-16) makes explicit references to initiatives in the UK (such as ICC and RC). There are also references to the BS 7750 and EMS from the European Commission (Glaxo, 1994), of which the first could be understood as home country influence in the definition of the company's environmental management. In terms of environmental performance there are many references to sites in the UK and mainly commitment to wildlife conservation in the UK coast or worldwide (managed by UK-based NGOs). There is no reference to the Brazilian site, but it is quite obvious that the poor environmental performance of this site could not produce any 'best practice' to be

disseminated throughout the corporation. Therefore, it is clear that the focus is placed on best practices at British and European sites.

To summarize, the similarities between Zeneca and Glaxo are poor environmental performance, non-compliance with local requirements, decentralized structure (that is, the subsidiaries have autonomy to adapt and implement the corporate environmental policy) and high dependence on local profits to make new investments. It may be argued that there are connections between the decentralized approach followed by British companies (Campbell and Goold, in De Witt and Meyer, 1994, p. 301) in Brazil and the historical perspective of environmental incorporation by business in the UK (Smith, 1993). The fact that British environmental authorities eschew confrontation but negotiate case-by-case (Vogel, 1986) may be an indicator of a more lax climate (Wintle, 1994). At the same time, there is lack of interest from Britain (mainly in business terms) in Latin America (Miller, 1993).

Considering such background, Glaxo's poor performance as well as Zeneca's past liabilities (which could be partly explained by ICI's internationalization through acquisition of domestic companies) could be more easily explained. For example, both Groups are highly dependent on foreign sales, of which Latin America represents a small percentage of their turnover. This fact could explain why two leading companies are promoting "greenwash". However, the analysis of British cases is complicated by other contradictory factors, such as the existence of environmental groups at home with a radical stance towards the business community (illustrated by the Greenpeace versus Shell case, Dickson and McCulloch, 1996).

According to McGrew (in Smith, 1993, p. 21) the British environmental movement "consists of a diverse and diffuse array of groups whose only common objective is a concern to protect the environment". But this is not atypical, since the same diversity is found in other industrial societies. Vaughan and Mickle (1993, p. 30) state that environmental pressure on business practices is quite strong from NGOs, public, media and competitors and more superficial from trade bodies in the UK. In short, it is obvious that the high environmental concern at home was not imitated by British subsidiaries in Brazil.

Consumer pressure for corporate change has been noted in the UK, although British consumers do not appear willing to pay a premium on green products. For

example, the sales of unleaded petrol only became substantial (approximately 30% of total passenger vehicle fuel sales) after the government imposed a lower tax, making unleaded cheaper (Vaughan and Mickle, 1993, pp. 36-37). A similar pattern of consumer behaviour backed by legislation and/or economic incentives in the UK was observed by Wong et al. (1995) regarding household detergents, recycled paper, unleaded petrol and automobile catalytic converters.

Despite the move towards deregulation and self-regulation implemented in the UK, a contrary trend is evident with greater direct regulation of environmental matters (McGrew, in Smith, 1993, p. 19). Moreover, the European Community is increasingly active in establishing environmental regulations, directives and decisions aiming at community participation and harmonization of national policies. However, the implementation of environmental initiatives remains a source of conflict and concern. According to Smith (in Smith, 1993, p. 3) "the UK badly needs a Freedom of Information Act that would remove the secrecy that has surrounded pollution regulation in the past".

Despite being deceptive as results, the comparative research design was improved by this relatively low level of environmental concern in the British subsidiaries. Moreover, these cases brought other potential explanations into the analysis which are out of the main scope of this thesis (as will be discussed in section 6.2.2).

6.1.1.2 - American origin

There are some interesting findings common to the two American subsidiaries, that is, DuPont[6] and Lilly[7]. First, and perhaps most relevant, is the concern with liabilities. More specifically, this means the existence of image and legal concerns at corporate and subsidiaries levels. The subsidiaries stressed how common it is for American companies to adopt a new procedure with a previously defined deadline. Subsidiaries of American companies are usually required to implement general corporate policy, though this does not mean that American companies will implement corporate policies evenly. American companies are keen on this type of corporate

[6] Interview at DuPont's subsidiary (on 11/09/96).
[7] Interview at Lilly's subsidiary (on 23/09/96).

dissemination of homogeneous procedures worldwide. Moreover, such a rigid approach reflects that the criteria set by US legislation are being incorporated by the headquarters and spread widely to affiliates.

It is suggested that 'American companies understand (better than TNCs from other origins) that there is no point in making environmental improvements at home but not abroad'. In this sense the global visibility of those companies combined with pressures from environmental NGOs within the US are the major explanations for such pattern of behaviour. Consequently, these companies demonstrate high concern with their image in the face of an aggressive media[8], and the threat of legal action (even from incidents and/or accidents in the foreign affiliates, such as Bhopal[9]). UNTCMD (1993, p. 39) states that environmental policies in American corporations were in most cases "driven by the threat, that is, fear of lawsuits or criminal prosecution, rather than by the opportunity to enhance the benefits of strategic environmental planning".

Secondly, both companies claim to be beyond the local legal requirements regarding their SHE activities. Such a claim is supported by the environmental investments made in the Brazilian subsidiaries. Accordingly, UNTCMD (1993, p. 39) states that North-American companies "were most likely to state explicitly their policy of complying with applicable national and local standards of countries hosting foreign affiliates".

Third, it may be said that both American companies have good environmental records. Also clear in both cases is the relevance of technological modernization and the convergence of interests in new business activities regarding environmental management services (e.g., Lilly operates an incineration service and DuPont sells managerial programmes on safety and risk in Brazil).

Fourth, the similarity in terms of management is very apparent. Lilly and DuPont's managers were very precise in the use of specific terms to emphasize

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[8] Robert Repetto (from WRI) suggested that one positive effect of globalisation is the possibility of American NGOs denouncing the double-standards of American TNCs worldwide in the US media. This comment was made in the Seminar on International Trade and the Environment, which was held in São Paulo in October 1996, co-sponsored by the Secretary of State for the Environment and Ernst & Young.

[9] One of the biggest industrial accidents of all time, involving the release of methyl-isocyanate from the Union Carbide plant at Bhopal, India, killing approximately 3,000 people and condemning many thousands more to progressive debilitation and premature death. This accident shook the chemical industry, particularly in the US, not only in terms of questioning the safety of operations but also in the legal actions in American courts for compensating the victims. See Shrivastava (1992) for a comprehensive analysis.

corporate principles and control over subsidiaries. Finally, both companies have clear plans of investment regarding environmental improvements and they hold a good position within their market segments.

The most obvious differences between Lilly and DuPont are the size and industry sector, though both are members of the Responsible Care initiative in the US and Brazil. As assumed by one of the research propositions, Lilly (pharmaceutical company) has less environmental problems in relation to those of DuPont (chemical company). Moreover, Lilly's subsidiary has recognized DuPont's leadership in SHE issues. However, Lilly's strong environmental commitment must be acknowledged. Its primary pharmaceutical and herbicide (former joint venture with Dow Chemical) productions are managed as a chemical operation, with investments in new technology to make it safer and cleaner.

More specifically, it is possible to identify compliance with legal demands[10] in the US in DuPont's report (such as at the '1993 Progress Toward Goals', UNEP, 1994, p. 73). This evidence supports the assumption of influence from the 'country of origin' at the EMS (as suggested by the subsidiary). Accordingly, DuPont's subsidiary is a typical example of imported technology and managerial culture, in which it was necessary to understand the corporate history in order to understand the current SHE practices.

Likewise, Lilly's subsidiary presented evidence of some indicators of performance, which have been collected at the Brazilian subsidiary. One of them - the percentage of accidents based on the OSHA standards - is a clear example of the corporation incorporating standards from the country of origin. It was said that "the corporation attempts to turn into internal norms all requirements from the Environmental Protection Agency" (e.g., the list of prohibited substances). Those legal requirements will be translated into the company's language and then turned into practices. This is very interesting evidence of the home country's influence, mainly if combined with the ethnocentric characteristic of Eli Lilly (Malnight, 1995, analysed Lilly's case in face of its recent strategy of globalisation).

[10] There are specific explanations based on American standards for toxic air emissions, and carcinogenic air emissions. Additionally, reduction in the releases of '33/50' chemicals is reported, which is a voluntary initiative launched by the EPA. There is also reference to hazardous wastes with goals based on the US Resource Conservation and Recovery Act (UNEP, 1994, p. 105).

Additionally, Frederick et al. (1992, p. 236) summarize the main federal agencies in the US by type of regulation. In the category of 'social regulatory agencies' are the FDA, EPA and OSHA. These are the same agencies mentioned by Lilly's subsidiary as influencing the corporate principles, and indirectly the respective Brazilian governmental agencies. More specifically, Brazilian regulations on water, air and soil contamination are said to be based on American standards. However, this assumption resulted in a counter argument from the Brazilian environmental authority. According to CETESB's official[11] the American companies follow 'recipes from the headquarters' and they have no intention of adapting them to local demands. As such, there is ongoing and exhausting negotiation with local authorities to liberate them from Brazilian legal requirements.

In the US, business responses to environmental issues started with command and control regulations in the 70-80s. However it has since then changed, which may be related to some particular features of business in the US. One interesting aspect is that companies do not have a single owner. They are all floated in the stock market and many shareholders are demanding improved environmental performance (Frederick et al., 1992). The US companies are concerned with long term efficiency and disclosure because of shareholders interests[12]. Moreover, there are market instruments (such as pollution permission) and voluntary schemes for pollution control. In sum, there is a mixed regulatory approach towards industrial pollution.

The technological incorporation (which started with end-of-the-pipe equipment during the 70s and 80s, Frederick et al., 1992; Choucri, 1991; DiMento, 1986) is now highly advanced in so-called environmental technology. However, double-standards (between industrialized and developing countries) remain a permanent feature of TNCs' operations. However the technological differences are not as huge as they were in the 60s-70s mainly because of 'global competitiveness'. At present the corporation disseminates technical and managerial development to all subsidiaries to keep the

[11] Interview with official at the CETESB's Pollution Control Division. This official is also the coordinator of the Secretary of the Environment's special programme for pollution control (on 07/11/96).

[12] These interests include short-term pressures for 'reasonable returns' and concern with the long-term economic performance. Moreover, the US Securities and Exchange Commission has confirmed that corporate environmental policy is a matter of extraordinary importance and of direct financial concern to shareholders - an argument in line with a precedent response it issued when shareholders asked DuPont for a faster CFC phase out. The investor will measure corporate environmental performance based on legal compliance, accidents and the management policies, programmes and procedures in comparison with industry benchmarks (Business and the Environment, May 1994, p. 2).

companies' overall position worldwide. This assumption of global pressure is mainly true to the extent that some US companies have been largely dependent on the domestic market (as sanctuary market, Doz, 1986), and are now willing to increase their participation in the global market (such as in Lilly's case). Additionally, there are new opportunities in emergent markets outside the Triad (i.e., Europe, Japan and US).

In conclusion, American companies are not solely or even primarily concerned with 'environmental liabilities'. There are other driving forces such as shareholders, marketing demands and opportunities. Yet surprisingly, for some NGOs and environmentalists, they have been proactive even in the developing world (DuPont is recognized as such in Brazil). The voluntary installation of an incinerator by Lilly without being requested to do so by the Brazilian authorities is claimed to be a proactive investment.

Overall, investments in waste management happened because companies (not only American - Lilly - but German as well - BASF and Hoechst) have realized that hazardous wastes became a critical issue in developed countries. For that reason these companies started to dispose of their wastes properly in Brazil, anticipating that it would become a critical issue for the local authorities. Thus they acted proactively at the same time as reducing future liabilities and exploring market opportunities.

6.1.1.3 - German origin

First, it is interesting to note that German companies (that is, BASF[13] and HMR[14]) are concerned with the best way of manufacturing[15]. More specifically, a common concern with process safety (engineering) was found in both German cases. However environmental improvement represents costs at this stage, though the changes seem to be very substantial. This means that goals are more realistic and the search for causes (not effects) is the focal point of their EMS, in spite of its recent

[13] Interview at BASF's subsidiary (on 16/10/96).
[14] Interview at HMR's subsidiary (on 07/11/96).
[15] Regarding the recent creation of HMR, additional data was requested from Hoechst's chemical division in Brazil (on 03/12/96). This request was made to the manager responsible for EH&S issues, who was previously also responsible for the pharmaceutical site in Suzano. Most importantly past environmental practices and influences from the headquarters were enumerated. Finally, some documents (such as 'Press Releases', 'Progress Report 1996 for Environmental Safety and Health', and the environmental magazine 'Change', launched in 1996 by the Hoechst Group) were provided to complement the HMR's case.

introduction. The concern with public opinion and image (most common among American chemical companies, as suggested by the RC scheme) was unimportant in both cases. There are investments in the modernization of current operations, which include the installation of new units. Finally, both companies have established incineration services for the disposal of wastes.

High concern with manufacturing activities at BASF and HMR is reflected in any discussion on EH&S, in which the operational process is the focal point. There is also a prominent and explicit concern with employee safety. As well as this, consumers (though BASF and HMR have different types of consumers) were often mentioned as sources of concern and/or constraint. There is a clear emphasis on risks associated with the manipulation of chemical substances. This issue is not so relevant now, in HMR's case, as it used to be prior to the separation of pharmaceutical and chemicals operations at Hoechst. Finally, there are similarities in management style, considering that it is not predictable, systematic and lacks a tight control mechanism (such as that used in American companies).

As mentioned before, industry-based differences are evident between the German cases as well. Since HMR has recently become an independent (from Hoechst chemical division[16]) company, its environmental management is not as strict as in BASF. The latter has indicated special concern with the international connection of workers' unions and consequent of local matters to headquarters. It is relevant to say that both Hoechst and BASF are publicly committed to and active in the RC programme. Hoechst is a leading member of the 'regional cell' in Suzano, however, HMR has not become a member of this national initiative in Brazil.

In briefly, the main characteristics of the environmental regulatory context (considered to be over-regulated) in Germany are strict and rigid standards, with an emphasis on technological procedures. According to Vaughan and Mickle (1993, p. 33) companies consider the German procedures for legislation implementation too complex. For example, "pollution discharge permits can take up to 13 months to obtain; if there is a declared national public interest the time can be far longer". Moreover, companies indicated that the German federal government interprets European regulations "somewhat more stringently than do other member states".

[16] The HMR is worth around DM 30 billion, out of a total of DM 48.6 billion for Hoechst. Moreover, the refusal to sell HMR has cut 20 percent off Hoechst's share price (Economist, 10 May 1997).

Finally, "German companies felt that environmental standards applied nationally are currently emphasized too much", suggesting that voluntary agreements are better for the industry. Similar aspects have been highlighted in evidence from the Brazilian cases. Such as, the argument by BASF's subsidiary that environmental protection represents high 'costs'. It is also clearly seen in German cases that technological procedures and rigid standards are the basis of their EMS.

Altogether, the rigid environmental standards have resulted in trouble for the German economy and its business community, since it has become highly cost-intensive for companies to comply with these strict standards. Some adjustment is expected in the near future, because pressures from labour unions and consumers are too intense for firms to resist.

The environmental driving forces in Germany are quite distinct from what was stated previously as regards British and American companies. The workers' unions constitute a key factor in explaining the environmental concern of German companies. Roberts (1995, p. 40) has indicated that employees are the major source of pressure on German companies (based on Vaughan and Mickle, 1993, p. 30). They will represent the strongest force requesting safety and environmental protection across the industry. Additionally, some pressure may come from the media and consumer, and to a lesser extent from competitors. Besides this, Germany is the only European market where consumers are "currently willing to pay a premium on 'green' products" (Ibid., p. 36). Finally, these aspects confirm Hodges and Woolcock's (1993, p. 332) statement that in Germany "consensus among management, owners and the work force of each firm and with society as a whole is considered a prerequisite for sustained prosperity".

BASF's case has provided unique findings regarding pressure from the home country in the subsidiaries' implementation of the corporate environmental policy. The pressures come from environmentalists and workers' union in Germany, through their connections with their Brazilian counterparts. It is worth noting that pressures and/or criticism from environmentalists and/or workers' representatives will reach the subsidiary through the headquarters. For example, news of an accident in the transport of raw material in Brazil (as mentioned in chapter four) reached the headquarters through complaints from workers' representatives. More specifically, the workers'

unions in the 'ABC area'[17] are connected to their German peers (including within the governmental agency GTZ). Due to the same connections, information from Germany will also reach the Brazilian subsidiary[18].

The correlation (similar to the 'causal links' investigated by this thesis) between home country's legislation, corporation's requirements, host country's awareness, and finally subsidiaries' behaviour were clearly made by HMR's subsidiary. First the HMR's subsidiary stated that the regulatory requirements from the home countries were incorporated by TNCs and later disseminated to subsidiaries. The most strict environmental legislation come from Germany, Holland, Sweden and the US; consequently the most strict standards of operation will be found at companies with origin in these countries. Finally, the implementation of corporate requirements by the subsidiary will depend on the strictness of the context of the host countries.

After BASF restructuring[19] in Brazil the S&E area became subordinated to the engineering division. It used to be linked to the technical division at subsidiary corporate level (designed to provide support), though this was eliminated during the restructuring. The S&E coordination is now subordinated to the engineering division to emphasize even further the incorporation of these issues into the operational process (in technological terms). This approach followed by BASF in S&E is supposed to be a common characteristic among German companies. Accordingly, Hampden-Turner and Trompenaars (1995, p. 233) stressed "the German's enthusiasm for applied science, especially engineering". More specifically, 'the making and running of things' have equal status, because "*technik* includes everything necessary to make techniques work, including good management".

Another relevant finding comes from concern at BASF's subsidiary about product life-cycle (also called 'from cradle to grave') assessment. This evidence particularly confirms UNEP's (1994) indication that German companies are following an EMS based on life-cycle assessment. Besides this, the Brazilian subsidiary has highlighted two relevant aspects of such an approach. First, at company level the

[17] This is a highly industrialized part of the metropolitan area of São Paulo, including the municipalities of Santo André, São Bernardo do Campo and Santo Caetano, where well-paid and organized workers' unions (including metallurgical, chemical engineers, etc.) are located in Brazil.

[18] For example, the subsidiary's staff was aware that German workers went on strike at BASF on October 1996.

[19] Since 1991 BASF Group has reduced its workforce by 25,000 which is now 103,000 (Economist, 10 May 1997).

indicators of performance have not yet been established because of the complexity of connecting pollution sources and effects throughout the operational process.

Second, BASF's life-cycle approach has similarities with the 'process stewardship code' from the RC. However, BASF's manager stressed that the Brazilian chemical industry has no idea of how complex it will be to implement this commitment or to achieve practical results[20]. In conclusion, this is a critical commitment (copied from the American chemical manufacturer association) in which results will be heavily dependent on the interest of TNCs' headquarters in the incorporation of environmental issues. Here, German and Scandinavian companies may have a competitive advantage following findings from UNEP (1994).

6.1.1.4 - Cross-country comparison

According to the ABIQUIM's official[21] the comparison of environmental policies and practices from American, British and German companies will merely indicate that they have distinct 'managerial cultures'. It was said that there is a clear difference between American and European companies, in that American companies may implement environmental initiatives more easily. They follow the policies, manual and procedures from the headquarters at the same time that they have access to technologies for environmental management.

Moreover, American companies are more similar among themselves in their environmental practices. For example, DuPont's basically focuses on American companies when doing benchmarking. In the Brazilian context, the subsidiary will exchange information mainly with American companies assuming that they are at the same level of performance. DuPont's manager[22] added that it is difficult to comparing SHE practices with European companies because "there are some cultural differences".

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[20] Gutberlet (1996, pp. 128-129) stresses that domestic companies (in the mining, textile, paper, chemical and steel sectors) lack financial and/or technological resources for further implementation of EMS in Brazil. Ernst & Young's (1996, p. 6) survey shows that companies in the São Paulo state are investing in environmental management, however, investments to assess the life-cycle of products is scarce.

[21] Interview with ABIQUIM's official, who is responsible for the Responsible Care programme (on 04/09/97).

[22] Interview at DuPont's subsidiary (on 11/09/96).

Additionally, Lilly's director[23] denied that American and European companies exercise the same level of EH&S concern. There is a widespread perception in Brazil that Europeans are 'more adaptable' (i.e., lax) than the American companies. This implies that their approach accepts, 'on average practices' instead of the 'best available'. In sum, American companies follow strict principles with less flexibility to local adaptation than European companies. Elsewhere, Zeneca's manager[24] stressed further differences. For example, the headquarters (including ICI and Zeneca) never imposed changes, practices and procedures, but agreed objectives, which is much more flexible (with potential for staff discretion) than an American company.

When comparing US with European companies it is evident that the latter lack some guidance from headquarters. This lack of corporate guidelines could be specifically related to the RC, because Zeneca, HMR and BASF provided evidence of access to technology for environmental management. Besides this, the example (by ABIQUIM's official[25]) that BASF received the recommendation from the headquarters to implement the Brazilian version of the RC and to report its achievements has been cited. This happened because the RC's implementation started almost at the same time in Germany and Brazil (ICCA, 1996). In conclusion, there is a different structure of environmental management in American and European companies. Surprisingly, the ABIQUIM's official[26] said that environmental management in Rhodia (a French chemical company penalized for wastes contamination in Cubatão) was better than English and German companies, because the company has more access to environmental technologies.

BASF's subsidiary[27] stated that the American management style has given American companies an competitive advantage in EMS. They are one step ahead in the development of the EMS in the Brazilian context. The main consequence is that their EMS became the benchmark for the Brazilian chemical industry (consolidating the already strong US influence). Once again, this happened without any querying that the American style cannot be assumed to translate appropriately to different contexts such as Brazil (as suggested by Amado and Brasil, 1991).

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[23] Interview at Eli Lilly's subsidiary (on 23/09/96).
[24] Interview at Zeneca's subsidiary (on 19/09/96).
[25] Interview at ABIQUIM as stated in Note 21.
[26] Ibid.
[27] Interview at BASF's subsidiary (on 16/10/96).

However, BASF's subsidiary did not question the limitations of the EMS approach followed by American companies (as suggested by UNEP, 1994). Therefore, one should asked what the peculiar characteristics of the American approach are, because they may be specifically related to the RC's implementation. In sum, if the parameter of comparison is the RC's implementation, American companies are more advanced than European ones the Brazilian context. But if the parameter is the life-cycle assessment of the operations, there are some indications that German companies could achieve it more successfully in the future than American companies (which are mostly based on checklist and standards for specific aspects of industrial pollution, lacking a broader understanding of environmental impacts).

In short, Brazilian subsidiaries employ some practices which are more advanced than those imposed by legislation. At the same time they have environmental problems similar to domestic firms. CETESB's official[28] illustrated this point with two examples, as follows: (a) Souza Cruz (B.A.T's subsidiary) has continual problems with the community due to the odour from tobacco processing at the São Paulo site, and (b) Bayer makes a strong rhetorical commitment without operational implementation. Similarly, an environmental consultant from GTZ[29] said that the Brazilian affiliates of German companies lack standards similar to those instituted in the home country (mainly for pre-treatment and integrated measures at the manufacturing process). However they may be more advanced in environmental control than other companies in Brazil.

In conclusion, these findings highlight the importance of context and culture in establishing environmental management approaches (similar to a claim made by Carr, in Papadakis and Barwise, 1997, p. 123, comparing strategic management in Britain and Germany). The table 6.3 shows the differences between the German and British economic context, aiming to reveal the idiosyncrasies of European companies.

[28] Interview with CETESB' official, as stated in Note 11.

[29] This consultant worked in a cooperation project (from 1993 to 1996) between the German agency (GTZ) and the Brazilian environmental agency in Rio (FEEMA) aiming to improve inspection mechanisms (Informativo CRQIII, December/January 1996, p. 5).

Table 6.3 - Comparative data on Germany and Britain

Contextual factors	**Germany**	**United Kingdom**
Stability of economic framework	High	Low
Proximity of corporate relationships versus arms-length made relationships	High	Low
Consumer' emphasis on high quality versus low price	High	Low
Availability of highly skilled labor	High	Low
Effectiveness of conflict resolution with respect to industrial relations	High	Low
Availability of managers with high degree of technical versus generalist competence	Very high	Low
Status/skills of engineers and operational staff	Very high	Low

Source: Adapted from Carr (in Papadakis and Barwise, 1997, p. 109).

In the end, the explanations for distinct approaches of environmental management may be based on differences in the regulatory structures of the home countries (e.g., governmental investments to curb pollution, in the table 6.4). This argument is also appropriate in the Brazilian case, in which the environmental regulatory structure is decentralized. Therefore, it is possible to identify regional variances of environmental performance, because there is no federal agency coordinating the efforts in a similar way to the EPA in the US or the Department of the Environment in the UK.

Table 6.4 - Environmental expenditure on pollution abatement and control (% of GDP)

Home Countries	**1990**
Germany*	1.65
United Kingdom**	1.5
United States***	1.6

Source: * OECD, 1993a, p. 106 ** OECD, 1994, p. 101, *** OECD, 1996a, p. 132.

According to UNTCMD (1993, p. 37) the US regulatory context is highly legalistic and contentious, and environmental regulation has been keen to restrict administrative discretion and to establish uniform standards. In the case of Europe, it is stated that there are common features shared by Britain, Germany, the Netherlands and

Scandinavian countries especially after the European Community directives (aiming to harmonize environmental regulations). It is suggested that the approach followed resulted in a more cooperative and consensual relationship between regulators and industry representatives.

Hodges and Woolcock (1993, pp. 330-331) stressed that "several features distinguish the different forms of European capitalism", but "a key element is the degree of discretionary intervention by the state". Accordingly, Germany has an extensive regulatory framework allowing market forces to operate only within prescribed rules. Moreover, it limits the scope for discretionary intervention. Otherwise, Britain has traditionally based its policies on discretionary interpretation, without the restrictions of a regulatory framework, and on public interest assessed by the political party in government.

In conclusion, Hodges and Woolcock (1993) indicate that a sort of regulatory framework similar to the German model will emerge in the European Community as a consequence of the creation of the Single Market. However, the most relevant aspect of the present discussion is the indication of the differences between the social market economy in Germany and the liberal market in Britain. The latter (called the Anglo-American model or Atlantic capitalism) is characterized by its focus on individual achievement and short-term profits. The German model (or Rhine capitalism) places emphasis on collective achievement and public consensus.

6.1.2 - Explanations grounded in corporate management

This thesis was motivated by the scarcity of studies on the incorporation of environmental issues by TNCs' subsidiaries. Consequently, the driving forces influencing environmental issues in Brazilian subsidiaries were investigated, which resulted in interesting findings to be presented in this section. Moreover, a common pattern of behaviour was found among cases of the same origin. Despite the complexity of TNCs' management, there is evidence that specific aspects, that is authority and control, are critical in explaining the implementation of corporate environmental policy.

Overall, as the previous section of this chapter has shown, there are similarities among the cases that may be explained by the context of the country of origin, to the extent that every action in a social system is always influenced by the wider cultural system (as suggested by the resource dependence perspective of Pfeffer and Salancik, 1978). Hofstede (1994) has developed a 'worldwide typology' on differences among national cultures, which criticizes the assumption of culture-free theories of management. According to Hofstede (Ibid., p. 39) "management is not a phenomenon that can be isolated from other processes taking place in a society", because "it interacts with what happens in the family, at school, in politics and government. It is obviously also related to religion and to beliefs about science".

Likewise, Bartlett and Ghoshal (1992, p. 42) state that the "influence of a nation's history, infrastructure, and culture permeates all aspects of life within the country, including the norms, values, and behaviours of managers in its national companies". Consequently, these characteristics become "part of each company's 'way of doing things' and shape its international organization structure and processes".

Additionally, Hymer (in Little and Smith, 1991, p. 357) states that MNCs hierarchy presents a type of specialization by nationality. On the one hand, MNCs "must adapt to local circumstances in each country. This calls for decentralized decision making. On the other hand, they must coordinate their activities in various parts of the world and stimulate the flow of ideas from one part of their empire to another. This calls for centralized control". Consequently, MNCs have to "develop an organizational structure to balance the need for coordination with the need for adaptation to a patchwork quilt of languages, laws and customs". In short, this problem is solved by labour division based on nationality between headquarters and affiliates. Likewise, Hofstede (1994, p. 45) states that the existence of MNCs is based on their ability to coordinate "employees with extremely different national cultural values. What keeps them together is a corporate culture based on common practices".

The notion that the multinational's nationality may influence the subsidiary's behaviour is a recurrent issue in the literature on international business. For example, Erramilli (1996) concludes that there are significant differences in ownership[30] preferences among various nationalities, which are explained by cultural and economic

[30] The focus on ownership is justified by the fact that it often "represents the degree to which the parent multinational corporation exercises control over its subsidiary's activities" (Erramilli, 1996, p. 225).

variables. According to Erramilli (1996) there were some successful works linking patterns of behaviour to firms' nationality (e.g., Hofstede, 1983; Kelley et al. 1987; Kogut and Singh, 1988 and more recently, Doyle et al., 1992). Finally, strong corroboration of the importance of the firms' nationality came from Porter's (1990, pp. 18-19) study on nations' competitive advantage.

The study from Egelholf (1984), on the patterns of control in American and European multinationals, found that the company's nationality had a strong influence on the type of managerial control exercised over affiliates. The author concludes that there is a common belief that American MNCs exercise tighter control over their foreign subsidiaries than European firms, however "the difference is more one of type of control than of volume or level of control" (1984, p. 81). More specifically, the American chose output-based control and the European preferred behavioural-based control systems.

It is worth noting that there is a vast quantity of business literature[31] which provides many approaches for environmental management, all of which have in common the definition of patterns of behaviour based on environmental performance. However, the positive and negative aspects of all those normative and prescriptive studies will not be addressed here because the present focus is on the dependence of the subsidiary on the headquarters for managerial and technological resources.

Prahalad and Doz (1981) have addressed the dilemma of centralization versus decentralization, naming it "strategic control". Historically, headquarters depend on control over strategic resources (such as capital, technology, management or access to markets) as a basis for strategic control over subsidiaries. In sum, the headquarters "is not only interested in influencing the strategic decisions of subsidiaries but also in monitoring their progress toward fulfilling the strategic expectations" (1981, p. 6). Additionally, the authors have identified the contradictory forces feeding this dilemma. On the one hand, a small number of worldwide competitors pressures MNCs to make a global strategy (increasing the tendency to centralize). On the other, host government demands (in both developing and developed countries) penalize centralization.

[31] For example, DeSimone and Popoff, 1997, discuss the concept of eco-efficiency; Bennett et al., 1993; Coodington, 1993; Schmidheiny, 1992; Willums and Goluke, 1992; Buzzelli, 1991 and Davis, 1991, introduce strategies for the greening of business; and finally CBI, 1995b; Chynoweth et al., 1992; Gentry, 1990; Greeno and Robinson, 1992; Pierce, 1992 and Taylor, 1992, elaborate environmental management systems.

According to Bartlett and Ghoshal (1992, p. 43) large British companies were dominated by 'family capitalism'[32] until World War II, in which the "overseas businesses were often treated as a portfolio of investments rather than an integrated worldwide business". Elsewhere, the management of American companies was based on a corporate meritocracy, which supported the "development of a new class of professional managers, to whom owners delegated the authority of running the business" resulting in 'managerial capitalism'[33].

More specifically, European companies that expanded in the pre-war period adopted the classic model of 'multinational' organization; that is, "a decentralized federation of assets and responsibilities, a management process defined by simple financial control systems overlaid on informal personal coordination, and a dominant strategic mentality", which regarded foreign operations as a portfolio of national businesses (Ibid., p. 49). American companies followed the model of 'international' organization that became predominant in the postwar decades. That is, a combination of professional management, delegation of responsibility, and coordination and "control through sophisticated management systems and the specialist corporate staffs". Consequently, "subsidiaries were more dependent on the center for the transfer of knowledge and information" (Ibid., pp. 50-51).

Accordingly, the advent of modern corporations (Chandler, 1990), which separated ownership and control, gave rise to an agency relationship between stockholders, as principals, and managers, as agents. Therefore, two basic mechanisms are available to stockholders to tackle the problem: (a) development of systems of measurement and control, and (b) development of incentives for the concurring of interests between the principal and the agent. The table 6.5 illustrates the implications of centralization versus decentralization on the subsidiary's autonomy (that is, the degree of discretion in adapting and/or implementing the corporate policies).

[32] See Chandler (1990) for a more detailed account of this concept.
[33] Ibid.

Table 6.5 - TNC's strategic management versus subsidiary's autonomy

	Decentralized	Centralized	Coordinated decentralization
Authority (over strategy)	High - subsidiary as profit center	Low - strategic decision concentrated at headquarters	Low - overall strategy at headquarters
Control (over operations)	Loose - bureaucratic control over output	Tight - bureaucratic and/or cultural control over output and/or behaviour	Not so tight - agreed or decentralized implementation

Source: Adapted from Czinkota et al., 1992, pp. 544-545, and Mayer and Whittington (in Whitley and Kristensen, 1996, p. 90.

Additionally, the most famous organizational types of international firms are represented in this table. First, the decentralized model is basically found in holding companies (in which strategic control over subsidiaries is personal, provisional or partial); the centralized model represents the functional organization (highly centralized around key functions); and finally the coordinated decentralization corresponds to the 'M-form' or multi-divisional companies (originating in the US).

Mayer and Whittington (in Whitley and Kristensen, 1996, pp. 89-90) state that the M-Form (with centralized strategy and decentralized operations) is justified by the internalization of the market by the firm, due to market imperfections. However, the "survival of the holding company in Europe [mainly in France, Germany and Britain] and the relative failure of the multi-divisional support an institutional rather than universality approach to economic organization" (Ibid., p. 105).

Moreover, the successful acquisition of control by headquarters requires changes in the balance of power[34] between headquarters and subsidiaries. Changes in the external context (e.g., environmental protection pressures) "that require increased headquarters control may trigger power shifts: these changes may increase the importance of interdependencies among subsidiaries or between headquarters and subsidiaries" (Doz and Prahalad, 1981, p. 27).

Doz et al. (in Bartlett et al., 1990, p. 119) state that strategic management in multinationals is based on three capabilities: (a) control of subsidiary actions; (b) ability to change internal relationships, and (c) flexibility to coordinate marketing

[34] See Pfeffer, 1981, for a comprehensive discussion of power struggles within organizations.

efforts. In brief, strategic control is the sum of operational control and strategic co-ordination (Ibid., p. 122), meaning that "subsidiaries are usually dependent on system-wide R&D and management skills (Ibid., p. 123).

According to Bartlett and Ghoshal (1992, p. 171) those subsidiaries in a non-strategic context (e.g., Brazil) have limited capabilities which will determine their "implementation role". In this case, they "have little ability to contribute to corporate information flows and are normally out of the loop of the organization's resources flows". Moreover, these subsidiaries "tend to be managed by formalized systems, which allowed headquarters to coordinate their activities with the least expenditure of corporate management time" (Ibid., p. 172).

Bartlett and Ghoshal (1992) have indicated the similarities of coordination mechanisms among companies from similar backgrounds; for example, American companies are based on formal systems, policies, and standards. That is, coordination through 'formalization', which is different from centralization (i.e., direct actions and intervention from the headquarters). Formalization subjects "decision making to an impersonal set of policies that assume a power independent of the interests and motives of either headquarters or subsidiary", which results in "important operating efficiencies" such as lower operating costs (Ibid., p. 161). Consequently, this entails "high fixed costs of establishing the systems, policies, and rules so that they become effective and reliable surrogates for issue-by-issue decision making" (Ibid., p. 162).

Otherwise, European companies coordinate their operations through 'socialization', which "overcomes centralization's problem of headquarters overload, and formalization's inflexibility" by enhancing the simultaneous influence of headquarters and subsidiaries (Ibid., p. 163). Theoretically "it relies on shared values and objectives", consequently decisions reached by negotiations between groups with common objectives should be "better than those made by superior authority or by standard policy" (Ibid.). However, considering the costs it represents (e.g., in top management training and use of expatriates) companies will not rely solely on this mechanism.

A large number of European companies still fit their national stereotypes, such as British financiers, German bank-dominated giants and the engineering tradition in small firms. Overall, Europe has provided an alternative to American capitalism. For

example, northern countries in Europe emphasize continuity, consensus and training; because European capitalism "has been good at building skills and businesses for the long term, and at avoiding the financial and social excesses of corporate America"[35]. Moreover, corporate America confers quasi-heroic status on tough managers, which is emphasized by business education and management consultancy. Corporate Europe is more careful, at least at home, in terms of equality and social justice (though the workforce has been reduced). The table 6.6 summarizes cultural differences in the business context of the selected home countries.

Table 6.6 - Cultural differences per selected countries

Organizational factors	Germany	UK	US
Profit is only real goal*	24	33	40
Sees company as a set of tasks	41	55	74
Competition is a vital antidote to collusion	41	65	68
Personal initiatives encouraged	84	90	97
Limited commitment to organizations in respect to career duration	83	94	99
Inner directed individual	65	51	68

Source: Adapted from Hampden-Turner and Trompenaars, 1993, pp. 32, 57, 60, 65 and 71.
Note: these figures represent the percentage of managers/respondents from each nationality agreeing with and/or identifying themselves with each proposition.

In short, the time-frame for implementation of the corporate environmental policy was expected to be different between headquarters and subsidiary. However, the fact that autonomy and loose control resulted in environmental liabilities is a surprising finding, following a perspective of strategic control (which was grounded in Doz, 1981, 1986; Prahalad and Doz, 1986; and Czinkota et al. 1992). The evidence from Zeneca suggests a case of TNCs' subsidiaries exploiting the lax regulatory context in a developing country[36]. Besides this, evidence from the cases reinforces the view that the 'traditional business rationale' is still present - that is, the predominant economic view of short-term profits (as criticized by Smith, 1993) and environmental externalities.

[35] Economist, 23 November 1996.
[36] There other cases reported in the literature, such as DuPont's project in India in Cohen and Sarangi (1995), and several cases of corporate "greenwash" according to Greenpeace (1992).

6.1.2.1 - British origin

The driving forces for the incorporation of environmental issues in Zeneca's subsidiary[37] are, as follows: (a) the company's image, (b) the guarantee of renewal of operational licences, and (c) the possibility that environmental improvements may result in cost reduction and/or revenue (e.g., waste minimization as control of inefficient use of resources). At present, Zeneca's subsidiary claims to be accomplishing goals established by the corporation rather than by other stakeholders. However, it is paradoxical that the corporation is the main source of constraint since the management is decentralized - that is the subsidiary has autonomy to implement an EMS. Besides this, the subsidiary defines the priority issues, based on local capabilities (i.e., availability of financial resources[38]). In reality, the corporation requires the formalization of locally developed environmental procedures in order to perform audits.

The subsidiary environmental policy is a full translation of the corporate environmental policy, which is used to disseminate SHE issues among the employees. It was signed by the president of 'Zeneca Brasil' to demonstrate the commitment from top managers. In 1995, Zeneca Group reformulated its corporate environmental policy[39] to be more concise, omitting targets and deadlines. Such a lack of quantitative commitment in the corporate policy may be regarded as a weakness (according to CBI, 1995b and UNEP, 1994). It is interesting to note that the subsidiary was not consulted in the definition of the corporate environmental policy, which confirms lack of 'good SHE practices'. Consequently, the policy implementation became harder due to its distance from the local context.

The first stage of policy implementation is the formalization of local procedures. The safety area had established procedures long ago as a consequence of

[37] Interview at Zeneca's subsidiary (on 19/09/96).

[38] The Brixham Laboratory (UK-based) belongs to Zeneca Group since the demerger from ICI due to its focus on bioscience. The subsidiary had access to this laboratory just once, when samples of the underground water were sent to be analysed after the soil contamination in Brazil.

[39] Until this date the corporate environmental policy was a copy of ICI's policy issued in June 1992. The Zeneca version states support and encouragement for the principles of the RC and the ICC's Business Charter for Sustainable Development. The Brazilian version of the policy states more generally the principles of sustainable development instead of the ICC's Charter.

legal requirements (subject to inspection) from the Ministry of Employment. The second stage is the evaluation of the policy implementation by corporate audits. Additionally, there is a 'letter of assurance'[40], which is an instrument informing the headquarters about the implementation of SHE standards in each business.

At present, the Brazilian subsidiary lacks corporate staff for SHE issues. It is quite obvious that SHE issues have lost salience within the organizational structure since the demerger[41]. The SHE department was eliminated in 1992 and since then these activities have been organized by the so-called 'focal point' approach (i.e., each area at operational level is responsible for the definition of its procedures).

Consequently, safety, health and environment are distinct areas at the site level. In fact, health is the responsibility of the doctor of the site. There are safety staff comprising one supervisor and a technician. Finally, there is a coordinator responsible for environmental management. The staff exclusively devoted to environmental issues consists of six (low qualified) workers. They are basically responsible for water treatment, waste management, and effluent treatment. There is no systematic training for environmental issues, though the corporate policy indicates that employees should receive SHE training.

The lack of staff and priority (i.e., environmental concern is a secondary issue for the site's managers) are the main explanations for the current struggle to formalize environment procedures. However, the corporation requires procedures to be formalized to control the subsidiary (mainly in bureaucratic terms for both output and behaviour, Czinkota et al., 1992). There are two types of audits[42] - operational and managerial - the latter is accomplished by English auditors every two years.

The Brazilian legislation is the external driving force that has motivated Glaxo's subsidiary[43] to develop an environmental commitment. However, there is also concern with the corporate mission on human health and its image considering that

[40] A copy of this document was shown as evidence of corporate control over the subsidiary's practices. The 'letter of assurance' is an instrument of self-assessment for the affiliates, in which the site top managers evaluate the degree of compliance with corporate requirements. Additionally, this instrument aims to harmonize the companies' practices; because the corporation will report back to the subsidiary with recommendations for performance improvement.

[41] In late 80s ICI had a corporate SHE manager in Brazil aiming to coordinate safety, environment and occupational hygiene issues among its affiliates (including support at the site level). After ICI's restructuring (preparing for the demerger) this manager became an executive at the site level subordinated to the site manager of technology and production.

[42] Interview at Zeneca's subsidiary (on 19/09/96).

[43] Interview at Glaxo's subsidiary (on 01/10/96).

Glaxo is the world's biggest pharmaceutical company. Glaxo (1992) states that the implementation of the corporate environmental policy must be made by the technical staff of the affiliates, and a policy statement should be produced by them. Since 1996 Glaxo's subsidiary has had a formal statement for environmental issues, which is a full translation of the corporate policy (as in Zeneca's case).

The present version of the corporate policy is from 1993, though environmental issues have been addressed by the Group since the 70s. The first corporate environmental policy, created in 1978, was called 'environmental control policy'. Nevertheless, the subsidiary has no historical recollection of environmental concern within the Glaxo Group, which may be understood as evidence of the lack of cultural control by a shared philosophy of management.

The 'Group Environmental Policy' (Glaxo, 1994b) includes the environmental guides that are disseminated to subsidiaries to be translated into local policies and/or procedures. However, Glaxo's subsidiary claimed that 'a strict corporate environmental policy is useless'; because the Brazilian subsidiary lacks the resources for its implementation (another aspect similar to Zeneca's case).

In sum, Glaxo's management approach is decentralized, thus subsidiaries have high autonomy. Accordingly, Glaxo Group will provide a long-term mission and some policies, and the subsidiary is 'free to move around' when pursuing its objectives. In practical terms, the corporation states that local legislation is a minimum requirement, but the subsidiary knows that this 'minimum standard should be improved by the implementation of corporate principles' in order to receive full approval. The subsidiary was neither following the corporate nor the Brazilian legislation regarding effluents and risk of fire. This is because the deadlines to implement the corporate guidelines are usually negotiable.

Accordingly, the GRM will define the EH&S principles (as centralization of strategic decisions) and check them later by audit (a form of control over output). This decentralized approach resulted in a lax implementation of corporate policy. Furthermore, the low priority placed on environmental performance at Glaxo's subsidiary is due to the recent launch of the corporate environmental policy in Latin

America. The first event devoted to EH&S issues was organized by the headquarters[44] in July 1996.

Likewise, Zeneca's case has presented similar findings suggesting a British management style. But most important is the evidence that in both firms the highest priority has been assigned to implementing corporate marketing efforts (as discussed by Doz et al., in Bartlett et al., 1990, p. 119) in the Brazilian market. Such an "implementation role" (which means that subsidiaries in non-strategic environments have limited capabilities, as suggested by Bartlett and Ghoshal, 1992, p. 171) resulted in neglect of the subsidiaries' social responsibilities.

The lack of environmental staff is evidence (similar to Zeneca's case) that this issue is of secondary importance. More specifically, the industrial director is responsible for 'the adaptation and implementation of corporate guidelines in every day operations'. However, there is clear emphasis on safety issues during the implementation, which is made by safety staff consisting of an engineer and three safety technicians.

The corporate newsletter (Glaxo, 1994b) made reference to the development and implementation of EMS by affiliates. Nevertheless, the subsidiary was ambiguous about any environmental management system, though the existence of corporate audits (every two years) was acknowledged. After these inspections a 'travel report' is sent from the headquarters to the subsidiary. Based on this report the subsidiary will evaluate improvements and brief the headquarters every three months. In reality, this is a qualitative evaluation of the site's manufacturing process, including risk assessment. In sum, Glaxo's subsidiary seemed to be unaware of its own evaluation of performance[45]. In other words, it is not clear if the risk assessment includes EH&S issues, despite the corporate claim that they are coordinated by the GRM (Glaxo, 1992).

[44] Glaxo's subsidiary provided evidence of a workshop (held in Rio on July 1996) on 'health, safety and environmental protection'. This event was chaired by the corporate GRM director, and the corporate medical director with an audience of industrial directors from affiliates in Latin America. As part of the organization of the workshop, the corporate environmental policy was translated into Portuguese creating the subsidiary policy.

[45] Interview at Glaxo's subsidiary (on 01/10/96).

6.1.2.2 - American origin

The incorporation of environmental issues by DuPont's subsidiary[46] is based in the following company-specific explanations. Firstly, DuPont's long experience on safety issues has become a business area, marketing safety programmes developed by the firm. Furthermore, there are fewer legal liabilities related to safety and occupational health, because the number of accidents and/or incidents is very low. Secondly, the company transcends legal requirements, as a result of the internal connections between environmental management and its former safety and occupational health performance.

At external level the major driving force for DuPont is the concern with the corporate image, in which "anything that may damage its image will started the internal digestion"[47]. Accordingly, the scientific evidence linking CFCs to the destruction of the ozone layer became a threat to DuPont's image accelerating the "internal digestion"[48]. In sum, DuPont kept the technological vanguard and provided an immediate answer by finding a substitute based on the scientific capabilities of its R&D area.

From a historical and linear perspective[49], the CFCs ban by the Montreal Protocol on Substances that Deplete the Ozone Layer (1987) is the main single factor explaining DuPont's strong environmental commitment since this event made the corporation more visible worldwide[50], posing a real threat to its image. Nevertheless, the subsidiary did not indicate when CFCs would be phased out (at the Goiabal site)[51] in Brazil. However, the SHE progress report (DuPont, 1995) states that Brazil is the

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[46] Interview at DuPont's subsidiary (on 11/09/96).

[47] Ibid.

[48] The Montreal Protocol (curbing the use of ozone-depleting CFCs) was secured with support from DuPont and ICI. In 1988, DuPont, the world largest producer of CFC, backed a total ban on their use, becoming the leader in the market for CFC substitutes (Economist, 3 June 1995).

[49] Mainly based on Willums and Goluke's (1992, p. 277) accounts of SHE issues at DuPont.

[50] Smart (1992, pp. 185-199) has reproduced DuPont's case written by its CEO (Edgar Woolard). Accordingly, the decision to phase out CFC was made in 1988, and the turning point for environmental issues within the corporation happened in 1989 (the same year that Woolard became Chairman and described himself as DuPont's 'chief environmental officer'). The CEO claims that the company had a substantial environmental background prior to those events. For example, the corporate environmental committee was created in 1966, and the company received its first award for environmental issues in 1987.

[51] It was announced that the Goiabal site is phasing out the production of freon gas used by the refrigeration industry, as part of major changes in the composition of local businesses. Additionally, the production of insecticides and fungicides will be expanded (Gazeta Mercantil, 03 December 1996, p. C-1).

last subsidiary producing CFCs, because of a special request made by the Brazilian government.

DuPont's environmental statement is a formal commitment signed by top executives, which is called the 'DuPont Compromise'. The local version (full translation of the corporate policy) is a one page statement signed by the Board of Directors at the regional headquarters and distributed to employees. Such a statement was last reviewed in 1993 resulting in a more concise version, which makes support to the RC scheme explicit.

It was claimed that the policy statement originated with the EMS, therefore the policy has avoided the risk of an inadequate compromise. The SHE policies are established at corporate level (that is, centralized strategic decision), and subsidiaries are obligated to follow, aiming at the harmonization of procedures. The implementation of these principles will require adjustment to the local reality, because of the principle of compliance with local legislation as a minimum requirement. The local demands will be accomplished based on their "technical and economic" viability, faithful to what was called a "pragmatic management" (or contingency perspective in organization theory literature, Ghoshal and Westney, 1993). Furthermore, the subsidiary claimed that corporate principles and local legislation are considered in relation to each other and subsequently the stricter standard is followed.

In general terms, DuPont's management approach is based on two principles: managerial support and organizational commitment (as the corporate ownership advantages). The SHE issues are implemented following these principles, but more specifically, 'safety concern is a condition of employment'. This strong organizational culture (that is, cultural control over behaviour by shared philosophy of management, Czinkota et al., 1992, p. 552) is explicitly stated in the SHE policy[52]. Furthermore, the company has the 'goal to establish SHE aspects as part of the organizational culture', because DuPont has its image linked to SHE issues.

The EMS is structured by a line of responsibilities and working groups. As such, the top manager of each site is responsible for accidents and/or incidents in conjunction with the supervisor and employee(s) directed implicated. The SHE staff (at the subsidiary's corporate level) gives support (without direct involvement) to

[52] Moreover, DuPont's high safety standard has been confirmed by other sources within the Brazilian chemical association and managers from other American companies.

incorporate these aspects into the business operations. The SHE manager has basically to guarantee that the subsidiary is complying with the standards defined by both corporate policy and local regulation.

At the operational level, every site has a "central SHE committee" constituted (chaired by the site manager) and "sub-committees of activities" with multi-functional members. The committees are responsible for the implementation of policies and guidelines at the site level[53]. The coordinator of the sub-committees has authority to make changes in order to achieve their goals. As a consequence of this type of organizational structure the number of employees working on SHE issues varies according to the site's size.

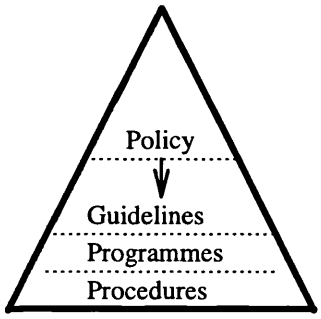
It was stressed that DuPont's subsidiary is focused on safety and occupational health because it represents the immediate care of employees at the site. In the medium- and long-term it will be necessary to take care of environmental issues as well as to complement the short-term tasks. As exemplified by DuPont's case, it is very difficult to conciliate the short-term need to keep the business running (or to make profits) with the long-term vision of sustainability. Moreover, the business time-frame for incorporating environmental concern is different for environmentalists and for the expectations of legislators. For example, safety-related issues are specifically short-term because accidents may disrupt the operation. Environmental protection is therefore usually a long-term task which may be turned into short-term as a consequence of accidents.

The Brazilian legislation (similarly to the US regulation) makes no connection between safety, health and environmental issues (which was criticized by Neder, 1992). Thus the emphasis on one issue will not directly produce results in the others. Despite the fact that the managerial model requires responsibility for all SHE areas, there is clearly priority placed on safety and health issues at DuPont. Thus, environmental improvement will be to some extent a consequence of prior achievements in these issues.

[53] Such an organizational structure was confirmed by the SHE supervisor at DuPont's site in Paulínia. More evidence specifically focused on DuPont's environmental practices was collected during a seminar held at UNICAMP (on 18/09/96). During this event DuPont presented its implementation of the RC and was criticized for its lack of environmental disclosure. The same criticism was direct towards ABIQUIM for its lack of transparency in the management of the RC programme in Brazil.

DuPont's structure of environmental management resembles a pyramid[54] (see figure 6.1 below), suggesting that power (in terms of strategic decisions) is concentrated at the locus of the corporate environmental policy's definition (i.e., the headquarters). The guidelines translate the policy into operational language, later resulting in programmes (e.g., environmental audit became an independent programme in 1992). There are six procedures for audits based on the six codes of practices from the RC programme, which are coordinated from the South American headquarters in Brazil.

Figure 6.1 - DuPont's environmental management model



The forces driving the incorporation of environmental issues at the Lilly's subsidiary[55] are basically from sources that may exercise 'control' over the company's practices. Firstly, the home and host legislation are extremely important, even assuming that the company has the intention of improving its EH&S performance. The legislation (which includes inspections) will motivate the company's measures to improve performance. Consequently, Lilly has provided the most direct indication of how crucial legislation is as a driving force, confirming similar arguments from Wong et al. (1995), Porter (1991), Porter and van der Linde (1995), and Gleckman (1995). Moreover, it implicitly has stressed the combination of two aspects: (a) the intentions of the company, and (b) the pressure of legislation through inspection and control. Nevertheless, this is not a critical issue for Lilly because of its 'philosophical concern with quality excellence'. That is, continuous improvement is 'the norm number one in

[54] Based on the interview at DuPont's subsidiary (on 11/09/96) when documents (including the corporate environmental policy, guidelines, programmes and procedures) were used as evidence of environmental management.
[55] Interview at Eli Lilly's subsidiary (on 23/09/96).

the organizational culture' (i.e., cultural control over behaviour, Czinkota et al., 1992), which is similar to DuPont's case.

The Eli Lilly environmental policy is stated in the 'company guidelines and policies' (or Red Book[56]) as part of the corporate ethical code, which is signed by the CEO. The corporate environmental policy is defined by the corporation (which centralizes strategic decisions) and disseminated to affiliates. Moreover, Lilly has a 'term of compromise' that employees are obligated to sign, representing their awareness of the corporate commitments. At the same time they declare that practices and guidelines are compatible. Consequently, employees are responsible for the accomplishment and/or non compliance regarding the corporate guidelines (that is, the anecdotal "P to P" - "from the President to the Porter" - approach followed by American companies).

However, the subsidiary has 'some discretion' in the implementation of the corporate environmental policy, though there is a core that must be homogeneously implemented. Nevertheless, it is realistically recognized that the 'timing of implementation among subsidiaries is different', but it should not be interpreted as double-standards.

It is worthwhile saying that it is possible to negotiate the applicability of corporate principles. These guidelines set norms (a form of cultural control over output), but if the Brazilian subsidiary lacks the technological complexity of another affiliate it may have a different programme. For example, there is a corporate norm banning underground tanks, but there are still two of these tanks in the Morumbi site. Lilly's subsidiary kept these tanks[57], due to its location in an urban area, claiming that they are safer than tanks on the surface. Following a corporate recommendation it now has to perform 'well inspections' to detect spills. In addition, the subsidiary could never make unilateral decision, because it has to justify discrepancies from the guidelines during the audits. This is evidence of tight control over the subsidiary's

[56] The 'performance manual' for SHE issues (including an 'environmental corporation affair' leaflet) was used as evidence during the interview at Lilly's subsidiary. This 'manual' includes the SHE guidelines and the result of the corporate audit in the affiliates worldwide (classified by issues such as: energy consumption, fuel, vapour, inputs, etc.). Finally, a copy of the corporate statement for environmental issues was provided. Such a statement is reviewed on an annual basis to re-affirm the commitment with environmental and ethical issues (Portuguese version is called 'Diretrizes da Companhia', Eli Lilly, 1995, p. 11).

[57] The subsidiary's justification also included the argument that all fuel tanks in São Paulo city are underground, and the fact that the Brazilian authorities allow this type of tank.

practices similar to findings from DuPont's case, which suggests a common characteristic of American companies.

The first exclusively environmental audit[58] was made in Lilly's subsidiary in early 1996. It aimed to evaluate the current status of affiliates worldwide, as the first assessment from the recently created 'corporate environmental affairs'. Accordingly, the environmental area has been transferred from the human resources division to report directly to the CEO of the corporation. This represented an upgrading within the corporation, resulting in more power and influence to improve environmental practices (which started with the worldwide self-assessment).

The corporate report (Lilly, 1995) states that there is an approach to total quality called the 'Lilly Team Excellence'. In reality, there are three affiliates (including the Brazilian affiliate) out of twenty manufacturing sites which are considered as 'class A' (that is, the highest grade of performance) within the corporate ranking. However, there is no evidence that SHE issues are part of the TQM (such as in BASF and Zeneca). The performance standards includes the indices of 'employees in training' programmes (that is, a behavioural control), 'accident rates' and 'flexibility of the process' (in terms of efficiency of process and timing of production). These latter indices were implemented in the Cosmópolis site achieving a reduction in the production timing (another characteristic common to American companies).

These standards constituted the first step in the creation of internal indicators of performance by Eli Lilly. This is also evidence (such as in BASF's case) of how complex it is for companies to measure efficiency. Furthermore, the lack of performance indicators shows that the incorporation of environmental issues is a long process. The evidence presented here indicates that Levy (1995) was correct in suggesting that performance is the key variable in evaluating the companies' incorporation of environmental issues because such incorporation is more complex and time and resource demanding, than is suggested by the business literature (confirming the criticism made by Walley and Whitehead, 1994, on the win-win rhetoric).

[58] The subsidiary's newsletter notified that the first environmental audit, with American staff, was made in Brazil, in which both sites achieved 'satisfactory results' (Lilly em contato, year 29, no. 266, May-June 1996, p. 7).

6.1.2.3 - German origin

There are a set of factors driving BASF's subsidiary towards the incorporation of environmental issues (such as pressures from headquarters, local legislation, workers' unions, image and the threat from Brazilian public attorneys). Brazilian legal requirements were identified as a source of external pressure, following the corporate principle that legal compliance is a minimum requirement. Nevertheless, it is principally pressure from headquarters that will make the subsidiary improve its S&E performance.

At the internal level, BASF's manager[59] stated that the incorporation of environmental issues will depend on the 'responsibility and awareness of the local top executive'. In this case there is a lack of continuity because the top executive (an expatriate) will be changed every four years. Moreover, the S&E coordinator has to justify present practices and future projects to a new top executive, which is a unique characteristic of BASF when compared with other German subsidiaries in Brazil.

Accordingly, there is always adaptation of the corporate environmental policy to the characteristic of each host country. There is also discrete implementation according to businesses segments. Therefore, the subsidiary's role is clearly focused on adapting and implementing corporate guidelines (Czinkota et al., 1992; Doz and Prahalad, 1986).

The environmental area in the Brazilian subsidiary consists of corporate and operational levels. At the corporate level, the S&E manager coordinates and gives support to all Brazilian sites, though there are environmental staff at the operational units. This group is exclusively dedicated to the implementation of S&E aspects. Finally, in 1996, the corporate S&E area was restructured to include other South American affiliates. Consequently, the Brazilian subsidiary has more importance within the corporation's structure as the regional headquarters (including access to information and resources).

The relationship with the headquarters is the single most important factor explaining the environmental improvements at BASF's subsidiary, a pattern similar to

[59] Interview at BASF's subsidiary (on 16/10/96).

that evident in other TNCs' subsidiaries in Brazil (in reference to a survey[60] made by Ernst & Young, 1996). In BASF's case 'it is undoubtedly the headquarters that commands the process', through technological access and support. For example, BASF's subsidiary exceeds the minimum requirements in the RC evaluations by the chemical association. This performance was basically achieved via the implementation of corporate policies, guidelines and norms.

The first audit carried out exclusively for S&E issues was made in 1997 (previously it was only for safety). Through these audits, which are scheduled for every four years, the headquarters will define targets for the subsidiaries. Based on these targets, the subsidiary will elaborate on a timetable of activities and report back to the headquarters. Consequently, the subsidiary's progress will be a responsibility for local executives.

It is interesting to note the absence of specific guidelines from BASF's headquarters concerning performance indicators for environmental issues. There are safety indicators in use throughout the company, which are reported every three months to the headquarters. However, there is only a qualitative report on environmental issues from affiliates (generating the corporate environmental report). On a trial basis, the Brazilian subsidiary has been monitoring the efficiency of the process (via energy consumption). Overall, it is possible to identify the positive evolution, since the early 90s, in the development of an environmental monitoring system. Whittington (1989, pp. 130-131) suggested that companies look for strategic continuity; strategic changes do not therefore take place as often as assumed by the business literature. Consequently, it takes some time for new strategic issues (such as EH&S) to mature and produce tangible results within companies.

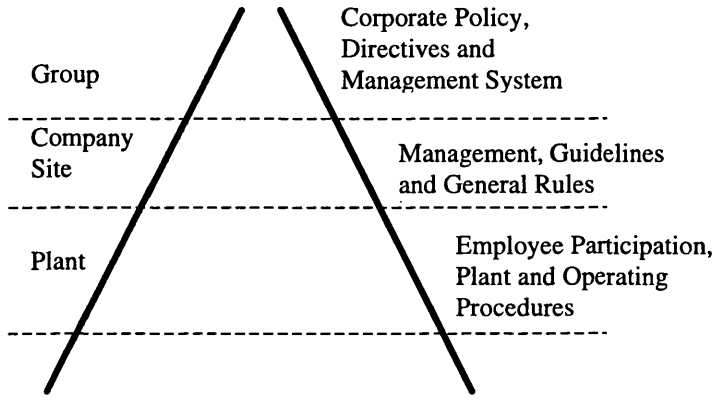
The difficulties in defining indicators of performance are mainly the result of company-specific factors. These indicators must represent targets, otherwise they are meaningless. Consequently, resources will be required in order to achieve the targets (e.g., waste reduction, high energy use efficiency, etc.). Another internal obstacle concerns staff participation, considering that there is always resistance when practices are evaluated through audits. Finally, financial constraints seem to be a core aspect of

[60] According to this survey (encompassing 160 domestic and foreign companies located in São Paulo state) two factors have a major influence on companies' environmental performance: (a) shareholders and internal policies (including corporate policies), and (b) environmental legislation.

the implementation of corporate environmental policy; thus companies must be profitable in order to improve their environmental performance (as stressed by UN, 1994a).

BASF's model for environmental management indicates that there are policy and guidelines, which should be implemented by the subsidiaries through operational procedures. Recently, these guidelines started to be called an environmental management system and is represented through a pyramid model[61] (such as in DuPont's case). Moreover, this model indicates the respective organizational level responsible for each set of tasks (see figure 6.2 below).

Figure 6.2 - BASF's environmental management model



With reference to this management model, the implementation of the corporate environmental policy is a responsibility of the top executive in each host country. Consequently, it is difficult to accomplish the S&E tasks if the top executive is not committed to these issues. Besides, S&E issues compete with other functional areas for resources, because the amount of new investments devoted to the Brazilian subsidiary is calculated on an annual basis. When applying for resources the S&E area has to submit a project based on a cost-benefit analysis (that is, with indications of the gain in reduction of energy consumption, and efficiency in the use of raw materials, etc.).

[61] Based on the 'Safety and Environmental Management Directives' (BASF, 1995, p. 3). This document indicates that the elements of the EMS and the 'BASF Quality Management Directives' form the unified code of practice for all group companies and majority holdings. There is a version in Portuguese from November 1995.

For example, BASF's manager[62] said that the Guaratinguetá site 'has recently completed some investments related to environmental issues'. Accordingly, the installation of the incinerator was accomplished in 1994, the effluent treatment system was renewed in 1996, and there is a planned landfill area to complete the cycle of waste treatment. Since improvements in the environmental management were made, this site competes with other BASF's affiliates for new units[63]. Ultimately, the most relevant recent change in the management of the Brazilian subsidiary was the introduction of total quality management aimed at achieving ISO 9000 certification, which connects the corporate cost-reduction measures and the restructuring of the Brazilian subsidiary.

According to HMR's manager[64] the driving forces of the incorporation of EH&S issues are: (a) legislation from home and host countries, (b) capital to be able to cope with strict standards, (c) corporate image in the international media, and finally (d) the location of the site (mainly in a large country, i.e., Brazil). Based on the regulatory demands is the inherent need for investments to fulfill strict standards. For example, it is necessary to invest in order to develop the manufacturing process. Occasionally, the environmental investments are so high that they must be justified in business terms (as in BASF's case).

When the data was collected at HMR's subsidiary, there was no formal environmental policy statement. In this case, Hoechst's commitment to EH&S issues (which includes a corporate environmental policy statement) was taken into consideration during the analysis of HMR's case. However, it was claimed that HMR will combine the policies from Hoechst and Marion Merrell Dow. But, there is a high probability that it will be defined by the headquarters in Frankfurt: the 'Supervisory Board of the Hoechst Group' (Hoechst, 1996, p. 92) has reiterated its concern to the further development of 'environmental and safety management', with particular focus

[62] Interview at BASF's subsidiary (on 16/10/96).

[63] The Brazilian subsidiary has a new unit in Guaratinguetá. In addition to market explanations for the selection of Brazil as the corporation's sourcing centre for this new fungicide, the S&E manager said that the existence of another agrochemical unit, and the site's pollution control system were among the factors justifying such a decision (an investment of US$ 38 million). This fungicide will be exported to Germany and Belgium. After the proper registration it will be sold in the countries forming Mercosur. Finally, the Brazilian agrochemical business accounts for US$ 90 million in 1995, representing 7.8% of the Group income - US$ 1.1 billion (Gazeta Mercantil, 13 November 1996, p. B-16).

[64] Interview at HMR's subsidiary (on 07/11/96).

on its importance in the future structure of the Hoechst Group[65]. Such discussions followed incidents at two German sites (in Griesheim and Hoechst) at the beginning of 1996.

The HMR corporate level has not produced any new set of 'basic principles' for EH&S issues since the merger in 1995, but corporate guidelines are expected in the future. At the present it is considered more relevant for the company to assess the HMR sites worldwide. Evaluation has already started concerning the EH&S performance of all affiliates, and the Brazilian subsidiary claimed to be among the most advanced.

Immediately after the merger each site followed its own procedures, thus, initially the previous guidelines were kept. But at the second stage the EH&S's manager started to select the best practices from both sites in Brazil, aiming to formalize them later at the Suzano site[66]. The final EH&S approach will be a "hybrid model", that is, a combination of Hoechst and Marion Dow, because Roussel followed a policy of compliance with the local legislation. On the contrary, 'Hoechst and Marion Dow have more than local requirements, which were set with the objective of avoiding double-standards'.

Prior to the merger, Hoechst pharmaceuticals followed the minimum requirements, which are called 'EH&S basic principles'. In Marion Dow they were called 'minimum requirements' (the same concept using different terminology). The EH&S 'basic principles' are established by Hoechst's headquarters and the subsidiaries must implement them. It was also part of Hoechst's policy to evaluate the implementation of the 'basic principles' through audits every two years. It is carried out by EH&S auditors from the corporation who produce a report with recommendations for performance improvement.

The audit is focused on 'operational performance' (including quantitative evaluations) and it later forms the basis for 'action plans'. The corporation intends to

[65] In 1993, Hoechst's spotless environmental record was tarnished by a series of freak chemical spills that resulted in governmental investigations and the early retirement of the chairman (late in 1994). In this same year, Hoechst faced strong environmental pressure and decided to end the production of chlorinated solvents. It also started to build a plant to produce an alternative to CFCs (called R 134a). In 1994 a new plant was built to make an environmentally friendly water-based paint (Hoover's Handbook of World Business 1995-1996, p. 252).

[66] From 1998, all pharmaceutical manufacturing will be concentrated in this site, which already contains Hoechst's pharmaceutical and chemical units. However, it was confirmed by the EH&S's manager of the chemical division (interviewed on 08/11/96) that these are two independent sites (separated by the railway).

avoid double-standards by implementing policies defined at the headquarters in all subsidiaries. But the subsidiaries 'will always face problems in implementing such policies'. It was emphasized that the German approach to 'correct making'[67] also aims to save resources[68]. Therefore, the focus is on the constant improvement of the manufacturing process (such as in BASF's case).

6.1.2.4 - Cross-country comparison

It should be reiterated that the degree of autonomy left to subsidiaries to adapt corporate policies according to host countries' demands turned out to be the weak link in the implementation of corporate environmental policy. It mainly happened because the Brazilian context is more lax on environmental matters than the home countries. As such, the combination of lax legal enforcement, the low environmental awareness of managers and lack of institutionalized public concern (that would be expected in developing countries) resulted in poor environmental performances.

Most important are the recent changes in the Brazilian regulatory context (as mentioned in chapter three, from command-and-control to economic instruments). Consequently, companies will gain more flexibility (i.e., discretion) by increasing the use of self-assessment instruments, which may be accompanied by lack of knowledge about the environmental impacts of products and processes (Guimarães et al., 1995, p. 80).

More specifically, the subsidiaries' discretion in the implementation of the corporate environmental policy was the element responsible for the ambiguous explanations in justifying performance. The degree of discretion varies among the cases, but there is a pattern among companies from the same home country. In such cases, there is evidence that British and German companies enjoyed more discretion in implementing their corporate environmental policy than American companies. The latter are subject to stricter control (through auditing and check-lists) as part of their

[67] Interview at HMR's subsidiary (on 07/11/96).

[68] Hoechst is considered a pillar of traditional German industry, in which centralised and hierarchical management ideally suited the high demand years after World War II. Indeed, "a manager's performance was measured in output, not profitability". Since 1994 changes have been made (including the plan to spin off HMR) during which "business units were given much greater autonomy, but they were also required to reach a certain level of profitability within three years or face sale or closure" (Economist, 23 November 1996).

EMS. On the other hand, the decentralized approach followed in the British cases have resulted in poor environmental performance. This finding suggests that Rappaport and Flaherty's (1992) argument that decentralization is better for environmental issues because solutions are site-specific should be treated with some caution. The strictest control at Zeneca and Glaxo is exercised over the subsidiaries' financial results. Hamel and Prahalad's (1985) argued that the business culture of Anglo-Saxon countries is heavily biased towards cost-reduction rather than revenue generations as a means of producing profits[69].

The German subsidiaries have showed a moderate degree of discretion, where attempts have been made to implement the basic corporate principles. At the same time, the subsidiary's CEO has the discretion to set local priorities, but must comply with legal requirements. However, there are tight controls from the headquarters, which are not so rigid such as in the American cases (Hofstede, 1994).

There are therefore, clear differences between German and American companies in terms of environmental management. The German companies usually follow a more 'philosophical approach', in which new values must be internalized to change former values. In such a case the solution for environmental problems will be achieved by understanding its causes and changing behaviour. On the contrary, the American companies follow a more pragmatic approach. Consequently, the internalization of environmental concern is achieved by the extensive use of 'check-list procedures'.

6.2 - Re-evaluation of the research design and methodological implications

This section will first review the propositions defined by the research framework, in order to re-evaluate the research design. Secondly, it will discuss the methodological implications of the research design in view of the empirical results. Finally, the selected home-host dichotomy will be analysed to stress the limits of the research design followed during the investigation of TNCs' subsidiaries in Brazil.

[69] As suggested in the British media (Financial Times, 3 February 1996, p. 8).

6.2.1 - Cross-cases analysis and verification of propositions

The propositions (defined by the research framework) were confirmed (even though deserving certain qualifications) among the explanations for the implementation of corporate environmental policy in TNCs' subsidiaries in Brazil. In other words, the empirical findings confirmed the influences from the home and host countries' environmental regulatory policies, the industrial sectors' structure and environmental commitment, and the headquarters' commitment and control towards the incorporation of environmental concern in the subsidiaries' operations.

There is no substantive evidence (that could be replicated) among the cases of international pressures on the implementation of corporate environmental policies. Despite the lack of formal propositions in the research design, it was expected that international agreements, business association's environmental guidelines[70] and environmental concern from NGOs[71] at the international level would influence TNCs' practices in Brazil. However, the findings from the Brazilian subsidiaries demonstrated that these aspects are not among the driving forces in their incorporation of environmental issues.

Nevertheless, BASF's case is an exception regarding international pressures because German and Brazilian workers constantly exchange information on environmental issues. For example, BASF's headquarters has been pressurized by the German workers' union (which have links with their Brazilian peers) when the Brazilian subsidiary had an accident during the transport of raw materials that had an adverse environmental impact.

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[70] According to UNEP (1994) these guidelines are taken into account in environmental reporting. There are distinct reporting frameworks available to companies, such as: CERES (Coalition for Environmentally Responsible Economies, in North America); CEFIC (European Chemical Industries Council, 1993 guidelines); PERI (Public Environmental Reporting Initiative, followed by North-American and some European companies); GEMI (Global Environmental Management Initiative which has an environmental self-assessment program); WICE (ICC task force to review current environmental reporting and to develop guidelines); ISO (at the sub-group on EMS, the proposed standard will include public reports of performance as part of obtaining the certification); and finally BS (the EMS at BS 7750, though it does not obligate companies to publish environmental reports).

[71] Despite examples of confrontation between environmentalists and business (such as Shell, BP and Conoco cases), the environmental groups have changed their approach during the 90s. Accordingly, these groups are more conciliatory towards business and government as shown in the Kyoto Conference. Another characteristic of current environmentalism is a high level of education, which is required to sustain the 'solutions campaigning' of groups such as WWF, Greenpeace and Environmental Defense Fund (Financial Times, 30 December 1997, p. 8).

More specifically, there is evidence from two case studies confirming the first proposition, that is: ***The home country's environmental regulatory policy is the main source of pressure for the implementation of corporate environmental policies in TNCs' subsidiaries***. The evidence supporting this proposition came exclusively from the two American cases. In such a case it was confirmed that the American environmental regulatory policy (specifically enforced by the Environmental Protection Agency) is usually incorporated into the corporate principles. In DuPont's case the evidences are very clear in the environmental reporting (DuPont, 1995), which includes TRI releases and compliance with other special programmes set by the authorities. Likewise, Lilly's case confirmed that it is corporate policy to incorporate requirements from the US legislation and disseminate it among subsidiaries.

At this point, it relevant to note that American companies are particularly vulnerable in the face of a legal system that allows them to be prosecuted in the US for practices abroad (such as in the Bhopal case). There are possible legal liabilities in the home country as a consequence of actions in host countries. This regulatory context is not as strict in the UK and Germany.

In the other cases the evidence available is more ambiguous. For example, Zeneca's case showed evidence of particular characteristics from the UK context, such as corporate guidelines for transport by train and the EMS based on the British Standard. In HMR's case it was suggested that Germany has strict legislation which is incorporated and to some extent disseminated by German companies. The links between the home country's culture, legal system and corporate behaviour were mentioned in the previous sections of this chapter. However, these are instances where replication was not achieved.

Nevertheless, the overall empirical work has indicated other evidence of national character in the implementation of corporate environmental policies. In reality, the research design was mistaken in assuming that environmental regulatory policy was the most suitable representation (or variable representing the concept of national character) of the country of origin at subsidiary level. The incorporation of the regulatory standards by TNCs should be investigated following an institutional approach (Ghoshal and Westney, 1993; Sally, 1994), in which the corporate environmental policy is investigated at headquarters level. On the other hand, there is

empirical evidence (in which replication by country of origin occurred) that the management approach followed by the subsidiaries best represented the 'national character' of the countries of origin.

The findings from four cases have confirmed the second proposition, that is: ***The implementation of TNCs' corporate environmental policies includes the compliance with the host country's environmental regulatory policy as a minimum requirement.*** On a rhetorical level all subsidiaries claimed to comply with Brazilian legal requirements as a minimum requirement from the corporation.

First, it is necessary to emphasize how important the local regulatory context is as a source of pressure on subsidiaries' operations. Despite the recognized weakness of the environmental regulatory authority in developing countries (as discussed in the literature Gladwin, 1977; Haas et al., 1993; Pearson, 1985 and 1987), this is still the main source of pressure in the local context. Nevertheless, it is interesting to note that corruption has been an obscure issue in Brazil as regards the state environmental agencies. There is no hard evidence, though it is openly discussed by journalists, managers, governmental and non-governmental officials that this is a 'chronic' aspect of the Brazilian bureaucracy (as suggested by Zulauf, 1994). Moreover, the institutionalization of an intermediate agent to negotiate with the authorities has lead to numerous cases of bribery[72].

In fact, there are no extraordinary environmental practices among the selected cases, though DuPont is said to have a leading performance. Furthermore, DuPont, BASF, Lilly and HMR have been complying with the regulatory requirements. Their major interest lies in the renewal of operation licences granted by the Brazilian environmental authorities. Nevertheless, the poor performance of a large number of domestic and foreign companies in Brazil is a consequence of lax enforcement (Zulauf, 1994). However it could be worse without the current structure for industrial pollution control. In other words, what is there is needed in order to prevent more "free-rider behaviour" from TNCs' subsidiaries. The British cases (Glaxo and Zeneca) may undoubtedly confirm this since they have (past and current) histories of non-

[72] For example, Friends of the Earth's official states that logging companies, particularly from Asia, pressurize land owners in the Amazon region to obtain rights to extract woods. These companies "typically bribe officials to have generic environmental impact studies rubber-stamped" (Financial Times, 2 December 1997, p. 9). Such practice is also found with companies located in urban areas according to Zulauf (1994).

compliance. The existence of accidents at DuPont and BASF sites was also identified, as well as improvement in Lilly and HMR, as was required by the authorities in the early 90s.

The third proposition - ***If industry associations have environmental guidelines, TNCs' subsidiaries have stricter implementation of corporate environmental policies*** - was evaluated in chapters four and five (sections 4.4 and 5.4 respectively). To summarize, the empirical findings from the cases in the chemical sector have confirmed the proposition, namely, the existence of an environmental initiative in the industry association has resulted in the strong incorporation of environmental issues by the TNCs' subsidiaries. However, there was no disclosure of their achievements since the Responsible Care programme was launched in 1992.

Otherwise, the findings from the cases in the pharmaceutical sector have not confirmed the proposition. First, this is an industry with minor environmental impacts (if compared with the chemical sector), thus there are no environmental guidelines from the industry association. Secondly, there is no evidence that an environmental initiative would improve the performance of pharmaceutical companies. Nevertheless, there is evidence that pharmaceutical companies have areas regarding EH&S issues which are to be improved because of their involvement in processing chemical substances.

The empirical findings partially supported the fourth proposition, that is: ***The corporate environmental policies of TNCs' subsidiaries is defined by the headquarters, following a strategy of centralization***. This is mainly because there are some variations in the strategic approach adopted by the headquarters, though all corporate environmental policies were defined by the headquarters.

In brief, the American and German cases follow a centralized approach, though they have distinct mechanisms of control. On the contrary, British cases presented a decentralized approach in which subsidiaries have the autonomy to define their own policies and practices for environmental issues. In practical terms, corporate policies had been previously defined and Brazilian subsidiaries 'autonomously' made a full translation of these policies.

The most controversial set of findings, starting with the expected confirmation that all corporate environmental policies were defined by the headquarters, are

correlated with this proposition. First of all, it is relevant to state that the rhetorical commitments made by the headquarters were not followed up in the corresponding implementation at the selected subsidiaries. However, the so-called double-standard was not part of this investigation since all subsidiaries are located in the same host country. Thus, the evidence from the case studies comprehensively suggests that corporate principles are far from being fully implemented at the subsidiaries. The excuses for such a gap are based on technological obsolescence, lack of resources, staff and/or support from the headquarters, local legal requirements, low qualification of employees, and finally the lack of environmental concern in the local context (which included the market, consumers, community, authorities and also the subsidiaries top managers).

At the same time there is a widespread assumption (among the subsidiaries' managers) that corporate principles go beyond the local legislation. However, these principles have never been fully implemented, thereby making the latter statement meaningless. However, corporate principles are often used as a justification for the superiority of TNCs' practices over local authorities[73] and companies. According to the Brazilian authorities they are bluffing because this superiority remains rhetorical and there are still cases of non-compliance with local requirements.

More specifically, evidence from Zeneca's case[74] suggest that the headquarters 'started to be really concerned with environmental issues' after the denounce (followed by legal action) of underground water and soil contamination by agrochemical wastes at the Brazilian site. As regards the two British companies, it is possible to say that there is some resistance from the subsidiaries towards corporate guidelines. The other cases - DuPont, BASF, Eli Lilly and HMR - have indicated that the headquarters are the single major source of pressure in the incorporation of environmental concern.

Overall, it is confirmed that TNCs' environmental policies in a developing country are the result of a mixture of regulation and self-regulation (as suggested by the framework presented in section 2.1 of this thesis). However, the major driving force is of a regulatory nature, in which the regulatory context of the host country plays a key role (as stated in the second proposition). It is also confirmed that TNCs'

[73] A senior official from CETESB affirmed that American companies are constantly trying to convince the local authorities that their corporate guidelines should be accepted as the pattern of pollution control instead of the parameters defined by the local legislation (interviewed on 07/11/96).
[74] Interview at Zeneca's subsidiary (on 19/09/96).

subsidiaries from home countries with strict environmental regulatory policy (such as the US) have stronger environmental policies (as stated in the first proposition).

In addition to this, the concern and scope of the incorporation of environmental issues is higher in the most environmentally sensitive sector, that is, the chemical industry. Consequently the environmental commitment of the chemical industry association is stronger, mainly if compared with the lack of specific concern in the pharmaceutical association. The composition of both sectors, based on the origin of FDI, is similar, with a preponderance of foreign companies. Therefore, it may be suggested that the commitment in the chemical sector is much more a result of the (higher) potential environmental impacts. In short, the chemical sector subscribes to the RC initiative, aiming to improve public perception of their operations (as stated in the third proposition). It has been a source of pressure to companies and its major contribution is the improvement of the relationship with the community.

Finally, there is evidence from the cases supporting the assumption that headquarters' strategic decisions (as stated in the fourth proposition), concerning their subsidiaries' environmental incorporation, are directly related to performance. In other words, this means that the most consistent implementation of corporate environmental policy among the six cases resulted from direct (and continuous) pressure and control from the headquarters over the Brazilian subsidiaries. Accordingly, the headquarters-subsidiary relationship is claimed to be the explanation for some proactive practices (or cases of overcompliance) in face of the Brazilian regulatory policy. Moreover, the cases with the poorest environmental performance lack strong connections with the headquarters.

Taking into consideration the empirical findings (present in chapters four, five and in this chapter) the research question should be re-stated as follows: 'What are the main driving forces explaining the adoption and implementation of environmental policies by TNCs' subsidiaries in Brazil?'. Empirical investigation confirmed that there is no simplistic answer to such a question. The answer is rather a set of issues, explanations and assumptions. As such it is evident that the regulatory context has exerted pressure on all companies (both at home and host countries levels). It is also evident that there is a gap between headquarters' rhetorical statements and subsidiaries' implementation of the corporate environmental policy.

The main assumption of this research - that is, the implementation of TNCs' environmental policies in subsidiaries located in a developing country is mainly explained by external variables - was confirmed by the case studies. Some tangible variables (such as the legislation, operational licencing, etc.) and some intangible variables (such as image and public concern) were indicated by the cases as the driving forces conducive to the incorporation of environmental concern into their operations. In some cases the absolute lack of environmental concern prior to a turning point and/or crisis (e.g., environmental contamination, threat of closure, and CEO commitment) was reported.

In conclusion, internal variables (that is, variables representing those factors intrinsically related to business management, such as shareholders, leadership, and profitability) were not the main focus of investigation in the empirical phase (as mentioned in section 1.3 of this thesis). But some internal variables were identified and addressed during the literature review (in section 2.6 of this thesis). This reflected an intentional attempt to keep this investigation within feasible limits.

However, each case study has its own very peculiar explanations for the implementation of corporate environmental policy. For this reason, the so-called internal variables are among the cases' findings and were addressed in the cases' description and analysis. This mainly happened because the headquarters-subsidiary relationships turned out to be a critical variable explaining good and/or poor environmental performance among the selected cases (which confirms Rappaport and Flaherty, 1992).

6.2.2 - Methodological implications

There are some epistemological and methodological considerations that should be addressed at this stage of the data analysis. This thesis was based, in epistemological terms, on empiricist and positivist premises. It was therefore constrained by the principle that scientific practice should not validate value judgments. Consequently, theoretical propositions (addressed in chapter two) were developed according to rule of formal logic prior to the empirical phase.

However, in practical terms, this investigation was based on value premises when choosing scientific texts (Miles and Huberman, 1994, pp. 4-8). This aspect is grounded in the Weberian tradition that a satisfactory theory of social explanation must take account of both the meanings and the causes of social phenomena (Skinner, 1985, p. 6). Moreover, "the social scientist does not go out into the field as a *tabula rasa* and return with an account" (Outhwaite, in Skinner, 1985, p. 29) of what it is like to be a 'Brazilian subsidiary's manager'.

In methodological terms, it is relevant to note that the researcher is an insider on two counts - as a Brazilian and as the interviewer. Some authors (Yin, 1994; Eisenhardt, 1989) say that the insider's knowledge of the context (on how it operates) may be useful during data collection. Such an assumption was certainly confirmed when accomplishing the data collection and changing the research design simultaneously.

Nevertheless, to be an insider during the data analysis may be disturbing. The main reason is the difficulty for one to be objective (or impartial) when some findings seem to present no correlation with the 'theoretical reality' expressed in the literature, most of the time produced in particular socio-economic contexts. This aspect is surprisingly addressed by Rosenau and Durfee (1995, p. 181). Apart from the "frustration over the premises of social sciences in developed countries", there are many peculiar aspects that are only visible to insiders[75]. Consequently, patterns of behaviour found in Brazilian subsidiaries could not be analytically generalized.

Additionally, there is the discussion of the (not so glamorous) source of primary data (i.e., subsidiaries' managers) used to investigate the implementation of corporate environmental policy. Based on the case studies literature (Yin, 1994; Eisenhardt, 1989; Ragin and Becker, 1992), the data collected should include peculiar aspects such as consequences of the idiosyncrasies of the local culture, which should be addressed as a central point regarding comparative research (Oyen, 1992).

For example, the long interview at Zeneca's subsidiary made it possible 'to escape' from the guideline for interview to consult internal documents (as evidence of

[75] This point may be illustrated by body language or non-verbal clues, shared values, off-the-record information contradicting the earlier evidence, access to public bureaucracy, and finally (and perhaps most importantly) the narrative impregnated by the context (Thompson, 1981). This latter aspect means "magical realism" (Angulo, 1995) in the Latin American context, that is, the interviewee's narrative is usually permeated by this literary style.

its practices). However, the manager was not completely comfortable with the situation (though qualified to answer the questions). In fact, the discomfort was related to the legal action against Zeneca due to its environmental impacts. After the interview the manager reported off-the-record how the accusation was really made against the company, that is, by former site managers that were fired after the demerger from ICI. In the end, similar information from the environmental agency and industry association confirmed the data received off-the-record.

However, this situation stressed the vulnerability of the data collection method in defining past driving forces explaining the subsidiaries' environmental performances, because they are usually hidden or lost between one management team to another. Another relevant aspect comes from Glaxo's case. More specifically, the industrial director was uncomfortable with the headquarters' recommendation to provide information on the implementation of the corporate environmental policy in the Brazilian subsidiary. In other words, the previous contact with the headquarters was regarded as a negative aspect from the subsidiary's point of view.

In DuPont's case, the semi-structured interview guideline was avoided on the grounds that the historical perspective of SHE issues within the corporation was more important in understanding the subsidiary's environmental performance. Consequently, data collection at the subsidiary's corporate level is not so rich in details about practices when compared with cases where data was collected at the site level. Therefore, other source of data were investigated to confirm DuPont's environmental practices. Likewise, in Lilly no details about practices were provided.

In other words, the EH&S managers located on site are more specific about operational practices and procedures, at the same time that the researcher has the opportunity (despite a lack expertise about operational processes) to visit the site (which should be understood as the use of observation as data gathering in case studies, as suggested by Eisenhardt, 1989). Altogether, the data collection in the site level of the subsidiaries is more plausible evidence of environmental practices; that is a major contribution to this thesis.

Finally, the highest degree of disclosure was achieved in the German cases. In BASF's case the cooperative behaviour could be understood as an attempt to drive the interview to topics where disclosure was acceptable. Besides this, the researcher was

acquainted with this case (Guedes, 1993). Considering the recent creation of HMR, it was impossible to produce written evidence on the subsidiary's practices. However, an analysis of Dow Group and Hoechst Group's environmental policies was recommended, because HMR's corporate environmental policy would be a "hybrid" of both. The manager was very careful to explain the "grey area" between reality and his perception (a relevant aspect of an interview as a method of data gathering).

Considering the research design, there are no surprises in the limits of drawing conclusions from the empirical data. Nevertheless, the scope of the data collection may generate some questioning. Therefore, it is relevant to anticipate some aspects regarding the limits of extrapolating generalizations from six case studies.

Firstly, it is out of the scope of this research to compare the environmental performance of Brazilian subsidiaries with practices of subsidiaries located in the home countries and other developing countries. Consequently, it is necessary to be aware of the 'rhetorical' nature (as suggested by Dryzek, 1997 and George, 1994) of statements from the headquarters, because what is being compared is the statements made by the corporate environmental policy and reports (referring to high environmental concern, uniform implementation among subsidiaries, beyond legal requirements, etc.) with the practices (i.e., the formalization of commitments) in Brazilian subsidiaries.

Secondly, it was necessary to be careful in the comparative analysis due to the characteristics of the selected companies. It was necessary to identify how "progressive or retroactive" the subsidiaries in Brazil were, that is, if the company was competitive or if it was declining in its position in the local and/or global market. It is assumed here that this characteristic is more important than the size of the company (Nelson, 1991).

6.2.3 - Critical appraisal of the dichotomy between home-host countries

An interesting aspect emerged during the data analysis; that is the difference between the corporate rhetoric toward environmental issues and its practices in a developing country. Glaxo's case in particular is an example of an ambitious corporate

environmental policy and poor practices in what is (or was) a marginal business in South America.

Another relevant aspect regards the distinct layers of analysis, which require constant cross-analysis from the national to the international context and vice versa. The explanations from the international level are much more related to economic issues (i.e., global market and competitiveness) rather than regulation and management style (which are country-specific). Consequently, the structure and characteristics of the chemical and pharmaceutical industry worldwide were useful in explaining pressures from the international towards the national level (since there are no other sources of pressures over subsidiaries' practices).

More specifically, production from the subsidiaries is directed towards the Brazilian domestic market. Besides, the major markets of the selected corporations are located in the North (mainly the US and Europe), as well as their shareholders. Therefore, the TNCs' environmental commitment regarding their operations in a developing country (e.g., Brazil) is residual (that is, it is not a priority). Thus, it is possible to conclude that environmental concern for peripheral business will never be relevant by itself (or due to local reasons). On the contrary, it is always a consequence of hidden (or pragmatic) economic interests at the corporate level.

According to Whittington (1989, p. 8) "these large corporations constitute major actors within our society, whose strategies have vast repercussions. But deterministic theories absolve them from any social responsibility for their actions. Protected from internal query by rank and from external challenge by commercial secrecy, the small elites controlling these companies protest that they are merely servants of the abstract economic rationality of the markets". However, "far from being dependent upon the macro environment, these firms are active forces in determining it".

The conflicting priorities between the corporation and its affiliates are not really a matter of concern in the literature on TNCs and the environment (with the exception of Sklair, 1994). The discrepancies in terms of management (which includes cultural aspects) are not suggested and/or investigated as relevant issues. Rappaport and Flaherty (1992, p. 34) suggested that there is a real tension between

headquarters and affiliates, in which environmental problems (regarding they are site-specific) may prove particularly challenging to this relationship.

However, the attempts to manage global environmental issues bring these distinct perspectives together. Consequently, international agreements should not be focused on the definition of rules but on how to reconcile distinct perceptions and priorities. Otherwise, global environmental management will once again be directed from the top (international community) to the bottom (local communities in less developed countries) without addressing the idiosyncrasies (Thomas and Wilkin, 1996). Moreover, the TNCs' double-standards remain unquestionable[76] since all attempts to regulate their worldwide operations have resulted in failure (UNCTC, 1990; Eden, 1994; Gleckman, 1995; Thomas, 1995 and Miller, 1995).

Based on the empirical findings, flexibility and conflict in the implementation of corporate environmental policy was identified; both aspects are manipulated by local staff with acknowledgment of the corporation (as suggested by the British cases). For example, the anecdotal use of language (such as the 'piv'[77] from Zeneca's case) may be understood as a rejection of norms dictated by the headquarters. According to Amado and Brasil (1991, p. 58) "by being flexible and labile, Brazilians have a chance to face their authoritarian and discriminatory environment, as well as to resist change". Moreover, the language usage stresses how dubious corporate guidelines are, that is some are "really to be done", others are "nice to have". In the end, there is frustration with the lack of concern about SHE issues from both headquarters and local top managers.

In a different way, explanations based on language usage were also present in DuPont's case; for example the SHE manager was careful with language usage to represent precisely the rhetorical statement made by the corporation. It was suggested that there is no exact equivalent for either 'commitment' or 'accountability' in Portuguese. However, what is not addressed is that the difficulty comes from the

[76] Despite the self-deceiving recurrent media statements that Western multinationals are embracing business ethics, defining code of conduct and signing international guidelines such as the ICC's Business Charter for Sustainable Development. The same argument is made textually twice by the Economist (24 June 1995 and 20 July 1996).

[77] See Caldeira (1995, pp. 209-216) for an interesting account of the business and diplomatic relationship between Brazil and Britain in the last century. It was shows by the author that the expression "for the Englishmen see" (in Portuguese "para Inglês ver") was created during that period. Likewise, Freyre (1948) wrote an original analysis of the English influences in Brazil. For a British version of the events that produced such expression see Miller (1993, pp. 42-44 and pp. 53-55).

complexity of translating an approach saturated with American culture into the subsidiary's context (because, according to Hickson, 1997, management is not culture-free).

Additionally, one crucial question is left unanswered; that is, why rhetorical statements made by the headquarters in industrialized countries are considered a reliable source (and data from the subsidiaries is not taken into consideration) in the literature (Hamel and Huse, 1997; Salancik and Meindl, 1984; Shrivastava, 1994). In reality, neither subsidiaries' managers nor headquarters' executives are reliable sources of data[78], thus triangulation is required. For example, the headquarters' rhetoric is not translated into practice at the subsidiary level and the headquarters systematically deny (through public relations mechanisms) the existence of critical issues at subsidiaries.

Moreover, the rhetorical environmental commitment is useful to some extent for both headquarters and affiliates. For example, the corporate environmental policy is disseminated to subsidiaries, but their implementation is not the headquarters' responsibility (due to decentralized management, as argued in Zeneca's and Glaxo's cases). At the same time, the corporation is aware of the impossibility of improving performance without resources. Nevertheless, there are formal corporate statements for EH&S issues in all selected cases claiming that affiliates worldwide are concerned with environmental issues. In sum, these are findings that go beyond home-host explanations.

[78] The pilot case studies at British B.A.T. and Reckitt & Colman have shown that the two headquarters (interviewed on 02/04/96 and 21/03/96, respectively) were not aware of subsidiaries' practices (interviewed on 02/10/96 and 17/09/96, respectively). However, it must be recognized that rhetorical statements were closer to current practices in B.A.T.'s case rather than for Reckitt & Colman.

6.3 - Conclusions

The empirical findings have suggested that the implementation of corporate environmental policy in TNCs' subsidiaries is a quite complex phenomenon. In this case, the explanatory nature of this thesis required a broad level of analysis, in which contradictory forces were brought together. It is relevant to mention that the comparative analysis (aggregating the data by industrial sectors and home countries) reflects the current paradigm of investigation into TNCs within international relations (Strange, 1994; Sally, 1995). Moreover, it includes, at the empirical level, the interface between the unit of analysis with distinct levels of analysis. For example, the table 6.7 illustrates regulation versus self-regulation and its consequences for subsidiary's management.

Table 6.7 - Summary of regulation versus self-regulation per industry sector

Major constraint per type of industry	**Sensitive industry**	**Non-sensitive industry**	**Subsidiary's discretion**
Regulatory	Chemical (A)	Pharmaceutical (B)	Low
Self-Regulatory	Responsible Care (C)	* (D)	High
Industry's discretion	Low	High	

Source: Adapted from the research design (sections 1.2 and 2.1 of this thesis) following methodological recommendations from Miles and Huberman, 1994. Note: * self-regulation attempts in a non-sensitive industry is regarded as a surprising finding.

Altogether, this table summarizes some aspects of the empirical work. First, there is no industry-specific regulation in Brazil, although there is an environmental regulatory policy enforced by state agencies (as mentioned in section 3.3 of this thesis). However, the Brazilian chemical industry association has launched the Responsible Care programme, but the pharmaceutical industry lacks any similar scheme. Secondly, the more sensitive industry is obviously the chemical, the pharmaceutical industry being less susceptible to environmental problems (as discussed respectively in sections 4.3.1 and 5.3.1 of this thesis). Finally, the most

surprising case (corresponding to cell 'D' in table 6.7) is the American pharmaceutical company - Eli Lilly.

Despite theoretical efforts (covered in chapter two of this thesis) to build this typology, the empirical findings regarding the subsidiary's discretion demonstrated a distinctive pattern. Once again, Eli Lilly is a surprising case (among pharmaceutical companies) followed by Zeneca (among chemical companies). Zeneca is an interesting case of high discretion and poor performance in a sensitive industry, which is subject to self-regulation initiatives. Otherwise, Lilly is a case of low discretion and high performance in a non-sensitive industry, which lacks self-regulation.

In brief, the pattern that emerged in terms of subsidiary's discretion (a concept discussed in section 6.1.2, grounded in Hambrick and Finkelstein, 1987) is a consequence of the corporate management suggesting the existence of a national character. As such, DuPont and Eli Lilly have low discretion in the corporate environmental policy's implementation; BASF and HMR have balanced discretion, and finally, Zeneca and Glaxo have high discretion.

In addition to this, there is some evidence suggesting that the regulatory policy of the home country is a key constraint in the incorporation of environmental issues by American companies (discussed in section 6.1.1). However, this assumption was not confirmed by German and British subsidiaries (which may be linked to the historical explanations for the internationalization of European versus American companies, according to Bartlett and Ghoshal, 1992; Mayer and Whittington, in Whitley and Kristensen, 1996). Nevertheless, there are common elements of the managerial approach followed by subsidiaries from the same origin, suggesting a 'management style' with the home country (developed in section 6.1.2). Overall, these findings highlight a weakness of this thesis, that is the limit of generalizations about national character and management structure based on two firms from each country of origin.

The investigation of TNCs' subsidiaries headquartered in industrialized countries but located in a developing country, brings out an interesting pattern of analysis for environmental issues (Redclift, 1987; Miller, 1995; Sklair, 1995). Far from being a weak point of the research design the focus on one host country is a contribution to the literature. Prior investigations have been usually focused on companies with the same origin operating in distinct host countries (Flaherty and

Rappaport, 1991; Leonard, 1988; Pearson, 1985-1987; Ives, 1985; Gladwin, 1977). Additionally, the choice of TNCs from different origins has produced an understanding of the distinct pressures that TNCs' subsidiaries are subjected from their home countries. It was also found that TNCs' practices in a developing country are influenced by the predominant management pattern from their country of origin. The table 6.8 summarizes the finding regarding the type of management approach followed by the subsidiaries and its consequence in terms of environmental performance (that is, the control of industrial pollution according to the Brazilian legal requirements).

Table 6.8 - Summary of management approach versus performance per country of origin

	United States	United Kingdom	Germany
Management approach:			
Decentralized		X	
Formalized coordination	X		
Centralized coordination			X
Environmental impacts:			
under control	X		X
out of control		X	

Source: Adapted from the research design (sections 1.2 and 2.1 of this thesis) following methodological recommendations from Miles and Huberman, 1994.

To illustrate, Glaxo Group has a very ambitious corporate environmental policy. In such a case, the corporation is neither subject to strict environmental regulatory policy nor industry attempts at self-regulation in environmental issues (in the home country). However, the environmental commitment was made and a number of corporate reports disseminated instruction that affiliates should adopt and implement the corporate environmental policy following a decentralized management. Nevertheless, there is no strict control over operational performance, the result was a poor environmental performance in Glaxo's subsidiary. In conclusion, decentralization seems to be a very ineffective strategy to be followed for environmental issues (if one includes subsidiaries located in developing countries).

The subsidiaries' discretion and how it could be related to environmental performance, may be easily justified by the 'agency versus structure' discussion (Wendt, 1987; Ghoshal and Westney, 1993). In such a case, the subsidiaries are parts

of the corporation's structure at the same time that they challenge such a structure. Zeneca's case is an interesting example of conflict with headquarters over the implementation of the corporate environmental policy. The local managers used their discretion (granted by the decentralized approach) to reject, delay and misinterpret the corporate requirements (similarly to Glaxo's case). The managers usually indicated their decisions by reference to local requirements (it may include a legal obligation and/or the lack of obligation, such as in Lilly's case).

As shown in the literature review (addressed in chapter one) the discretion of TNCs' subsidiaries to adopt environmental policies was not anticipated, mainly due to their location in a developing country (Sklair, 1994). Other authors (Strange, 1994; Gleckman, 1995; Doz, 1981; and Ghoshal and Westney, 1993) also suggested this lack of discretion in the TNCs' subsidiaries. On the other hand, reports from NGOs and environmentalists disagree that there is environmental concern in subsidiaries located in developing countries. Accordingly, the double-standards will prevail as a comparative advantage of transnational business (Bruno, 1992; Greenpeace, 1992; Commoner, 1990).

The scarcity of literature on the implementation of corporate environmental policies has motivated this thesis. Moreover, the investigation of this phenomenon is mainly relevant for developing countries, where a set of constraints posed by the late and unequal process of development still makes environmental awareness a luxury for large groups of people (Keck, 1995; Castro, 1972). Nevertheless, developing countries are changing their views towards both TNCs (becoming more pragmatic, Stopford et al., 1991), and environmental protection (now interpreted more as a necessity, Miller, 1995). However, the practical results in Brazil are still modest (Gladwin, in Pearson, 1987, has made a similar argument regarding developing countries). Furthermore, the Brazilian environmental movement is relevant but not fundamental in explaining the changes in the business community towards environmental protection in that NGOs and consumers exert little pressure on companies' practices.

With regard to the Brazilian context, it must be said that its "chaotic reality" in face of a well-organized literature has provided some insightful findings. According to Da Matta (1987, p. 26) "the secret of a correct interpretation of Brazil lies in the possibility of studying what is 'between' things". Consequently many of the

explanations that go beyond the home-host countries and industry subject-areas owe much to local conditions. The research design's focus in one host country may be questioned by the limits it poses on the generalization from the cases, and how representative it could be of other developing countries. A similar investigation in other developing country will generate distinct results. However, a major contribution from the empirical work in Brazil is derived from the indication of the most relevant variables which explain the implementation of corporate environmental policies in TNCs' subsidiaries.

Overall, one can identify the scarce attention in the literature concerning Brazilian attempts to manage external pressure vis-à-vis internal needs. For example, the institutionalization of environmental concern at the governmental level includes advanced programmes such as the 'Proálcool', the recovery of Cubatão, Ibama's restrictions on new concessions for the timber industry, the first private-owned natural reserve in Paraná, and the demarcation of the 'Legal Amazon' area, which is subject to special attention from the government for any development plan. This area is much broader than the tropical forest including distinct ecosystems at the border of the native forest. Nevertheless, there are aspects of the government's commitments that are exclusively rhetorical responding to international pressure[79].

Public environmental concern (through NGOs and consumers) may be a major explanation for the definition of environmental policies in home countries. But it is not a source of pressure in the Brazilian context. Besides, there is no evidence that companies are incorporating environmental concern because of consumers' pressure and/or preferences[80]. At least in the Brazilian context these pressures were not

[79] The Brazilian media has identified that Fernando Henrique Cardoso has followed this approach in the opening discourse at the UN summit (held in New York in June 1997) to evaluate the progress achieved since the UNCED. The President affirmed that the 'Alcohol Programme' will be re-started as part of Brazilian programme to curb carbon dioxide emissions already anticipating the agreement in the Kyoto Conference on climate change. However, there was no evidence of such commitment in the domestic context. In reality, this programme has been criticized by the subsidies granted to cane plantation (Jornal do Brasil, 11 July 1997).

[80] In reality, there is a huge gap between consumers' willingness expressed at opinion polls and changes in their buying behaviour. For example, Brazilian consumers would change traditional products for environmentally friendly substitutes in some categories (such as detergents, soup, cleaning products, soft drinks, drugs and cars) according to a marketing research made by Rhodia in 1990. In this survey 79% of the sample confirmed that they would change products when informed that they were pollution intensive (Jornal do Brasil, 5 June 1991, p. 14).

apparent[81]. Business's concern with consumers are present in the pharmaceutical cases (where the final consumers are clearly identified), but it does not mean that consumers criticize these companies' operations and/or products. It is relevant to mention that the chemical sector has no final, but 'intermediate industrial' consumers.

The assumption that liberalization (which became a governmental policy from 1990) and globalisation have exposed Brazilian companies to international competition, thus the business community was faced with the new challenge to incorporate environmental concerns, was refuted by all cases. The six TNCs' subsidiaries are located in Brazil (i.e., their exports accounts for a maximum of 10 percent of total sales) basically to supply the domestic market.

The main argument here is that 'market forces' (like any other source of environmental pressure), have limitations in the Brazilian context. However, it does not mean that voluntary business initiatives should be ignored as levers. The issue is more complex because it deals with contradictory forces. Therefore, it is not a case of substitution; regulation for self-regulation (in both research and governmental policy), because better environmental performance is a consequence of multiple and simultaneous factors.

Nevertheless, this new 'liberal approach' has many followers at the environmental agency. It may be interpreted as the novelty of market mechanisms whilst the state government is bankrupted. But, most importantly the domestic market has not suddenly incorporated environmental concerns; there are no green consumers in Brazil. Thus, changes based on international pressures will be restricted to companies that export to industrialized countries. Those are the companies willing to have environmental certification to secure their markets.

The ISO certification (similarly to other managerial tools, such as "just-in-time" and "quality control" in the past), prompted a real "fever pitch" among the business community and public servants in Brazil. It is really supposed to be the instrument that will increase environmental awareness within the industry. At the same time, it will solve compliance problems for the environmental agency (given that legal compliance was included as one of the requirements for certification). However, there

[81] The findings from a pilot case study shows that Reckitt & Colman withdrew its range of environmentally friendly products from the market. The site is now producing traditional products (at a low price) due to an increase in the local demand (interview conducted in the Brazilian site, on 09/10/96).

is evidence that the use of the best practices in Brazil "which originated in technologically more advanced cultures and in the context of capitalist economies, has proven that such transpositions are doomed to failure, or take much longer to become functional than is tolerable" (Amado and Brasil, 1991, pp. 48-49). This is because cultural diversity is not taken into consideration.

In addition, there is widespread belief that American centralized management is more efficient than its European counterpart. Such an assumption is translated into the incorporation of American standards, which will overshadow other EMS approaches and technologies (e.g., from Scandinavian countries and Germany). Nevertheless, the authorities have claimed to take into account environmental management which combines different cultures. This aspect could be further developed assisting the understanding why some practices are implemented faster than others or concerning which are the issues the local managers will struggle to accept. These may be intrinsically related to the local culture and preferences. Besides this, Brazil is a recipient of FDI from a diversity of countries of origin, which should be managed as an asset in the search for better managerial approaches.

Considering that the lack of resources is an endemic aspect of Brazilian environmental agencies, it is necessary to disseminate distinct voluntary schemes. However, there is one mechanism that could produce a demonstrative effect in the business community, that is, to improve the transparency of the environmental agency. In such a case the media and/or NGOs could be the ideal partner to make public the polluters as well as the best environmental practices.

Overall, Brazilian environmental regulatory policy is a key element driving business behaviour towards cleaner technology and pollution prevention. Despite the expectation of further liberalization (in both the international and regional - by the Mercosur - levels) it is necessary to regulate companies regarding issues such as waste management and environmental disclosure. Accordingly, as a result of the local difficulties to enforce the law some state governments have regulated what was traditionally a voluntary instrument of self-assessment. Moreover, there is an attempt to make obligatory environmental auditing (project of law 3160 from 1992 in the Brazilian Federal Congress) valid in the country. This initiative suggests that environmental agencies are aware that the current regulation alone is not able to

produce good environmental practice in Brazil (though the penalty for misuse or failure to accomplish the self-assessment is exclusion from register).

On the other hand, the assumption that self-regulation will make companies more environmentally responsible is dubious because of the traditional rationality of short-termism and profits. The findings presented throughout chapter four and five demonstrate that such a mentality is still detrimental to the environment (which confirms Thomas, Thomas and Wilkin, 1996). There are therefore limits for what could be expected from self-regulation regarding environmental issues[82]. However, these attempts should be understood as bargain instruments to be used in negotiations with the government regarding the expectation of more and/or stricter environmental regulations (Turner and Hodges, 1992).

Moreover, TNCs are still imposing their standards (which have been hypothetically imposed on them by governments, shareholders and other stakeholders in their core markets) in host countries. However, their attempts at more global standards aim to facilitate their operations worldwide, at the same time that they impose similar standards on their competitors. In sum, this is not a case of "business ethics", but an attempt to control their institutional environments. Consequently, they remain closed and unaccountable on a worldwide basis, although they disclose information in those countries where shareholders and regulations obligate them. So far there is no sign that TNCs have changed their "financial rationality". In broad terms, there is the arrogant assumption that the management of global issues should be made accordingly to norms from Western industrialized societies (Thomas, in Thomas and Wilkin, 1996).

Overall, this thesis has also contributed to the literature by illustrating some environmental consequences of the industrial development in Brazil. Those findings reporting environmental degradation should be understood as a result of the "modernist project" (Robertson, 1992), which took place in the name of progress and/or generation of wealth in the postwar period, in conjunction with the multinational corporations phenomenon.

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[82] For example, there is no representation of the ICC in Brazil. Such lack of representation in developing countries was confirmed by ICC in the UK because their concern is concentrated on the major markets (that is, specifically the Triad markets) of TNCs' operations. However, a temporary office was created in Rio during the UNCED in 1992 (in cooperation with the Brazilian National Committee of ICC) confirming ICC interests on international environmental issues (Eden, 1994; Gleckman, 1995).

In addition to this, globalisation has been weakening the regulatory capacity of the state and has been strengthening the influence of other actors such as the TNCs. However, the empirical findings suggested that some practices already taken for granted at the TNCs' home countries are not present in subsidiaries located in Brazil. Therefore, the burden of pressuring TNCs' subsidiaries towards environmental issues should not be left to NGOs, environmentalists and/or the community at a local level, because they might not be available (as in the Brazilian context).

On the contrary, pressure should be also placed on the TNCs' headquarters by their home countries' governments, international governmental and non-governmental organizations. The WRI (1984, p. 6) states that industrialized countries should not try to extend their environmental norms to the foreign operations of their MNCs. This argument represents the short-term interests of the business community since they benefit from distinct regulatory contexts. Moreover, multinationals have been extending other aspects of their home-based operations founded on competitive advantage.

Nevertheless, the Brazilian government could assume a more active role towards environmental performance of business. It seems that there are opportunities (based on a bargaining approach) to require a more proactive role from TNCs' subsidiaries. It is specifically by technical assistance and pressure over local suppliers that these companies may contribute to enhance environmental concern. However, it is clear the lack of social responsibility among the selected cases (though BASF's case may be an exception).

It is relevant to note that the disposal of hazardous waste may became a critical environmental issue in Brazil. This finding suggests the urgent need for launching a scheme to clean up sites because there is a large amount of environmental burden to be recovered. In addition, there is no reliable evaluation of wastes disposed during the 70s and early 80s. Finally, Brazilian economic and political stability since the mid-90s, and the (rhetorical) environmental commitments from TNCs' headquarters and international business associations (such as ICC) have made redundant the subsidiaries' excuses for their poor performances.

6.3.1 - Summary of findings

The findings from this thesis will be summarized according to the four levels of analysis followed in the investigation of the implementation of corporate environmental policies in Brazilian subsidiaries.

First, at the international level the most relevant aspect is the lack of pressures on the selected subsidiaries in Brazil. Evidence was not found in particular from international environmental NGOs, consumer and business associations. However, these pressures have been found by other studies in the context of industrialized countries. Therefore, if both aspects are combined it leads to the argument that the context of the country of origin may exert more influence on the corporate environmental policies and practices than the context of subsidiaries. This is mainly because the environmental movement in Brazil has been concentrated on the preservation of natural resources (reflecting much of the international NGOs interests in Brazil), which usually does not directly affect the business community.

Nevertheless, the analysis of the industrial sectors shows that globalisation has exerted an influence on the TNCs' operations in Brazil. However, it has had a distinct pace and consequences for each industrial sector. More specifically, the changes and trends in the world chemical industry have been incorporated by the Brazilian industry. For example, technological innovation, market demands and competition are much more a consequence of calculation from the corporation than from their positions in the Brazilian market. As such, local managers either lack knowledge of the causality of improvements or attribute much importance to the fact that their production is basically directed to the domestic market.

Furthermore, the high environmental impact and risks of accidents in the chemical industry means that improvements represent a cost. On the other hand, the technological expertise (in operational and managerial terms) has become a new business for chemical companies. Most importantly, these services are basically sold to other TNCs' subsidiaries, which shows an integration among TNCs either as suppliers or consumers. Moreover, the importing of technology and standards in this sector has maintained the current dependence of domestic firms on foreign companies.

The pharmaceutical industry has benefited from unique momentum; that is, deregulation of imports and pricing control, new patent laws and the creation of a regional trade bloc in South America. Combined with the historical profitability of this sector, it results in high investments in expansion and modernization. Such investments will probably result in environmental improvements in a industry with minor impacts.

At the national level there are some qualifications to be made between the home country and the host country contexts. That is, there is evidence that the nationality of the firm is a relevant variable explaining the implementation of corporate environmental policies; therefore pressure should be exerted at the home country level (i.e., the headquarters context). This is mainly because it is there that decisions over investments are made as well as where powerful shareholders and consumers are located.

In short, the legislation from the host country was mentioned as the minimum requirement followed by the selected TNCs' subsidiaries. However, these claims were more rhetorical than practical in some cases (i.e., Zeneca and Glaxo). The few practices recognized as examples of overcompliance are based on headquarters guidelines (such as in BASF and HMR) and/or home country regulatory requirements that have been incorporated by the companies (such as in DuPont and Lilly).

In regulatory terms, there is evidence that more legislation is expected in the Brazilian context. Nevertheless, self-regulation will remain useful instrument of leverage in the business community to respond to external pressures. Brazil has been quite innovative by turning a traditionally voluntary instrument - environmental self-assessment - obligatory. This instrument includes different elements (such as disclosure and assessment) together, which may be a realistic option in the face of the state's weakness in enforcing the current legislation. An increase in the use of market instruments to improve environmental performance, such as the recent water taxation, is also expected.

At the company level the most striking aspect is the evidence that decentralization is not the best approach to environmental issues. This is a controversial issue because of the evidence that environmental impacts are site-specific; consequently it calls for decentralization in the management of subsidiaries'

operations. However, such decentralized management must include some type of control and/or assessment of the subsidiaries' environmental practices. Additionally, there is evidence that the environmental management of TNCs' subsidiaries reflects corporate management. The latter has specifically incorporated elements from their country of origin.

6.3.2 - Directions for further research

First of all, future research should be focused on the agency of NGOs as actors (which has been already suggested by Halliday, 1994, p. 242), such as TNCs, in the national and/or international context regarding environmental issues. More specifically, it is necessary to explain why subsidiaries use the local legal requirements as excuses for non-compliance with headquarters standards. Furthermore, the lack of representation of international business associations (e.g., ICC and BCSD) in developing countries deserves further investigation, because it may confirm the rhetorical aspect of their environmental commitments.

Moreover, there is evidence that TNCs (at both headquarters and subsidiaries levels) have been exaggerating their environmental improvements in developing countries (through aggregated data in environmental reports). There are many potential explanations for such behaviour (including economic, cultural and/or historical explanations). However, the use of critical theory could be a more useful basis to understand and explore this phenomenon.

This thesis has presented evidence that the TNCs' nationality is a relevant factor in explaining corporate environmental policies. However, it is recognized that the national character requires further development, because it permeates the environmental regulatory policies, the corporate environmental policy, management, technology and environmental disclosure. Consequently, it should not be assumed that TNCs are dispersed networks of power; indeed, they still have a core of power where strategic decisions are made (this locus is in the industrialized countries). Nevertheless, there is a vast literature that reports TNCs as powerless agents.

This thesis has not covered all aspects of TNCs' activities, however in terms of environmental issues it shows that the subsidiaries' discretion is exercised resulting in

both good and poor performance. Moreover, there is a strong indication that the corporate management is constrained by its institutional embeddedness in the home country. Consequently, cultural differences should be taken into account in the future because they are at the core of the explanations of corporate environmental policies in TNCs' subsidiaries.

In addition to this, the contradiction between rhetorical commitment (without top management commitment) and short-term (mainly financial) pressure over subsidiaries is an area that deserves further research. There is some evidence that a distinct epistemological approach would refute some aspects of the mainstream international business literature. There are some issues, such as lack of shared values and management philosophy towards environmental issues, that could be addressed in an attempt to understand the effectiveness of corporate environmental policies in developing countries. That is, management is not culture and value-free; therefore, it is necessary to take them into consideration. The reality's complexity (with its social, political and environmental demands) is voluntarily incorporated by the business community in rare cases. These case are basically found in industrialized countries, but rarely in developing countries.

The variation in the environmental performance of the selected TNCs' subsidiaries leads to the conclusion that industry is a relevant (basically economic-specific) variable, but it is simplistic to believe that this is the most important aspect explaining corporate environmental policies. However, data aggregation by industry is quite useful as a control variable given that the task context has similarities. Thus, it is recommended that further research is undertaken in developing countries in other industrial sectors. Nevertheless, the main concern should be focused on potential impacts rather than on volume of pollution (that is, pollution-intensiveness); because some sectors have high risks of fire and contamination but low rates of pollution emissions (e.g., the pharmaceutical).

Finally, the nationalistic view expressed by the Brazilian government on environmental issues (from early 70s until late 80s) reflects a historical vulnerability towards external influences. However, it is very rare in the literature to find such historical explanations and the explicit recognition that they deserve to be taken into account when analysing environmental management in the developing world.

In epistemological terms, there are two relevant points to be questioned in the future in the field of international relations, as follows: (a) the authority of the researcher to analyse and drawn conclusions from the data when doing comparative studies regarding that the final report usually exclude the description of the case studies (according to Stake, in Denzin and Lincoln, 1994, such description could allow the reader to learn directly from the case), and (b) the extent to which the developed versus developing countries (or North-South) discussion is still central to any investigation following a similar research design.

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Appendices

A.1 - Further Methodological Aspects

A.1.1 - Criteria for judging the quality of research design

The internal validity test was performed during the data analysis (presented in chapters four, five and six) through the use of a "pattern-matching" approach. Yin (1994, p. 33) suggests other tactics (e.g., explanation-building and time series analysis), however, the "pattern-matching" type seemed to be more suitable for this thesis because of the complementary propositions. External validity was ensured by the use of multiple case studies, with the intention of producing "replication logic". That is, the method of generalization is "analytic generalization", in which the empirical results from the cases were compared to the theoretical framework (Ibid., p. 31).

The reliability test was provided by the access, reported as an appendix, to the data collection model[1]. According to Yin "the goal of reliability is to minimize the errors and biases in a study" (Ibid., p.36). Thus it was demonstrated that the same procedures (i.e., the data collection methods adopted and followed) might be repeated in the same case, and that the investigator could arrive at the same results and conclusions. However, there is not a high probability that this procedure will obtain the same result by consecutive testing. In contrast, according to Popper (1992), empirical generalizations are falsifiable instead of verifiable. This means that theoretical assumptions can be tested by systematic attempts to refute them.

A.1.2 - Data collection and case studies description procedures

The data collection was organized in three phases: the first in the home countries, and the subsequent phases in the host country (see Appendix 2 - section A.2.2 - for a summary of the data sources). The first phase was focused on the collection of documents interpreted as the ones that support the environmental commitment from the corporate level. This means a corporate policy to be implemented worldwide as well as

[1] This database called "case study protocol" was developed during the research data collection, see Appendix 2 for further details.

the disclosure of major achievements. In sum, only secondary data was collected at this phase from the headquarters.

Attempts to collect data through interviews at the headquarters (in the UK, the US and Germany) were difficult and unproductive. It must be said that the lack of institutional support is one of the explanations for the difficulties in the US. Due to high concerns about environmental liabilities, some American companies systematically refused access. The reasons for problems of access in the UK and Germany were not given. Nevertheless, access was obtained in two British TNCs in the tobacco and household sectors[2]. These two cases were used as pilot cases, consequently they are not reported here.

In the second phase (in the host country context) the data collection was achieved through semi-structured and direct interviews at the corporate and operational levels of the companies[3]. Interviewees were members of the staff responsible for environmental management in the Brazilian subsidiary. Accordingly, the semi-structured guideline has ensured that all issues were properly and equally discussed in each case, which improved the quality of intra-case and cross-case analysis. The research propositions were covered in the guidelines and an effort was made to avoid asking questions that induced biased responses.

Aiming to acquaint interviewees with the areas of questioning and also to prepare secondary data as evidence, the guideline for interviews was sent long before the meetings. Here, one very peculiar situation emerged. That is, the interviewees read the guidelines only at the beginning of the meetings, which turned out to be a common characteristic of Brazilian managers. In addition, the most reliable way to contact them was in person and/or by phone, because written information was not given due attention.

In the third phase, faithful to the intention to use other sources of evidence[4], the environmental agencies, local environmental pressure groups and industry associations were interviewed in Brazil (partially addressed in chapter three). The basis for these

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[2] The semi-structured guideline for interviews at the headquarters is available in section A.2.3.

[3] The semi-structured guideline for interviews at the subsidiaries is available in section A.2.3.

[4] The research was particularly concentrated on triangulation by data source and by method (Miles and Huberman, 1994, p. 266). Briefly, several sources were contacted during the fieldwork activities in Brazil, such as: Foreign Relations Ministry; Ministry of the Environment; IBAMA; WWF; research agencies; Central Bank; BNDES; FIESP; business associations; scholars from 'Fundação Getúlio Vargas, Universidade de Brasília, Pontifícia Universidade Católica do Rio de Janeiro, Universidade Federal de Santa Catarina, UNICAMP, and Universidade de São Paulo'.

(open-ended and focused) interviews were both the literature reviewed (in chapters one and two), and the cases' findings (reported in chapters four, five and six).

Finally, another important element in the data collection process was that all interviews were tape-recorded. After the transcription and translation, a brief report was sent to the companies to be approved by the interviewees, in order to fill the gaps in the respective case studies. It must be said that the responses to this latter request were mixed; consequently the utility of such approach is questionable (though it was suggested by Yin, 1994, in order to construct validity).

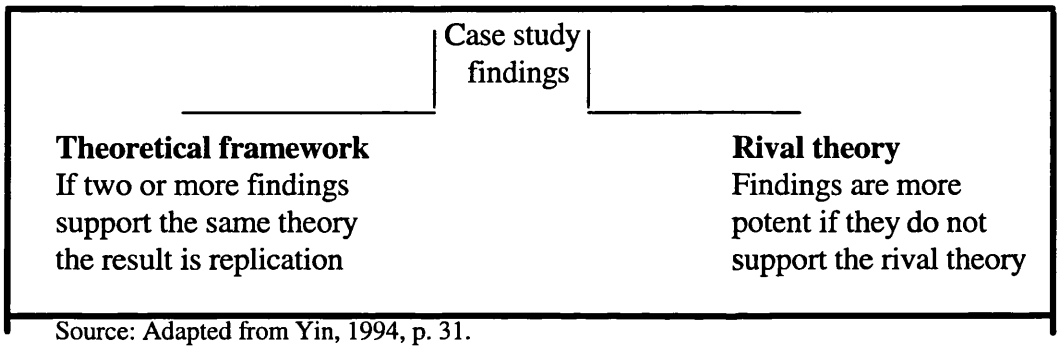
A.1.3 - Data analysis

It is generally acknowledged that analyzing data is one of the most difficult tasks in case studies, because the process requires a constant effort to keep strict logic (Yin, 1994, p.25). Information unrelated to the research propositions, though frequently interesting, was left aside. A conscious effort was made to analyze and write down the data early in the process; furthermore the data was analyzed individually in each case. However, it required several versions of the cases before the categories of data were really defined.

One helpful approach in explanatory studies is the establishment of causal relationships, whereby certain conditions are shown to lead to other conditions (it will also test the internal validity). This "pattern-matching" approach was adopted in order to link information collected from each case to the theoretical propositions. The main pre-condition for this tactic is to have, at least, two rival propositions that can be complementary or contradictory. Therefore, it will result in two unlike patterns to be used to interpret the findings (Ibid., pp. 25-26). The most common rival theory has been the "null hypothesis", which is simply the absence of the target hypothesis. However, Yin (1993, p. 60) suggests that for case studies "the best rival is a true rival - one that is mutually exclusive from the target theory. ... a poor rival would be one that is substantively different from the target theory but that also can coexist with the target theory". In principle, this thesis assumed a "null hypothesis" based on the home-host dilemma. But after data collection the industry- and home-specific propositions became "poor rivals".

The logic underlying the use of multiple-cases is that each case must be carefully selected to predict similar results (a literal replication) or to produce contrasting results but for predictable reasons (theoretical replication). Another relevant step in the replication procedure is the development of a rich theoretical framework (Yin, 1994, p. 46). In this thesis the theoretical framework was based on complementary propositions (that is, home-, host-, industry- and company-specific), which resulted in sets of explanations (organized from chapters three to six) for the implementation of corporate environmental policies.

One important question in doing case studies concerns generalization, because cases are not "sampling units" (Ibid., p. 31). In this thesis the method of generalization is the analytic (in contrast to the statistical generalization obtained from the use of statistical sampling), compatible with the research design. The diagram below illustrates the process of analytical generalization:



Source: Adapted from Yin, 1994, p. 31.

According to Yin, each individual case will "indicate how and why a particular proposition was demonstrated (or not demonstrated)". On the other hand, the cross-case analysis will "indicate the extent of the replication logic and why certain cases were predicted to have certain results, whereas other cases - if any - were predicted to have contrasting results" (Ibid., pp. 49-50).

The data analysis was accomplished in three phases, each of the phases was subsequent to the phases followed for data collection. The first occurred with the analysis of headquarters' secondary data, in which written documents were the main source of evidence on the contents of corporate environmental policies. Other sources of secondary data (such as newspapers, reports, etc.) were also used to avoid overdependence solely on environmental disclosure from TNCs. At the same time, with the aim of understanding the home countries' contexts, the analysis of selected variables

were included in the literature review. It included the environmental regulatory policies, NGOs and consumers' environmental pressures. Finally, the industry association's commitment to environmental issues were also included.

The second phase of data analysis happened after the data collection in Brazil. This phase included the investigation of the implementation of corporate environmental policy in six subsidiaries. The fieldwork in Brazil was accomplished in four months (including the investigation of two pilot cases). The data accumulated (from documents, newspapers, interviews and observation) was first organized according to source and later summarized following the research propositions. Such repetitive description and analysis of the cases was a helpful process of data reduction, as suggested by Miles and Huberman (1994, pp. 10-11). Furthermore, the authors advocate the use of more 'inventive and systematic' data display which permits conclusion drawing (table 1 below is an example of such data display).

Table 1 - Summary of evidence from the Brazilian subsidiaries

Selected variables	Case Study 1	Case Study 2	Case Study 3	Case Study 4	Case Study 5	Case Study 6
International level+	-	-	-	-	-	-
Home country level:						
1- Environmental regulatory policy	No*	Yes	No	No	Yes	No*
Host country level:						
2- Environmental regulatory policy	Yes*	Yes	Yes	Yes*	Yes	Yes
Industry level:						
3- Industry structure and commitment	Yes	Yes	Yes	No	No*	No*
Company level:						
4- Headquarters' strategic decisions	Yes	Yes	Yes	Yes	Yes	Yes

Notes: * means that this case has some exceptional explanation regarding the proposition, which was discussed in chapter six (section 6.2.1); + there was no evidence of international pressures from NGOs, consumers and business associations in the selected cases, thus no proposition was included in the final report.

The final phase of analysis was based on data from the previous stages. The data was finally organized into a matrix of countries of origin and industrial sectors, with the purpose of producing replication or theoretical explanations of the research propositions (as suggested by Miles and Huberman, 1994, p. 207). The cross-case analysis was based

upon similarities and then differences within the similarities. At the same time, the opposite process was undertaken to avoid biases. This tactic facilitated the search for more sophisticated explanations and new questions for further research.

The first step was to compare cases 1, 2, 3 and 4, 5, 6, looking for similarities determined by the same industrial sector, which produced literal replication to the host- and industry-related propositions. The second step was to compare case 1 with 4, case 2 with 5, and 3 with 6, to produce similarities as a result of a shared country of origin. These steps produced literal replication with some degree of variance. The similarities discovered were compared again, and differences that were expected confirmed both industry-based and country-based explanations. In such a case the theoretical replication was achieved (this phase is illustrated in the table 2 below).

Table 2 - Comparative analysis

	Country	**of**	**origin**	**1st result:**	**2nd result:**	**Final result:**
Industrial Sector	UK	US	Germany		**Literal Replication**	**Theoretical Replication**
Chemical	Case 1 (Zeneca)	Case 2 (DuPont)	Case 3 (BASF)	Similarities due to same sector	Comparison of similarities between	IF... Differences are
Pharma-ceutical	Case 4 (Glaxo Wellcome)	Case 5 (Eli Lilly)	Case 6 (Hoechst Marion Roussel)	Similarities due to same sector	two different industrial sectors	industry-based
1st result:	Similarities due to same country	Similarities due to same country	Similarities due to same country			
2nd result: Literal Replication	Comparison three	of similarities different	between countries			
Final result: Theoretical Replication	IF.... Differences	are country-	based			

A.2 - Case study protocol

A.2.1 - Summary of attempts to collect data

This is a brief report of the attempts made to gain access to selected sources of evidence. It includes requests for primary and/or secondary data made to companies, business and industry associations, environmental pressure groups, and international organizations.

List of companies per industrial sector

Company	Positive answer	Secondary data	Negative answer	No answer
Chemical:				
Zeneca	X	X		
DuPont	X	X		
Dow				X
Union Carbide				X
BASF	X	X		
Monsanto			X	
Household:				
Reckitt & Colman	X	X		
Unilever		X	X	
Colgate		X	X	
Johnson & Johnson				X
Procter & Gamble				X
Lubricants:				
Castrol				X
Texaco				X
Shell		X	X	
Exxon			X	
Mobil				X
Pharmaceutical:				
Glaxo Wellcome	X	X		
Merck				X
Eli Lilly	X	X		
Hoechst Marion	X	X		
Pfizer				X
Tobacco:				
B.A.T. Industries	X	X		
Philip Morris			X	

List of business and industry associations

Association	Primary data	Secondary data	No answer
International Chamber of Commerce (UK)	X	X	
US Council for International Business			X
Confederation of British Industries		X	
Chemical Industries Association (UK)	X	X	
Chemical Manufacturers Association (US)		X	
Verband der Chemischen Industrie		X	
Brazilian chemical industry association	X	X	
Brazilian pharmaceutical industry association	X	X	
Soap and Detergent Association (US)			X
Soap and Detergent Industry (UK)		X	
British Lubricants Federation (UK)		X	
Independent Lubricant Manufacturer (US)			X
Pharmaceutical Research and Manufacturer of America (US)		X	
Assn. of the British Pharmaceutical Industry	X	X	
Tobacco Assn. of United States			X
Tobacco Advisory Council (UK)		X	

List of international governmental and non-governmental organizations

Organization	Primary data	Secondary data	No answer
UNCTAD - Programme on TNCs	X	X	
UNEP - Industry and Environment		X	
Friends of the Earth (UK)		X	
Greenpeace (UK)		X	
WWF (UK)			X
Greenpeace (US)		X	
Environmental Defense Fund (US)		X	
WWF (US)			X
Greenpeace Brazil		X	
WWF Brazil	X	X	

A.2.2 - Summary of the data sources

I - Main source of evidence

The data collected at headquarters and Brazilian subsidiaries are summarized as follows:

1) Headquarters

(a) secondary data: formal environmental statements, public relations brochures, corporate environmental, health and safety manuals, environmental annual reports.

(b) primary data: interview with the manager responsible for the corporate environmental policy.

2) Brazilian subsidiary

(a) secondary data: formal environmental statements, corporate EH&S manuals and guidelines, environmental and annual reports.

(b) primary data: interviews with the manager responsible for the adaptation and implementation of the environmental policy (at the corporate and operational levels).

The data analysis (based on documents, interviews and direct observation) has generated a set of case reports regarding the implementation of the corporate environmental policy. These reports were sent to the subsidiaries for their evaluation prior to the cross-case analysis. This tactic (as suggested by Yin, 1994) aimed to enhance the reliability of this thesis.

II - Other sources of evidence

The data collected at other sources is summarized below:

1) Non-governmental organizations

(a) **environmental pressure groups:**

The data collection was concentrated on documents (reports, leaflets, campaigning material, and newspaper articles) and interviews with representatives of international and local pressure groups (located in Brazil). The main purpose was to identify the existence of specific relationships between environmental practices of TNCs' subsidiaries and those groups' actions in Brazil.

(b) **industry associations:**

The data collection included the gathering of documents (reports, manual, and newspaper articles) and interviews with those responsible for environmental issues in the industry associations. The main purpose was to investigate the dissemination of guidelines for environmental management. It was also relevant to address the role of the associations in the companies' compliance with environmental regulatory policy.

2) Environmental agency

The data collection was focused on the laws and regulations regarding industrial pollution control, at the federal and state levels. In addition, interviews (specifically regarding TNCs' subsidiaries) were held at the federal and state environmental agencies.

A.2.3 - Guideline for interviews

These are the guidelines used during the interviews at the selected companies.

A) Guideline of interview - headquarters

1- What are the main aims and goals of the corporation's environmental policy (CEP)?

2- Which programmes and/or procedures have been created to implement such a policy?

3- When were those programmes and/or procedures adopted?
a) Are all of them formal procedures?
b) Are there any informal procedures? Why?

4- Which of the following provoked a change in your overall, company-wide environmental policy?
a) change of legislation in your home country,
b) change of legislation in a host country,
c) environmental accidents at your premises,
d) environmental accidents at other companies,
e) environmentally related legal action involving your company,
f) environmentally related legal action involving other companies,
g) consumer related events (e.g. boycotts),
h) worker related events,
i) other.

5- What are the main lines of action so that the CEP might produce results of short and long term?
6- Which strategic choice is made by the corporation on issues of environmental protection?
a) standardization
b) local adaptation

7- Does the corporation have specific company-wide environmental policies and standards, beyond those required by national law or regulations?
a) Which environmental issues are covered?

8- How many subsidiaries adhere to such an environmental policy?
a) How was the CEP adapted to fulfill the environmental legislation of the host countries?

9- Is the aim of "zero emissions" a realistic goal for your company?
If Yes, a) How does the company manage action with resources to achieve such a goal?

10- What is the organizational area of the corporation responsible for the CEP's definition?

11- What is the political-administrative unit responsible for its implementation?

a) Is the decision-making process centralized or decentralized?
b) Are these activities linked and/or integrated to health and safety?
c) How many employees are directly involved in activities of data collection, training and communication of such a policy?

12- What does public opinion, on a global basis, see as the corporation's most serious environmental problem(s)?

13- What does the corporation itself see as its most serious environmental problem(s) on a global basis?

14- What does the company see as its major international environmental problem(s)?

15- Does the corporation have any special concern about its operations in developing countries? Especially regarding the following:
a) use of CFCs,
b) control of air emissions,
c) protection of drinking water supplies,
d) protection of seawater,
e) maintenance of land for safety zones,
f) protection of wetland and rainforest,
g) trade of genetically-engineered products,
h) the disposal of hazardous waste,
i) education programmes for workers and surrounding community.

16- What are the most innovative environmental management practices currently in use in your company's main sectors of operation?

B) Guideline for interview - Brazilian subsidiaries

Departamento de Relações Internacionais
Pesquisadora: Ana Lucia Guedes
Orientador: Dr. Ian Rowlands
Título da tese: "Políticas ambientais[5]de empresas multinacionais no Brasil"

I- Visão geral da Corporação[6]

a) Quais são os principais segmentos de negócios (setor industrial/produtos) no Brasil?
b) Quantas são e onde estão localizadas as unidades de fabricação no Brasil?
c) Quais são os produtos fabricados e comercializados por sua unidade?

II- Adoção e implementação da política ambiental

1- Aspectos gerais

a) Seria possível identificar historicamente a preocupação da empresa[7] com questões ambientais?
b) Há alguma política especificamente voltada para questões ambientais?
c) Como a política ambiental tem sido implementada?
d) Quais são os principais objetivos e metas definidos pela política ambiental?
e) Quais são os principais programas e procedimentos para a implementação da política ambiental?

2- Aspectos tecnológicos

a) Houve alguma mudança nos processos e/ou produtos com o objetivo de minimizar impactos ambientais?
b) Como ocorre a transferência de tecnologia dentro da corporação? Considerando especificamente o princípio de *'Best Available Technology'*.
c) Existe alguma atividade de Pesquisa & Desenvolvimento de processos e/ou produtos na empresa?

3- Aspectos operacionais

a) Quais são as principais fontes de impactos ambientais da empresa?
b) Existe algum tipo de comunicação para o público externo quanto a evolução das práticas ambientais da empresa?
c) Houve a definição de indicadores de performance ambiental? Quais são?

III- Influência de princípios externos na política ambiental da empresa

1- Instituições internacionais

---

[5] Política ambiental é definida nesta pesquisa como princípios gerais relacionados às decisões estratégicas da empresa, especificamente em termos de gerenciamento dos seus impactos ambientais, seguidos e implementados pelas unidades da corporação.
[6] O termo corporação é definido nesta pesquisa como o conjunto de todas as subsidiárias e o *headquarters* no país de origem.
[7] O termo empresa será sempre usado com referência a subsidiária no Brasil.

a) Existe alguma referência na política da empresa a princípios e/ou carta de intenções internacionais? (como por exemplo, *International Chamber of Commerce, CERES - Valdez principles, Business Council for Sustainable Development*)
b) A empresa tem conhecimento das críticas feitas nos relatórios das Nações Unidas? (especificamente os estudos da *Transnational Corporations and Investment Division*)
c) Existe algum aspecto da política ambiental voltada para promoção de "desenvolvimento sustentável"?

2- Aspectos legais

a) Quais são as leis e/ou regulamentos que afetam as atividades produtivas e de comercialização da empresa?
b) Como é o relaciomento da empresa com o órgão de fiscalização?
c) Existe algum aspecto da política ambiental que seja relacionado com a legislação ambiental no país de origem da empresa?

3- Aspectos relacionados ao setor industrial

a) Existe algum aspecto da política ambiental que seja resultado de princípios definidos pela associação industrial?
b) De que forma as características estruturais do setor industrial constrangem as práticas ambientais da empresa?
c) Seria possível identificar alguma liderança setorial (considerando os principais competidores nacionais e internacionais) em termos de práticas ambientais?
d) A empresa exerce e/ou sofre alguma pressão sobre/de fornecedores para minimizar impactos ambientais?

4- Relacionamento com a sociedade

a) Quem são os principais consumidores dos produtos da empresa? Existe algum tipo de demanda por produtos e/ou processos ambientalmente seguros?
b) A empresa tem sido pressionada por organizações não-governamentais dedicadas à proteção ambiental?
c) Houve alguma demanda da comunidade local por práticas de proteção ambiental?

5- Relações com o *Headquarters*

a) Existe padronização e/ou adaptação local de práticas ambientais?
b) A definição e implementação da política ambiental é feita de forma centralizada e/ou descentralizada?
c) Existe alguma demanda especial do *headquarters* para com sua subsidiária devido a sua localização em um país em desenvolvimento?