

29281

IEN Staff Report: Restricted Distribution

February 1995

Industry and the Environment: Patterns in World Bank Lending

Kulsum Ahmed

The World Bank

Industry and Energy Department

FILE COPY



Industry and the Environment Patterns in World Bank Lending

**IEN Staff Report: Restricted Distribution
February 1995**

Kulsum Ahmed

**The World Bank
Washington, D. C.**

This document has a restricted distribution and may be used by recipients only in the performance of their official duties. Its contents may not otherwise be disclosed without World Bank authorization.

Contents

Preface	v
1. Introduction	1
2. General Trends	5
Type 1: Environmental Components in Industrial Projects	8
Pollution Abatement Equipment and Technology	8
Technical Assistance	9
Equipment and Technical Assistance	10
Type 2: Environment-Related Industrial Projects	10
The Finland Water Pollution Control Project	11
Industrial Pollution Control in Brazil.....	11
The Experience in India	15
The Mexico Pollution Control Project	16
Clean-up of the Helwan Industrial Area in Egypt.....	17
Lessons Learned from Past Pollution Control Projects	18
Type 3: Industrial Components in Environmental Projects	18
The Indonesian BAPEDAL Development Technical Assistance Project	19
The Environmental Monitoring and Development Project in Mauritius	19
The China Projects	20
3. Bank Lending for Technical Assistance	21
Policy Approaches	21
Background Information for Policy Decisions	22
Command-and-Control Strategies.....	24
Market-Based Incentives.....	25
Negotiations	27
Policy Implementation	27
Monitoring and Equipment	27
Information Dissemination	28

4. Relation of Recent Bank Projects to Country Environmental Action Plans.....	31
China	31
The Environmental Action Plan	31
The Relation of Recent Bank Projects to the EAP.....	32
India	33
The Environmental Action Plan	33
The Relation of Recent Bank Projects to the EAP.....	35
5. Conclusions.....	37
Annex 1: Data Gathering	39
Choice of Projects	39
The Quality of the Information	40
Annex 2: Summary of Bank Projects Reviewed.....	41

Preface

This paper is intended as background material for the further development of the Industry and Energy Department's work on environmental policies. It is a stepping-stone for further work; other work planned includes reviews of sector work and supervision reports, reports on field experience, and workshops and seminars on environmental policies and clean technologies.

I would like to thank Dennis Anderson, Bernard Baratz, Roger Heath, Tribhuwan Narain, Walter Vergara, and Yaacov Ziv for their most helpful contributions to this paper.

1

Introduction

1.1 A significant amount of World Bank lending has been for industrial sector development. This has taken two forms—the first is direct lending to state enterprises, and the second has been via lending to development finance companies (DFCs) for industrial development. Figures 1.1 and 1.2 show the loan amounts for both these categories made from IBRD and IDA from 1970 to 1993 (1970–87 in the case of DFCs, as after this date lending to DFCs has been mainly for strengthening of the financial sector rather than for industrial sector development). On average, in the 1970s, about 17 percent of total Bank loans found their way either directly or via DFCs to the industrial sector. This percentage declined slightly in the 1980s to about 12 percent and has declined further in the 1990s. The decline in recent years has been for a variety of reasons; first, the lending to DFCs for industrial sector development has been virtually stopped, and few examples of this type of lending are found, and second, with the increasing emphasis on private sector development, World Bank lending directly to state enterprises has declined.

1.2 Industry has grown rapidly during this period in the low- and middle-income economies. Table 1.1 illustrates this growth by comparing the share of GDP from industry in 1965 with 1990 for India and China combined, for the rest of the low-income economies, and for the middle-income economies. The share of GDP from industry has grown from 29 percent to 36 percent during this period for China and India, 20 percent to 34 percent for other low-income economies, and 34 percent to 37 percent for the middle-income economies. The *World Development Report 1992* notes that “in many [developing countries], the historical and current pace of industrial growth has outstripped that of industrial countries and will continue to do so as per capita incomes rise.” With this industrial growth, however, come new issues, such as how to cope with the pollution arising from industrialization.

1.3 This paper looks at how the World Bank lends for environmental issues in the industrial sector and is intended to provide background for the further development of the Industry and Energy Department’s work on environmental policies.

Figure 1.1 Trends in IBRD and IDA Lending for Industry, Fiscal Years 1970–93

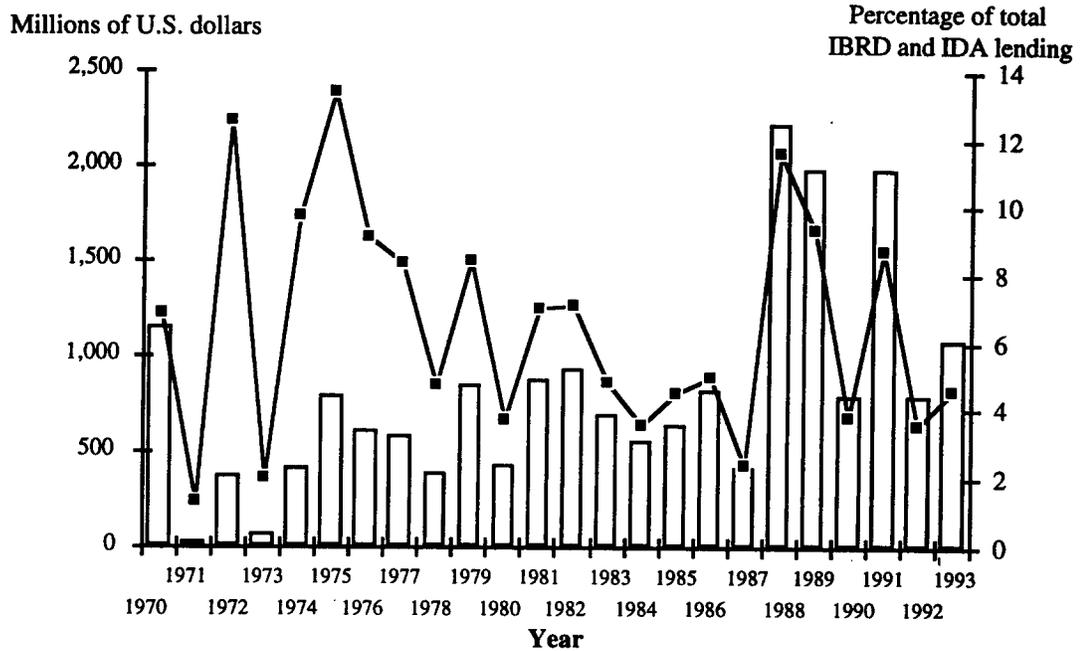


Figure 1.2 Trends in IBRD and IDA Lending for Industrial Development through Development Finance Institutions, Fiscal Years 1970–87

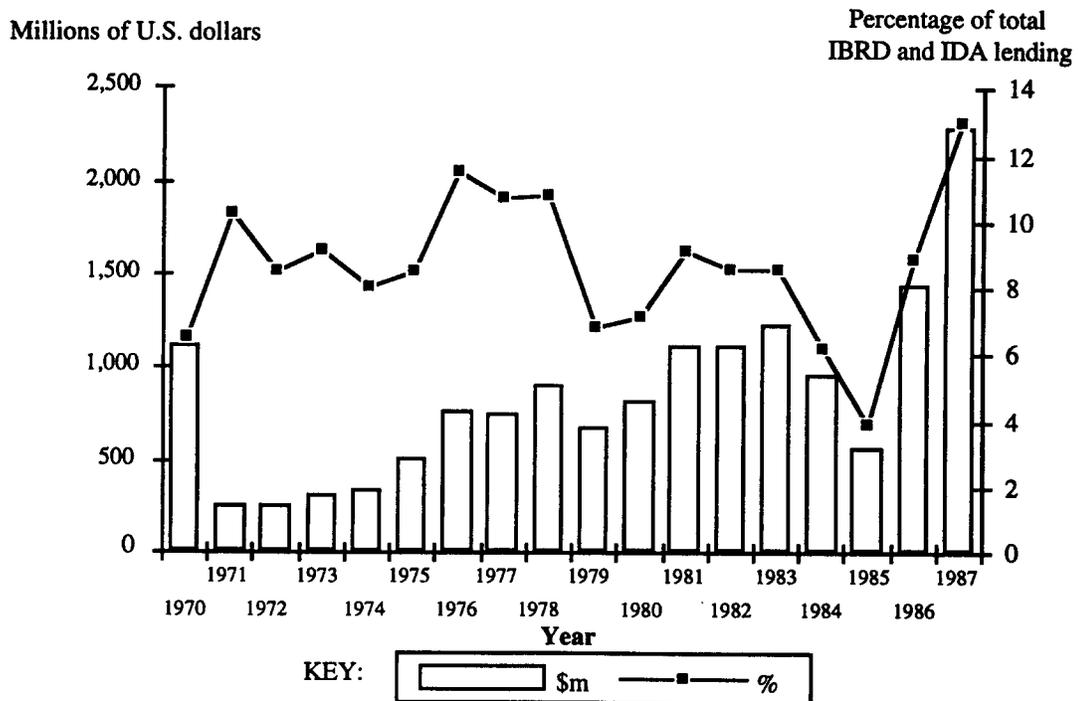


Table 1.1 Share of GDP from Industry, 1965 and 1990

<i>Economy</i>	<i>1965</i>		<i>1990</i>	
	<i>GDP (\$ billion)</i>	<i>Industry share of GDP (%)</i>	<i>GDP (\$ billion)</i>	<i>Industry share of GDP (%)</i>
India and China	145	29	619	36
Other low-income economies	104	20	307	34
Middle-income economies	762	34	2,438	37

Note: GDP values for 1965 are in constant 1990 prices and 1990 exchange rates. They have been calculated from 1990 GDP values (taken from Table 3 of WDR 1992) on the basis of the average annual GDP growth rate for the period taken from Table 2 of the same WDR. No adjustment for inflation has been made. Industry shares and 1990 GDP values have been taken directly from Table 3 of WDR 1992.

Source: *World Development Report* (1992).

1.4 Chapter 2 describes in general the trends in project design from the mid-1970s to the present. Lending for the environment in industrial projects has evolved from lending for pollution-control equipment for state-controlled industrial plants to mainly technical assistance for industrial environmental policy formulation and enforcement and the financing of credit lines for pollution-control equipment. A brief description of some projects is also given in this section to illustrate the evolution in project design. The second section looks in more detail at the technical assistance component in some of these projects. This takes several forms: from World Bank lending for environmental policy formulation and implementation in the industrial sector to studies of the effects of industrial pollution. The third section discusses the industry-related component of some country environmental action plans (EAPs) and looks at how recent World Bank industry / environment projects in those countries fit in with the corresponding EAP.

2

General Trends

2.1 A brief review of 34 World Bank projects, from 1974 to 1993, was undertaken to identify and analyze the different ways in which the World Bank lends to industry for environmental purposes (see Annex 1).¹ President's Reports (PRs), Memorandums of the Director (MODs), Staff Appraisal Reports (SARs), Project Completion Reports (PCRs), and Project Performance Audit Reports (PPARs) were studied (see Annex 2 for summaries of the projects reviewed).² Most of the projects in the sample were recent; therefore, Project Completion Reports (PCRs) and Project Performance Audit Reports (PPARs) were not always available. Supervision reports and projects in the pipeline have not been reviewed.

2.2 The 34 projects have been put in the following categories, based on the extent of the environmental component in the project:

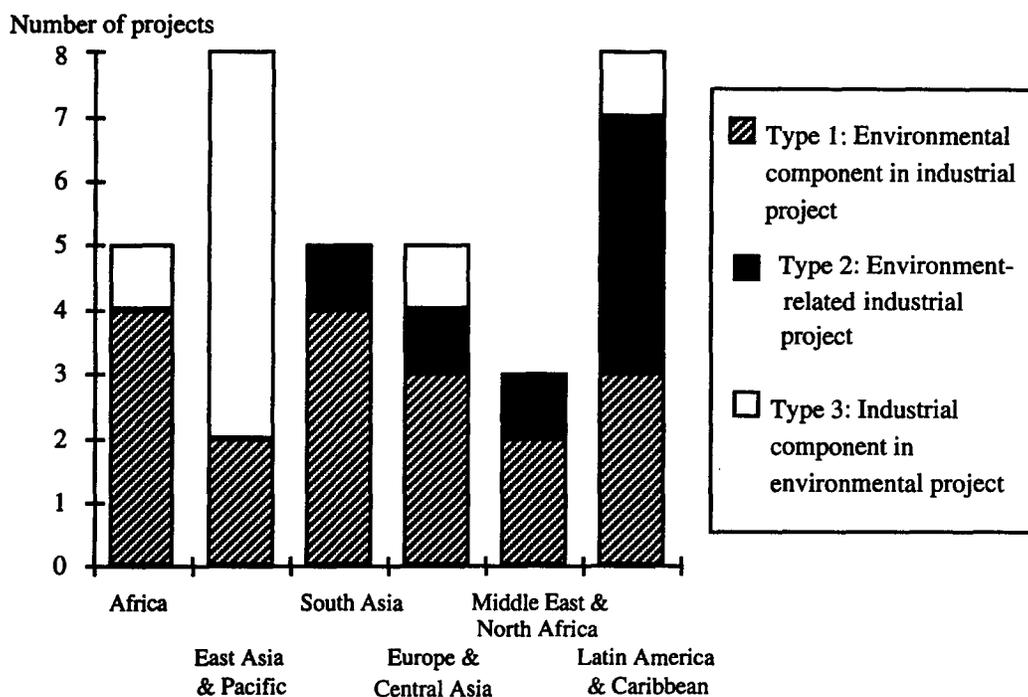
- *Type 1: Environmental component in industrial project.* The main focus of these projects is industry, such as new plants, expansions, and sector restructuring, but an environmental component is included (e.g., pollution-control equipment, choice of low-polluting technology in project design, and establishment of environmental standards for the industry).
- *Type 2: Environment-related industrial projects.* In these, the whole project is aimed at the environment-related interactions of the industrial sector.
- *Type 3: Industrial component in environmental project.* In these projects, the industrial component is part of a more general project to improve the environment.

1. An initial search was conducted of all Bank documents dealing with industry and the environment, which yielded almost 500 reports. This was narrowed, as discussed in Annex 1, to a total of 34 Bank projects (79 available documents) with specified environment-related industrial components. The dates of the President's Reports and Staff Appraisal Reports of these projects ranged from 1974 to 1993.

2. See Annex 1 for a discussion of the "quality" of this sample stemming from the methods used to identify these projects. Since completion of this review, other projects with environment-related industrial components have come to light (e.g., the *Hungary Fine Chemicals Project* [1985], which included a component to finance construction of a hazardous pharmaceutical waste incinerator).

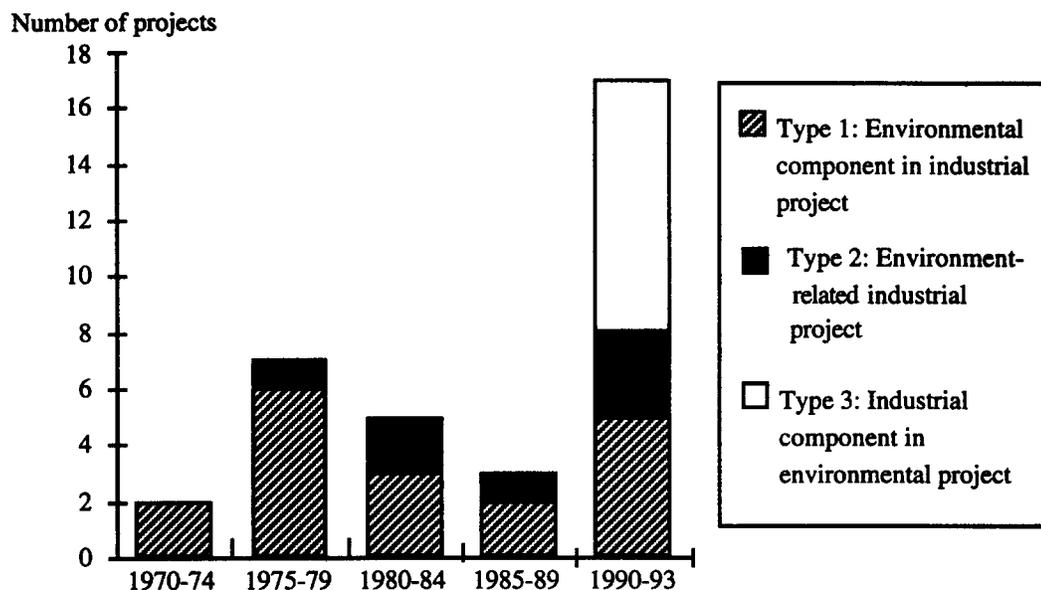
2.3 Figure 2.1 shows the projects undertaken during the period 1970–93 by region, divided into the categories given above. Note in particular the large number of general environment-related industrial projects in Latin America and the Caribbean, which consist mainly of three industrial pollution-control projects in Brazil (Type 2: environment-related industrial projects). The East Asia and Pacific region also has a large number of environmental projects with an industrial component. These consist mainly of five projects in China (Type 3: industrial component in environmental project).

Figure 2.1 Bank Projects with an Environment-Related Industrial Component During the Period 1970–1993 by Region



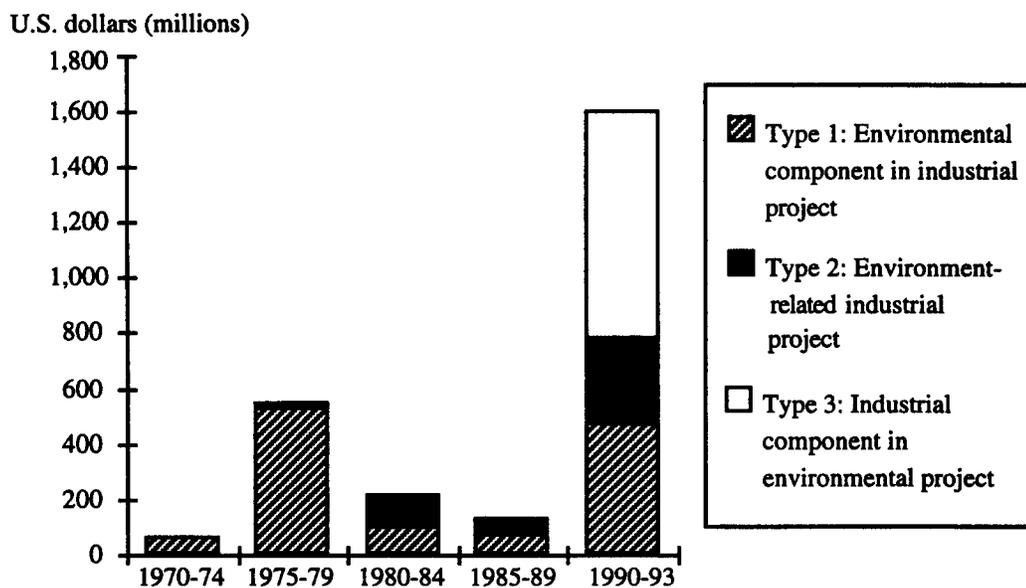
2.4 Figure 2.2 illustrates the numbers of projects undertaken, by type, from 1970 to 1993. The World Bank has been lending for environmental components (usually pollution control) since the 1970s. The Bank also initiated environmental assessments of all projects in 1970, albeit at a different level from that carried out in recent years; the *Annual Report* (1977) noted that “every project is now routinely examined for its environmental implications (including health), and any protective measures, identified as necessary, are incorporated in its design and execution.” Of interest, too, is the advent of Type 2 projects as early as the late 1970s (these are discussed later in this paper). They have increased in number in recent years. Type 3 projects only emerged in the 1990s. The reason may be the 1987 organizational changes, when the Bank set up environment divisions. Figure 2.3 shows the same information, but in terms of loan or credit amounts for the *whole* project. It is difficult to assign quantities spent on the actual environment-related industrial component, apart from Type 2 projects, where it is the whole amount.

Figure 2.2 Number of Bank Projects with an Environment-Related Industrial Component During the Period 1970-1993



Note: Loan or credit amounts are as specified in the SAR, and are not based on actual amount disbursed.

Figure 2.3 Total Loan and Credit Amounts for Projects with an Environment-Related Industrial Component During the Period 1970-1993



Type 1: Environmental Components in Industrial Projects

2.5 The environmental assessment of all projects is now a normal part of Bank procedure. Most industrial projects are in category A (i.e., they have potentially significant environmental impacts).³ The projects described in this paper are only those for which the task manager has specifically highlighted the environmental aspects (see Annex 1). Bank lending for environmental components in primarily industrial projects takes two forms, with the first being much more prevalent in the industrial projects reviewed and the second more usual in the newer projects:

- The first is for pollution-abatement equipment and technology—for example, in the setting up of new plants, expansions, modernization, and rehabilitation, or by setting up credit lines for industrial equipment, which includes pollution-abatement devices.
- The second is for technical assistance to tackle the deleterious environmental effects of industry by a variety of methods, such as the setting up of new environmental laws, identification of pollution sources by carrying out audits, ensuring adequate monitoring and implementation of regulations, and studies of the different methodologies that can be used to abate pollution successfully.

Pollution Abatement Equipment and Technology

2.6 The first type of lending for equipment is carried out in different types of industrial projects. These include the following:

- Lending for pollution prevention (see Box 2.1 for definition) in the case of new plants, such as in the *Balikesir Newsprint Project* in Turkey (approved in 1976) where the process technology used for pulping was thermomechanical pulping. This generates wastewater with lower BOD (biological oxygen demand) than chemical methods, as the fiber does not have to be bleached with chlorine.
- Lending for pollution-control and testing equipment and treatment facilities in new plants, expansions, or during rehabilitation and modernization of existing plants with inadequate pollution-abatement facilities. A few examples of this type of lending are as follows:
 - Installation of wastewater treatment facilities, as well as control of air emissions in the Tanzanian *Mufindi Pulp and Paper Project* in 1979
 - Installation of dust, fume, and noise-pollution-abatement devices in the *Sofomeca Foundry Modernization and Expansion (fourth industry) Project* in Tunisia in 1983

3. Bernard Baratz (EMTEN) (personal communication, June 1994) notes that most “greenfield” projects are in category A, but this is not necessarily so for “rehabilitation” projects.

- Installation of pollution-control equipment for the *Ashuganj Fertilizer Project* in Bangladesh in the 1970s
- Installation of pollution-control devices such as dust collection units in the *Tourah Cement Expansion Project* in Egypt (approved in 1975)
- Rehabilitation of six major fertilizer plants and one copper smelter with particular attention to energy saving and pollution control in the *Second Fertilizer Industry Rationalization and Energy Saving Project* in Turkey in 1982
- A credit line to provide finance for machinery, equipment, and services, including pollution-control devices and for related technology development, to industrial enterprises in the *Fourth Industrial Equipment Fund (FONEI) Project* in Mexico, approved in 1982
- A credit line to enterprises to modernize existing facilities, including for the purchase of pollution-control and testing equipment in the *Fertilizer Industry Project* in India (in 1975).
- Lending for the rehabilitation and modernization of existing pollution-abatement facilities, such as in the *Refineries Rehabilitation Project* in Nigeria (1989), where part of the project's objective is to improve the functioning of the waste water treatment system to cope with the increased load of contaminated water.

Box 2.1 Pollution Prevention vs. Pollution Control

- *Pollution prevention* is the *elimination* of potential pollution at its source, usually by changing the process by which the end-product is obtained.
- *Pollution control* is the *reduction* of pollution, typically by installing "end-of-pipe" controls that remove the pollutants from the discharge or convert the pollutants to a less toxic form.

Technical Assistance

Examples of the second type of lending for technical assistance include the following:

- Lending for the establishment and implementation of environmental policies and programs pertaining to industry, such as in the *Mining Development and Environmental Control Technical Assistance Project* in Ecuador (1993).
- Lending for the training of management in environmental issues; for example, a component in the Philippines *Industrial Restructuring Project* approved in 1990 (see below).

- Lending for the identification of sources of pollution and recommendations for their abatement; for example, by carrying out audits or studies, as in the *Second Petroleum Technical Assistance Project in Equatorial Guinea* (approved in 1992), which contains a small component to finance a consultant study on the environmental impact of fuel production from the field and recommendations for environmental protection. Another example is the *Regional Cement Industry Project* in China (approved in 1992), which includes a component to finance a study to provide technical support to rehabilitate potentially economic small plants in terms of production efficiency and pollution control.

Equipment and Technical Assistance

2.7 Some projects have both of the above components, such as the *Philippines Industrial Restructuring Project* (1990), which comprises a credit line to provide financing for eligible enterprises for modernization, expansion, and new facilities, including pollution-control devices and training, along with technical assistance for environmental protection. The latter is in the form of assistance to industrial enterprises in the design of least-cost pollution-control components compatible with prevailing standards, as well as support to build up the capabilities of the Environmental Management Bureau to carry out industrial environmental audits and to develop generic Environmental Impact Assessments for critical industries. Another example is the *Mining Sector Restructuring Project in Mexico* (approved in 1991), which not only provides support to establish environmental standards for the industry but also has a credit component of \$191.5 million to help fund small- and medium-scale enterprises to acquire assets including pollution-control equipment.

Type 2: Environment-Related Industrial Projects

2.8 This category of project deals only with the environmental effects of industry and their alleviation. The World Bank has lent for six industrial pollution-control projects to date; the first of these was in Finland in 1975 (see below).⁴ This type of project has increased in numbers, particularly in the 1990s (see Figure 4), and other such projects are in the pipeline today. These include projects in India and Thailand. These projects deal solely with the reduction of pollution from the industrial sector. They tend to consist of a credit line for industrial subprojects (usually to the private sector, through a financial intermediary) and/or a technical assistance component to strengthen the institutional capability of the local environmental protection agency (EPA) in terms of planning, monitoring and enforcing pollution-abatement measures or the financial intermediary in terms of training in environmental impact assessment, financial analysis of pollution-control projects, or pollution-abatement technologies. The first project of

4. The Bank stopped project processing for one project, the *Helwan Industrial Pollution Control Project* in Egypt, due to the inability of the government of Egypt to meet certain conditions (see later section on this project).

this type in Finland (see below) highlighted a number of pitfalls, which, in general, have not recurred in subsequent projects.

The Finland Water Pollution Control Project

2.9 The *Water Pollution Control Project* in Finland was the first effort by the World Bank to get involved in programs to improve the environment on a national scale. In 1975, a loan of \$20 million was made to a subsidiary of the central bank to lend for water-pollution-control investment subprojects undertaken by industry with zero or negative financial rates of return. The intention was to aid those parts of the industrial sector that had difficulty raising capital for “uneconomic” projects. The SAR noted the specific difficulty in identifying benefits resulting from pollution-reduction measures because of the complex relationships of production processes, but required that such benefits be identified and deducted from costs to determine fulfillment of the unprofitability criteria. The loan was canceled in 1978 after only \$5.7 million had been disbursed. Some reasons for the lack of utilization of the loan, as identified in the PCR and PPAR, were as follows:

- The requirement for a negative or zero rate of return (this was later lifted to less than 10 percent, but that was only marginally helpful); at a time of recession in Finland, companies were not interested in unprofitable projects.
- The difficulty in identifying pure unprofitable pollution-control investments; this definition excluded design, scope, or process changes with positive aspects, as well as investments in which the treated effluent was used for beneficial purposes, such as animal feed, which cannot be separated from the pollution-control aspects and are all more profitable ways of achieving pollution control.
- The loan was too expensive. The loan was disbursed by the Bank in hard currencies; as these appreciated, the cost of funds increased.

2.10 With regard to the second point, the PCR and PPAR appear to be incorrect. The SAR did not specify pure pollution-control projects as only being eligible for loans, but it did require that this aspect be isolated during the loan processing by deducting benefits accruing from the investment. The main difficulties seemed to arise in carrying out the complex loan processing procedures (how to quantify benefits is still a point of contention), and therefore they may have been simplified to just “pure pollution-control investments.” Why they should have concentrated on “unprofitable” investments raises further doubts about the policies chosen. The aim of environmental policies is to make pollution abatement profitable, not unprofitable; and pollution unprofitable, not profitable (see chapter 3).

Industrial Pollution Control in Brazil

2.11 The World Bank has financed three industrial pollution-control projects in Brazil: the *São Paulo Industrial Pollution Control Project*, the *Second Industrial Pollution Control Project*, and the *National Industrial Pollution Control Project*. The

first two dealt solely with the state of São Paulo; the third was national. The lessons of these progressive industrial pollution-control projects in Brazil are described below.

2.12 The first of the projects was approved in 1980 and was the first such World Bank project in the Latin America and Caribbean region. It consisted of a technical assistance component of \$3 million to the environmental protection agency for the State of São Paulo (CETESB) for the training of its staff, pollution-control research by international consultants, a training program run by CETESB staff for local entrepreneurs, and monitoring and laboratory equipment. Also included was a credit line of \$55 million to the industrial sector for air and water-pollution-control, pollution prevention (process change), and relocation as a result of compliance with environmental standards. Subloans were on the basis of the least-cost direct treatment or pretreatment solution to attain the required pollution-control targets. This \$58 million loan was part of a total \$187 million investment. The project was originally envisaged as a water-pollution-control project, because pretreatment of industrial wastes was seen as necessary to ensure operational effectiveness and full use of the Bank-financed sewage treatment plant projects in preparation for the greater São Paulo area. The project was then expanded to include air pollution control, as it was felt that a broader approach was needed to deal with environmental deterioration in the greater São Paulo area.

2.13 This project was approved in 1980 but loan utilization progressed slowly because of cumbersome procedures, unfavorable repayment terms, and an economic downturn in Brazil that inhibited industrial borrowing in general. The project was substantially modified in 1982–83, when the loan amount was reduced by \$24 million, the loan procedure was simplified, and the project was extended to cover all of São Paulo State, including the industrial area of Cubatão. The project then proceeded smoothly and was fully disbursed by the end of December 1986. Some 80 percent of the loan went to the industrial area of Cubatão, and other industrial regions in the state, outside the original Greater São Paulo Metropolitan Area, mainly for large subprojects (see Box 2.2).

2.14 The effect on water pollution as a result of the project was difficult to measure because of the masking effect of untreated domestic sewage discharged into the receiving waters and because of the delay in the completion of the Greater São Paulo Sewage Treatment Program. In the case of air pollution, sulfur dioxide emissions were reduced by the 60 percent planned (8 percent financed by the project), and industrial particulate matter emissions were reduced by 65 percent during 1980–86 (as reported in the SAR of the Brazil *Second Industrial Pollution Control Project*). These emissions reductions, in turn, resulted in a corresponding decrease in the ambient levels of sulfur dioxide; however, virtually no difference was obtained in ambient levels of particulate matter, despite reductions in industrial emissions of particulate matter, because of the greater influence of nonindustrial sources, such as dust from roads and open areas. The PPAR, however, does note a higher awareness of the environment in the region as a result of the project.

Box 2.2 The Case of Cubatão, Brazil

The Brazilian industrial town of Cubatão is in the state of São Paulo,⁵ an area that became known as the “Valley of Death” in the 1970s and early 1980s because of the heavy industrial pollution. Cubatão experienced its first “state of emergency” in 1984:

“On September 3, 1984, in the midst of an atmospheric inversion, officials of CETESB and SEMA visited Cubatão. A few hours later the governor of São Paulo. . . decreed a “state of emergency” in Cubatão, citing particulate concentrations in excess of the ambient standard of 875 micrograms per cubic meter. CETESB promptly required nine industries in Vila Parisi to shut down and ordered residents to evacuate the district. Police were sent from the city of São Paulo to assist in the evacuation and to prevent looting of empty homes. Although the mayor of Cubatão protested that he had not been consulted before these measures were taken, he agreed to make the soccer stadium available for displaced residents and to provide food and blankets. Eventually, atmospheric conditions improved, the state of emergency was downgraded to a state of alert (defined as concentrations of particulates in excess of 625 micrograms per cubic meter), the eighth such alert of 1984, and people were allowed to return to their homes.”⁶

A new attitude and considerable investments in pollution abatement since 1985 by the World Bank and local companies have produced a marked reduction in critical air pollution episodes (alerts and emergencies)⁷ and, as a result, Cubatão was hailed as a “model of pollution control.”⁸ However, an article in the *Financial Times* (July 10, 1991) reported yet another state of emergency in Cubatão.⁹ A thermal inversion trapped factory emissions and caused pollution levels to soar, forcing the governor of São Paulo to order a 24-hour shutdown of the town’s 23-industries. Pollution abatement is not simple.

2.15 The *Second Industrial Pollution Control Project* was then prepared in 1987 because of a strong demand for additional resources for industrial pollution control in São Paulo; it was designed with knowledge of the progress of the first project and therefore addressed some of the criticisms. First, it reduced the onerous loan processing

5. Roger Findley, “Pollution Control in Brazil,” *Ecology Law Quarterly* 15(1988): 1–68.

6 Findley, “Pollution Control,” p. 59.

7. The actual number of critical episodes reported in a particular time frame varies by source: The *Brazil Second Industrial Pollution Control Project SAR* (1987) (p. 8) reports that “the number of critical air pollution episodes (alerts or emergencies) during the worst winter months dropped from an average of six per year to zero.” The *Brazil Sao Paulo Industrial Pollution Control Project PPAR* (1989) (p. 4) notes that “in the Cubatão area (the worst pollution source) these incidents have been reduced from six to zero during the period 1982–1986”; however, the PCR (1989) (p. 27) notes that “during the period 1984–1986, these actions reduced the number of critical air pollution episodes (alerts or emergencies) during the worst winter months from an average of six per year to zero.” Finally, Findley (1988) (see footnote 5) quotes a newspaper advertisement by 21 Cubatão industries, published in November 1986 claiming the following environmental improvements: “In 1984, Cubatão had 12 states of alert and 1 of emergency. In 1985, 8 states of alert and 1 of emergency. In 1986, 1 alert.”

8. John Barnham, “Brazil’s Greens Brave the Air to Fight their Cause,” *Financial Times* (International edition), September 13, 1989, p. 7.

9. Victoria Griffith, “The Fight to Escape from a Black Hole,” *Financial Times* (London edition), Wednesday, July 10, 1991, p. 12.

procedures of the first project; and second, it came forward with a pipeline of 20 possible subprojects to enable faster disbursement. It also gave an interest-rate incentive to direct treatment (i.e., pollution-control equipment). It is interesting to note that in doing so, the project may unintentionally have favored pollution control over pollution prevention. Under the project, a total of \$100 million, of which \$50 million was a loan from the World Bank, was to be invested in the following:

- Subprojects by industrial enterprises to reduce all types of industrial pollution in São Paulo (\$88.8 million).
- Institutional strengthening of the São Paulo state EPA (CETESB) in the purchase of specialized monitoring and laboratory equipment, training of staff, and applied research and studies in the field of biological and toxic treatment, hazardous risk assessment, and cost-benefit analysis (\$5.2 million).
- Institutional strengthening of the Special Secretariat of the Environment (SEMA) and state EPAs (other than CETESB) for purchase of laboratory equipment and monitoring programs, diagnostic studies of industrial pollution problems in states other than São Paulo, with recommendations for control strategies, assessment of local training resources, and training programs. This part also included assistance to SEMA for development of appropriate incentives for investments in pollution control (\$6.0 million).

2.16 This loan also experienced delays before it became effective because of the indebtedness limits of the State of São Paulo to the federal government and new restrictions imposed by the Central Bank prohibiting the transfer of resources to public entities. After the loan became effective, disbursements were slow because of the sluggish demand caused by staggering inflation rates. The loan commitment period has since been extended.

2.17 The most recent project, the *National Industrial Pollution Control Project*, covers the whole of Brazil and grew from the intention of other Brazilian industrialized states to follow São Paulo's example and to request Bank assistance. The loan of \$50 million (of a total of \$100.5 million) approved in 1992 would finance investments in existing industrial facilities in Brazil to control all types of industrial pollution (air, water, and hazardous waste). The development bank of Brazil, BNDES, is the borrower and the implementing agency. Loan funds will be passed on by BNDES directly or through financial intermediaries to industrial firms. Most of the funds are to be used in states with Bank-approved pollution-control strategies, and in some states, some funds will be spent to carry out these strategies. The World Bank can approve state pollution-control strategies at any stage of project implementation, with approval being conditional on the institutional capability of the state EPA and its ability to enforce pollution control. These state EPA strategies have been designed to effect an overall improvement in the environment, by identifying the industrial polluters and ranking them based on the type of pollution, the relative contribution of the industrial sector compared with other sectors, and the assimilative capacity of the receiving medium. By concentrating on the

improvement in environmental quality rather than the reduction in industrial pollution, the project designers intend to prevent a recurrence of the anomalies experienced in the first São Paulo loan.

2.18 There is no specified distinction between pollution control and pollution prevention in this loan, with end-of-pipe controls, in-process modification, and recycling/recovery being given equal weight, together with other discharge-reduction schemes. The project also allow companies to build joint facilities. An interesting component of the project is a grant of 1 percent to the state EPA, of any subloan to a firm in the corresponding state. These grants are intended to motivate the state EPA to enforce pollution control more vigorously and to strengthen its institutional capability. The funds are to be used for the following purposes:

- Development of pollution-control strategies, including specialized studies on market-based pollution-control mechanisms
- Acquisition of laboratory and monitoring equipment
- Upgrading of the staff's technical capability.

The Experience in India

2.19 The *India Industrial Pollution Control Project* was approved by the World Bank in 1991. It consists of a loan of \$124 million and a credit of \$31.6 million equivalent toward a project totaling \$260 million to support the government of India's efforts to prevent and alleviate environmental degradation caused by industrial operations and to assist in the successful attainment of the proposed short- and medium-term targets of its environmental policy. The project itself consists of three components:

- An institutional component that is intended to strengthen the monitoring and enforcement ability of state Pollution Control Boards by financing a training program in technical and managerial skills and the acquisition of equipment and other laboratory facilities
- An investment component that would finance subloans and subgrants for common treatment facilities in industrial estates, individual projects undertaken by enterprises dealing with waste minimization, resource recovery and pollution abatement, and selected demonstration projects for prototype or pioneering units
- A technical assistance component to assist the Ministry of Environment and Forests to evaluate environmental problems and develop solutions and the Development Finance Institutions to help enterprises to undertake the required feasibility studies.

2.20 The eligibility criteria for the subloans in the investment component include, among others, the requirement for a "substantial positive effect on the environment" in the case of individual subprojects and adequate address of the legal,

financial, and operational aspects of any joint treatment facility. All industrial projects that seek to reduce the environmental aspects of their operations are eligible.

2.21 In the pipeline is a second project of a similar sort, the *India Pollution Prevention Project*. First, the draft (yellow cover) SAR reports on the progress with the first project; lessons learned at this early stage include the need for strong institutional coordination and consultation between the central and the individual state Pollution Control Boards to prevent duplication and inefficient use of resources, the need for information dissemination of the availability of finance and technical assistance under the project to potential beneficiaries, and the difficulty of organizing the large number of parties involved in setting up central treatment facilities.

2.22 This proposed project is along the same lines as the first and consists of three components. The first component is institutional; it will help to strengthen some state Pollution Control Boards by training, financing acquisition of laboratory facilities and equipment, and helping to develop a pilot Geographical Information System to monitor toxic residues. The second component provides funds to finance subprojects, as under the first loan, as well as funds for industrial water recycling plants that use sewage as input. It gives priority to subprojects by individual firms for pollution abatement with a focus on waste minimization and adoption of cleaner methods of production. The third component is technical assistance to support the establishment of a clean technology institutional network to promote the development, diffusion, and transfer of clean technologies, extension services for the identification of waste minimization and abatement methods for small-scale industry, preinvestment studies for central waste treatment facilities to be financed under the investment component, and the financing of training and consulting services. This last component thus addresses several issues raised in the first project, such as the problem of information dissemination.

The Mexico Pollution Control Project

2.23 The *Mexico Pollution Control Project* approved in 1982 is similar in design to the projects discussed earlier. The Bank gave a \$60 million loan in 1982 for a \$190.0 million project to Mexico. The project was to finance industrial enterprises' acquisition and installation of pollution-control equipment, process changes, or plant relocation; finance the acquisition of emissions testing and diagnostic equipment for private automobile garages; finance the acquisition and installation of pollution-monitoring equipment, laboratory facilities, and emissions testing and diagnostic equipment for automobile inspection stations; train technical staff of implementing agencies, financial institutions, industries, and auto mechanics; and support studies and technical assistance to help develop long-term control strategies and emissions standards. This loan was closed in 1988 after only \$8.7 million had been disbursed; the remainder of the loan was canceled. The effect of the small amount disbursed was negligible. The low demand for investment under this loan has been attributed to two main reasons: (a) Mexico's economic recession and (b) the lack of aggressive enforcement by Mexican environmental authorities. The Mexicans, after a period of no particular policy, moved to

a system of negotiated "social contracts" (see also subsection: Command-and-Control Strategies); these contracts were proposed by industry and did not focus on priority pollution problems but rather gave priority to lowest-cost pollution issues. Regulating authorities did not even monitor implementation of these contracts.¹⁰

Clean-up of the Helwan Industrial Area in Egypt

2.24 The *Helwan Industrial Pollution Control Project* in Egypt (1993) was intended to help initiate the first phase of environmental clean-up of the Helwan industrial area. A loan of \$50 million from IBRD and a credit of \$50 million equivalent from IDA, together with financing from other sources made up a project totaling \$240.9 million. This project was to have consisted of the following components:

- *Development of local environmental monitoring, inspection, and enforcement capability.* This was to proceed by helping to establish a Helwan Project Office of the Egyptian Environmental Agency and an Environmental Monitoring Unit in Helwan. The former would oversee project implementation, monitor cement pollution against agreed targets and pollution from sources other than cement against existing standards, formulate and oversee the environmental action plan, and provide training to company management and municipal officials. The latter would monitor air and water quality, industrial emissions, and effluent discharge levels and practices. It would also train personnel in these techniques.
- *Preparation of the Helwan Environmental Action Plan and implementation of the Hazardous Effluent and Solid Waste Program.* The former would be based on environmental audits and feasibility studies of the main non-cement industrial polluters and would also include the establishment of reasonable standards for these industries. The latter would be on a 50–50 cost-sharing basis with the industry involved and DANIDA to address the current discharge of hazardous materials by industries in Helwan.
- *Reduction of cement pollution by financing an integrated package of restructuring measures.* These were to be aimed at environmental control, energy conservation, process optimization, management restructuring and labor rationalization and training for three state cement companies in Helwan, as an initial step to privatization.

2.25 The World Bank, however, stopped project processing at the green cover stage because of the government of Egypt's inability to meet certain conditions, the prime one being its refusal to shut down a lead smelter, a major health hazard in the area.¹¹

10. Bernard Baratz, EMTEN (personal communication, June 1994).

11. Discussions with Tribhuwan Narain, MN2IE (July 1994). Both the cement plants and a lead smelter in the area have significant local environmental and health impact. Narain also notes that it was more economical to shut down the lead smelter and to put in pollution-control measures in the cement plants than to put in pollution-control technologies in both cases.

Lessons Learned from Past Pollution Control Projects

2.26 Only three of the above projects have been completed, the *Finland Water Pollution Control Project*, the first *São Paulo Industrial Pollution Control Project* in Brazil, and the *Mexico Pollution Control Project*. Therefore, the conclusions that can be drawn are limited. However, the PCRs and PPARs of these projects note certain factors as being important for the successful implementation of such projects; indeed these three projects were not completely successful because of a *lack* of some of these factors. Examples of the type of requirements that are necessary for projects to succeed include the following:¹²

- Political commitment (*Mexico Pollution Control Project* PCR)
- Establishment of environmental standards and regulations (*Mexico Pollution Control Project* PCR)
- Establishment of institutional capability to monitor and enforce standards (*Mexico Pollution Control Project* PCR)
- Establishment of administrative mechanisms and/or economic incentives to clean up (*Mexico Pollution Control Project* PCR).

2.27 If subloans are made available to enterprises for pollution-abatement equipment, the following conditions can increase the likelihood of successful pollution abatement in an area:

- A profitable and growing industrial sector (*Mexico Pollution Control Project* PCR)
- Availability of funds at close-to-market terms (*Mexico Pollution Control Project* PCR and *Finland Water Pollution Control Project* PPAR)
- Flexibility over the pollution-abatement method (*Finland Water Pollution Control Project* PPAR)
- Concentration on the improvement of the area's environmental quality (see design of *Brazil National Industrial Pollution Control Project*, after lack of visible improvements in air quality in the *Brazil São Paulo Industrial Pollution Control Project*, caused by emissions from other sources masking industrial emissions).

Type 3: Industrial Components in Environmental Projects

2.28 This category consists of projects that aim to improve the environment in general by strengthening institutional capabilities to create, implement, monitor, and enforce adequate standards. Some of these projects also finance facilities or equipment that abate pollution, such as central wastewater or sewage treatment facilities and

12. The report name given in parentheses after each point indicates the project completion or audit report that notes these requirements as being necessary.

pollution-control or prevention measures for individual enterprises. Because the industrial sector can be a heavy polluter of the environment, components of environmental projects usually affect the industry in the area they involve.¹³ In addition, the projects in our data sample deal specifically with pollution from the industrial sector in two ways: through the setting up of credit lines for the purchase of pollution-control equipment by industrial enterprises or through the instigation of studies on how best to control industrial pollution. World Bank lending for technical assistance to strengthen institutional capabilities in the environment sector is illustrated below by two projects, one in Indonesia, the other in Mauritius.

The Indonesian BAPEDAL Development Technical Assistance Project

2.29 In the Indonesian *BAPEDAL Development Technical Assistance Project*, the objective is to assist the government in implementing the Five-Year BAPEDAL plan through strengthening the institutional capacity and role of BAPEDAL and other environmental agencies and through designing and implementing pollution-control measures. The project aims to achieve these objectives by providing financing (a) to review existing laws and regulations relating to pollution control and to develop measures to ensure interagency coordination and enforcement of standards and regulations; (b) to design and develop pollution-control systems and procedures, such as permits, incentives, inspection, monitoring, and communication systems, as well as to test and refine them; (c) planning, establishing, and strengthening pollution-control agencies and laboratories at the regional level; (d) assistance with recruitment and the setting up of a training program; and (e) external resource administration.

The Environmental Monitoring and Development Project in Mauritius

2.30 The *Environmental Monitoring and Development Project* in Mauritius aims to put into place the country's national Environmental Investment Program (EIP), including the policy and institutional arrangements and the physical inputs necessary to manage, in a coordinated way, physical planning, land-use control, infrastructure investments, and environmental protection. The project has many components, such as preparation of a National Physical Development Plan; establishment of environmental laboratories; and, in particular, with respect to industrial pollution, site selection, design, and engineering studies for an industrial park.

13. The environmental projects described in this section explicitly mention an industrial component. There may of course be other Bank environmental projects that affect industry that are not included here as a result of the methodology used to gather the data (see Annex 1: The Quality of the Information).

has been the main approach of industrialized countries, although they are also now experimenting with market-based instruments.¹⁶

3.3 The second instrument, much preferred by economists, as it achieves the same abatement as command-and-control methods but at a lower cost, is the “market-based incentive.” Market-based incentives, too, can be either direct or indirect. Examples of direct instruments include effluent charges, tradable permits, and deposit-refund systems. Indirect instruments include input/output taxes and subsidies, subsidies to substitutes, such as pollution-control equipment, and to abatement inputs. Market-based incentives require the polluter to make a decision—whether to pay the charges for pollution or to abate pollution by changing processes or installing pollution-control equipment. This requires the polluter to be informed of all possibilities. Market-based instruments are also in use, but on a smaller scale compared with command-and control interventions. Both are also used together in many countries, such as the United States. In the case of direct and indirect instruments, arguments are made for and against both in terms of administrative costs and effect on pollution.

3.4 A third approach, found mainly in Japan and Europe, and particularly in the United Kingdom, is that of “negotiations.”¹⁷ Such negotiations are carried out between the environmental agencies and industries at different levels (firm, regional, or sectoral) to discuss overall pollution-control targets, voluntary agreements that go beyond legal demands, and pollution-control targets at the firm level. In the UK, few general laws exist, and a case-by-case approach is pursued. In Germany, as well, negotiations at a branch or regional scale are common and have been used mostly to arrive at industry-level voluntary agreements. The key to the use of any policy instrument, however, is identification of the polluting sectors and analysis of which instruments will best affect their mode of operation. A mix of different policy instruments can be used together effectively to combat pollution. Indeed, many Bank projects (described below) use one type of strategy while a different type is concurrently being employed in the country.

Background Information for Policy Decisions

3.5 Before choosing a policy approach, the involved parties need to assess the relative priority for industrial pollution control, the assimilative capacity of the environment, and the effect of this pollution; decisions also need to be taken on the adequacy of the existing standards, what needs to be tackled first and how, and the time frame to achieve these aims. The Bank has financed many such studies and action plans, mainly in recent years, illustrating its willingness to inform the client of the array of

16. See J. B. Opschoor and Hans B. Vos, *Economic Instruments for Environmental Protection*, Paris: OECD, 1989 and Jean-Philippe Barde, “The Economic Approach to the Environment,” *OECD Observer*, No. 158 (June/July 1989), pp. 12–15.

17. This draws from Pablo Gutman’s draft report for LA2C1, “Increasing Industrial Compliance with Pollution Control: Comparative Experiences” (5/9/94).

options available for tackling industrial pollution. A few of these studies and action plans are described below:

- A number of studies in the *Mexico Pollution Control Project* (1982) to help develop long-term control strategies and better pollution standards for air, water, and solid waste, as well as studies on the health impact of pollution.
- A component in the *Brazil Second Industrial Pollution Control Project* (1987) that finances diagnostic studies to determine the nature and extent of industrial pollution problems in states other than São Paulo, with recommendations for control strategies.
- The policy, management, and program coordination component in the *Poland Environment Management Project* (1990), which includes a management and policy subcomponent under which a team of policy experts would provide advice to the Ministry of the Environment on various matters, including advice on a country-wide environmental monitoring strategy and recommendations on economic incentives for environmentally sound investment decisions and efficient natural resource use. Another subcomponent deals with environmental factors and health and, among other things, is directed toward improving the quality of monitoring data, establishing priority lists of hazardous chemicals and technologies, establishing reliable linkages between environmental factors and health, and ascertaining which sources contribute most to population exposures. The third subcomponent would help establish a policy for municipal solid and hazardous waste management.
- The *India Industrial Pollution Control Project* (1991), which includes a component to help the Indian Ministry of Environment and Forests to evaluate environmental problems and develop solutions. One particular project in this component is the preparation of a comprehensive environmental strategy for the pulp and paper sector and associated amendment of pollution-control regulations.
- A consultant study in the *Second Petroleum Technical Assistance Project* (1992) in Equatorial Guinea to study the environmental impact of production from the Alba condensate and gas field and to put forward recommendations for environmental protection.
- The latest *Brazil National Industrial Pollution Control Project* (1992), which includes an interesting component: a grant of 1 percent of the subloan amount flows to the EPA of the state in which the firm receiving the subloan is located. These funds are to be used to motivate the state EPA to enforce pollution control more vigorously and to strengthen its institutional capability—for example, by developing pollution-control strategies, including specialized studies on market-based pollution-control mechanisms and securing monitoring equipment.
- The *Indonesia BAPEDAL Development Technical Assistance Project* (1992) contains a component to review the existing laws, regulations, and procedures

relating to pollution control and the development of specific formal and informal measures to ensure interagency coordination and enforcement of standards and regulations.

- Components in the *Ecuador Mining Development and Environmental Control Technical Assistance Project* (1993), such as the provision of advice on the preparation of environmental standards and the establishment and implementation of an extensive mining pollution monitoring program aimed principally at tracking the degree of pollution dispersion and its impact on soils, agricultural, and aquacultural products, drainage and irrigation systems, as well as human populations.
- Many components in the *China Environmental Technical Assistance Project* (1993), such as a policy review of cleaner production for industry and a line of credit to undertake specific environmental and ecological studies on areas such as rural industrial pollution control, strengthening China's pollution levy system, and pollution control in chemical industries.

Command-and-Control Strategies

3.6 A turning point with regard to the use of incentives in credit lines seems to have come in the 1990s, with projects prior to this giving subsidized interest rates. The *Mexico Pollution Control Project* (1982) seems to be an exception, and comments in the *Mexico Pollution Control Project PCR* (dated 1992) seem to bear this out (see below). In recent years, a number of projects have consisted of credit lines to enterprises for pollution-control investments, where the loan is at market rates. These credit lines depend on the existence of appropriate standards and strict enforcement of these in the country.

- The *Mexico Pollution Control Project* (1982) was designed on the basis of a command-and-control strategy being in place. Loans were made for subprojects to industrial enterprises (mainly in the private sector) at market rates (the SAR does specify an allowance to lend at 5 percentage points below rates for regular subloans (SAR, p. 41), but the PCR makes no mention of this, and indeed it appears from the PCR that this option was not exercised). It was assumed that firms would borrow and put in pollution-control equipment on the basis of a strict regulations and enforcement. However, the government never adopted this policy, and after a period of no particular policy moved toward negotiated contracts (see subsection below: Negotiations). The project was not judged a success according to the PCR; part of the loan remained undisbursed; one of the reasons noted in the PCR was that the project was based on a command-and-control strategy being in place. The PCR notes that future projects should consider the use of incentives, and it talks about the growing body of literature on market-based incentives (PCR, p. 10). In the country itself, at the time of the project, certain fiscal incentives for pollution control were in place (SAR, p. 21).
-

- Under the investment component of the *India Industrial Pollution Control Project* (1991), subloans are at the long-term domestic rate, but common treatment facilities and demonstration projects receive subsidies in the form of grants (SAR, pp. 22–24). However, a number of incentives are in place in India to promote industrial pollution control, including (a) positive fiscal incentives, (b) charges and fees, and (c) enforcement provisions (SAR, p. 10).
- With regard to the “control” part of the strategy, in the *Brazil National Industrial Pollution Control Project* (1992) loans to industries for pollution-abatement equipment are at regular long-term interest rates of the development bank of Brazil; however, the polluting industry, if it avails itself of the loan, is required to monitor and report its own emissions. To facilitate this further, the cost of any monitoring equipment can be included under the loan. The state environmental protection agency is required to monitor ambient air and water quality and is further encouraged to do so by receiving a grant of 1 percent of any subloan to a firm in the corresponding state. This grant is to be used for developing pollution-control strategies, including specialized studies on market-based pollution-control mechanisms; acquiring laboratory and monitoring equipment; and upgrading the staff’s technical capability.
- In all the recent China projects, interest rates are at market levels for loans from credit lines. Only in special cases are subsidies awarded, these have included the following:
 - The *Zhejiang Multicities Development Project* (1993), where up to 30 percent of the total loan from the Zhejiang Environmental Fund (funded in part from pollution levies) can be in the form of a grant in special cases based on a formula incorporating factors such as pollution-reduction gains, expected efficiency increases, plant location, and severity of pollution on human health and the environment
 - The Fund for Industrial Pollution Control in the *Tianjin Urban Development and Environment Project* (1992), where again 30 percent of the cost can be in the form of a grant, but only in the case of subprojects that are highly effective at pollution reduction but that may not generate sufficient financial returns to cover debt service fully within the maximum maturity.

Market-Based Incentives

3.7 The World Bank has financed studies on economic incentives for pollution abatement. For example, a component in the *Indonesia BAPEDAL Development Technical Assistance Project* (1992) provides for the financing of technical assistance for the design and development of pollution-control systems and procedures, including permits and incentives and their testing and refinement in targeted locations and industries.

3.8 **Pollution Taxes.** In many countries, enterprises are fined if their pollution levels are above a certain standard. However, the fines generally are not large enough to act as an incentive not to pollute.¹⁸ The *China Zhejiang Multicities Development Project* (1993) includes a component to establish an environmental fund to help finance industrial pollution control projects. The financing for this Zhejiang Environmental Fund (ZEF) is to be derived from pollution levies for pollutant discharges that exceed standards and fees paid by enterprises and institutions for wastewater discharges into water bodies, an IDA credit, and some local funds. The SAR, however, notes that despite the success at raising funds, the system has several weaknesses: the fee is far below the marginal cost of treatment equipment; the system provides only an incentive to meet the standard of contaminant concentrations, not to do better; and the fee system does not create an incentive to reduce pollution at minimum cost, as the law permits enterprises to pass the fee along in the price of the product (SAR, p. 132). A similar fund (i.e., one partly based on pollution levy revenues) can be found in the *Tianjin Urban Development and Environment Project* (1992).

3.9 **Pollution Subsidies.** Subsidies in earlier World Bank projects tended to be in the form of below-market interest rates for subloans in credit lines (the preferred option now is to avoid these, as discussed above). Examples include the following:

- The SAR of the *Finland Water Pollution Control Project* (1975) notes disapproval on the part of the Bank of subsidies given by the government for pollution-control investments (SAR, p. 19). The project itself gives some subsidies in terms of below-market interest rates for “unprofitable” investments; however, the water-pollution-control investments have no subsidized interest rate.
- Loans to industries are at interest rates lower than the market rates for productive industrial investment financing in the *Brazil São Paulo Industrial Pollution Control Project* (1980) (SAR, pp. 28–29). The state government justified this approach on the following grounds: the benefits of the program accrue primarily to low-income groups; lower interest rates are unlikely to affect the allocation of resources in the economy and bias investment decisions in favor of unnecessarily expensive capital equipment; significant incentives are provided to industrialists in other countries, giving pollution control a high priority not available to Brazilian industry; and existing industries should not be expected to assume the full cost of pollution-control investments, since regulations were not in place when they started operations (SAR pp. 28–29). Pollution control at the time of the project in São Paulo was based on standards for effluents and air emissions. The mission found that some of the effluent standards were conflicting or contradictory, and agreements to amend these were obtained from the government at the time of negotiations (SAR, p. 15).

18. Gunnar S. Eskeland and Emmanuel Jimenez, “Curbing Pollution in Developing Countries,” *Finance and Development*, March 1991.

- The *Brazil Second Industrial Pollution Control Project* (1987), too, has a component consisting of a credit line for pollution-control investments, mainly to the private sector. The subsidies in this project are biased toward end-of-pipe treatment, as direct treatment subprojects (pollution control) receive incentives in the form of a lower interest rate, but indirect treatment, such as process change (pollution prevention), receives no incentives, just funds at the usual bank (BNDES) long-term interest rates (SAR, p. 11).

Negotiations

3.10 Little information is available on use of negotiations affecting environmental control in World Bank projects. One of the few project reports that mentions negotiations is the PCR of the *Mexico Pollution Control Project* (1982). The authors of this report note that the command-and-control policy for environmental control and enforcement recommended by the Bank was never adopted. Instead, the Mexicans had a system in which negotiations between the industry and the ministry were carried out to define the environmental standards for the industry and to set the time frame for their adoption. The limited number of these standards that were reviewed by the Bank PCR mission appeared to fall short of Bank-recommended standards. The project itself was based on an underlying command-and-control strategy being in place and fell short of its objectives for various reasons, according to the PCR (see above: Command-and-Control Strategies).

Policy Implementation

Monitoring and Equipment

3.11 Once the policy approaches have been decided upon, they must be implemented and enforced. Effective monitoring can provide the best incentive for pollution abatement.¹⁹ This requires trained people and adequate monitoring of pollution. Many World Bank projects have a component to finance laboratory equipment for monitoring of pollution and training of personnel. These include the following projects:

- *Brazil São Paulo Industrial Pollution Control Project* (1980)
- *Mexico Pollution Control Project* (1982)
- *Brazil Second Industrial Pollution Control Project* (1987)

19. This applies to both developed and developing countries. The United States has some of the most comprehensive monitoring plans, but Eskeland and Jimenez (in *Finance and Development*, March 1991) note that a recent study on monitoring and enforcement of pollution regulation in the United States found that during the 1970s and 1980s much more public attention was focused on getting pollution equipment in place than ensuring its proper maintenance and use.

- *Philippines Industrial Restructuring Project* (1990)
- *Poland Environment Management Project* (1990)
- *Mauritius Environmental Monitoring and Development Project* (1990)
- *India Industrial Pollution Control Project* (1991)
- *Brazil National Industrial Pollution Control Project* (1992) (see above: Command-and-Control Strategies)
- *Ecuador Mining and Development and Environmental Control Technical Assistance Project* (1993)
- *Southern Jiangsu Environmental Protection Project* (1993)
- *China Environmental Technical Assistance Project* (1993).

Information Dissemination

3.12 It is important to address factors such as lack of information of the sources of pollution at the plant level and the available methods for its abatement. This is done in different ways, such as putting up demonstration schemes, carrying out voluntary pollution-related audits of firms, and compiling technology-related databases. Lack of information on the part of the financial institutions making loans for pollution abatement is also addressed in some World Bank projects. Some examples follow:

- A component in the *Poland Environment Management Project* (1990) to conduct voluntary reviews to assist economically viable industrial enterprises to identify least-cost ways to move toward compliance with environmental standards.
 - Assistance to industrial enterprises on the design of least-cost pollution-control components compatible with prevailing standards in the *Philippines Industrial Restructuring Project* (1990).
 - A host of schemes in the *India Industrial Pollution Control Project* (1991), such as the financing of demonstration projects of new approaches and techniques that have potentially wide replicability in India; technical assistance to Development Finance Institutions to assist enterprises in undertaking the required feasibility studies for pollution-control investments; development and transfer of technology in the pesticides sector of more effective and effluent treatment systems; preparation of a technical process manual and training program for use in achieving increased process efficiency in the pulp and paper sector; and revision of a specifications manual for sugar plants published by the government of India in order to include adequate consideration of emissions control requirements and necessary pollution-abatement equipment.
 - The *Brazil National Industrial Pollution Control Project* (1992), where a small component of the loan is to be used to develop professional staff skills of the borrowing bank, BNDES, in environmental assessment, environmental project
-

analysis, and analytical frameworks for dealing with the economics of pollution-control regulations.

- Pilot demonstration projects to develop and expand knowledge of cleaner production for industry in the *China Environmental Technical Assistance Project* (1993) and the provision of technical assistance to the university-level environmental education system, including a study to review and make recommendations for strengthening graduate and postgraduate environmental degree programs.

4

Relation of Recent Bank Projects to Country Environmental Action Plans

4.1 The World Bank had requested all IDA countries to submit environmental action plans (EAPs) detailing their priorities and strategies with regard to environmental protection by 1993. It is impracticable to review each of these EAPs; however, two challenging cases, China and India, are briefly discussed below. This section looks at how recent Bank projects relate to the country's own priorities and strategies with regard to industrial pollution.

China

The Environmental Action Plan

4.2 China's EAP lists the following as the top three priorities (out of a total of seven, China EAP, Executive Summary, p. xv) for the 1990s:²⁰

- Water pollution, particularly with regard to organic key pollutants
- Urban air pollution (key pollutants are TSP [total suspended particles] and SO₂)
- Pollution of industrial toxic and hazardous solid wastes and urban refuse to air, water, and land.

4.3 The section on industry (China EAP, pp. 43–53) notes that some of the general problems facing China are “backward technology, outdated equipment, enormous consumption of energy and big discharges of pollutants from unit products.” In addition, the large number of widely dispersed small enterprises creates difficulties in controlling pollution. With regard to the larger industries, the EAP singles out the chemical industry, the metallurgical industry, the building material industry, and light industry, specifying particular targets it hopes to achieve by 1995 and 2000, with regard to emissions.

20. *Environmental Action Plan of China 1991-2000*, produced by the National Environmental Protection Agency and the State Planning Commission of the People's Republic of China (no date).

4.4 The methods sketched out in the EAP to achieve these targets include continued implementation of existing systems, such as environmental impact assessments and existing laws and regulations; strengthening of environmental management and monitoring; and the setting up of an environmental protection inspection system and a system of pollutant-discharge permits (see Market-Based Incentives, p. 20). Particular strategies include the following:

- Promote cleaner production technology, thereby placing an emphasis on pollution prevention rather than control (see Box 2.1). Interestingly, with regard to the chemical industry, the EAP notes that “policies have been set up to guide the technical transformation, clearly pointing out what technology should be used by each industry, what technology should be used only in limited cases, and what technology should be prohibited entirely.”
- Develop and extend the techniques of comprehensively using industrial “three wastes” (i.e., recovery and recycling or re-use of wastes for other products).
- Strengthen the treatment of old polluting sources (i.e., accelerate rehabilitation and set a deadline for pollution treatment of old enterprises).
- Concentrate efforts on pollution control and improve treatment effectiveness by encouraging enterprises to treat wastes jointly.
- Rationalize industrial allocation by ensuring that industrial development is carried out according to plan rather than haphazardly.

The Relation of Recent Bank Projects to the EAP

4.5 The five projects described in the earlier part of this report and summarized in Annex 2 all contain components that tackle the undesired environmental effects of industry. Two of the projects date from before 1993 and therefore before the EAP; they are not considered here. However, the remaining three were approved in 1993.²¹ Each includes some aspect of the environmental priorities noted in the EAP. Some examples are as follows:

- The line of credit for industrial pollution control subprojects in the *Southern Jiangsu Environmental Protection Project* (1993) targets all sizes of industrial enterprises. Some of the large-scale enterprises include pulp and paper mills, iron and steel works, and pharmaceutical factories. The emphasis in these projects is mainly on pollution prevention—for example, by switching raw materials from straw (to make self-produced pulp) to purchased market pulp in some pulp and paper subprojects; relocating and modernizing an existing pharmaceutical factory; changing the mix of products and modernizing the wastewater treatment facilities in another pharmaceutical plant; and waste minimization by recovering by-products and recycling in the case of a steel works.

21. A number of projects are also in the pipeline for China; these are not reviewed here.

- The Zhejiang Environmental Fund in the *Zhejiang Multicities Development Project* (1993) provides a sustainable mechanism for financing pollution-control measures for small and medium-sized industrial enterprises by including as its sources fees that have been levied on pollution discharges.
- Technical assistance aspects are covered in the *Environmental Technical Assistance Project* (1993), which not only strengthens environmental management capabilities of the Chinese National Environmental Protection Agency but also helps to promote cleaner production technologies and information dissemination.

India

The Environmental Action Plan

4.6 Industrial pollution is mentioned in the EAP²² not only in connection with urban environmental problems but also in a separate section. It is caused both by the increasing regional diversification of industry and by the increasing numbers of small industrial enterprises in India. In the former case, some urban environmental problems caused by industry and noted in the EAP include high levels of water pollution from improper disposal of industrial effluents, high levels of air pollution from industrial activities, toxic or hazardous industrial wastes disposed in water bodies and land sites without proper treatment, and high levels of noise pollution from industrial operations (India EAP, pp. 102–107). The EAP also notes (India EAP, p. 106) that “the protection afforded to industry and the emphasis on decentralization of industrial development, has resulted in the pulp and paper, sugar and distilleries, leather tanning and chemical industry, mostly belonging to the small scale sector, resorting to pollution based and energy guzzling technologies.”

4.7 The EAP identifies seven priorities, of which the four that are related to industrial pollution are given below (India EAP, pp. 13–14):

- Control of industrial and related pollution with an accent on the reduction and / or management of wastes, particularly hazardous wastes
- Improving access to clean technologies
- Tackling urban environmental issues
- Strengthening scientific understanding of environmental issues, as well as structures for training at different levels, orientation and creating environmental awareness, resources assessment, water management problems, and so on.

4.8 The strategies noted in the EAP to tackle these priorities include a mix of regulatory and economic measures, such as the further strengthening of fiscal incentives

22. *Environmental Action Programme: India*, produced by the Ministry of Environment and Forests, Government of India (1993).

for environmental protection to facilitate access and absorption of clean technologies in industries; further evolution of the tax base for environmental protection; and training to increase human awareness and capabilities in the field of the environment (India EAP, pp. 130–34). Actions and programs outlined to achieve the priorities listed above include the following (India EAP, pp. 150–57):

- Modernization of the leather, textiles, and pulp and paper industries with regard to clean production
 - Several programs relating to nonpoint sources, such as the development of techniques for quantification of pollutants from nonpoint sources and development of methods to help make decisions about which pollution-control method to use for nonpoint sources, based on cost and extent of pollution abatement
 - Development, demonstration, and dissemination of water treatment, recycling, and reuse technologies
 - Projects relating to mining, such as investigation of the least hazardous methods for mining, control of erosion in mining areas, proper storage of minerals, and proper disposal of mineral wastes in mined area
 - Identifying cleaner technologies developed in research laboratories and industrial units in India and abroad and facilitating transfer and adaptation of such technologies in India
 - Establishing centers for cleaner technologies in various parts of the country in order to develop a centralized data base and provide information to industries
 - Launching a Technology Mission on Cleaner Production to coordinate activities for promoting cleaner technologies in India through government policies, strengthening of R&D institutions, industry associations, financial institutions, and regulatory agencies
 - Formulation of standards, in terms of waste discharge per unit quantity of raw material
 - Formulation of legal and economic measures to ensure absorption of clean technologies
 - Capacity building for, among other things, environmental audits for pollution prevention, assessment of environmental impact of clean technologies
 - Establishment of a national center to give training in environmental impact assessments, in addition to regional centers
 - A host of programs to create environmental awareness and to provide training on environmental matters.
-

The Relation of Recent Bank Projects to the EAP

4.9 India's EAP is dated 1993 and was written after the approval of the *India Industrial Pollution Control Project* in 1991. Indeed, the EAP notes that this project was initiated "to give teeth to our comprehensive environmental protection legislation and in order to operationalize India's Policy Statement for Abatement of Pollution" (India EAP, box on pp. 59–60). The follow-up to this, the *India Industrial Pollution Prevention Project*, is currently at draft yellow cover stage.²³ It is clearly impossible for one project to address all of the concerns and priorities of the EAP; however, this latest project does address several points, as illustrated below:

- *Institutional component.* A training program is included to assist several State Pollution Control Boards in four major areas: (a) quality assurance and quality control; (b) maintenance and operation training, including safety issues, for the proper handling of samples and equipment; (c) specialized technical training on topics such as risk assessment, hazardous waste management, and environmental chemistry; and (d) supervisory training for management of the laboratories' work and implementation of pollution-monitoring strategies. This component also includes the development of a pilot phase Geographical Information System to assist in the monitoring and tracking of toxic residues.
- *Investment component.* This component of the project provides support for the priority given in the EAP to improve access to clean technologies, by replenishing the line of credit in the first project which is now almost fully committed. This credit line gives priority to innovative approaches, and to projects with a clear demonstration effect. Another condition is that loans will only be provided for those projects that address environmental concerns associated with the most polluting industries, as defined by the Central Pollution Control Board.
- *Technical assistance component.* This supports the establishment of a "clean technology institutional network" to promote development, diffusion, and transfer of technology; extension services for the identification of waste minimization and abatement methods for small-scale industry, several other studies, and training.

23. This project was approved by the Board of the World Bank in 1994, after the completion of this report.

5

Conclusions

5.1 The following points emerge from this study:

- The World Bank's experience of environment-related components in industrial projects dates back 20 years and illustrates the extent of in-house expertise available for client countries.
- In recent years, environmental components in World Bank industrial projects have been increasing steadily (Type 2 and Type 3 projects have increased in number).
- Project designs have changed increasingly to include technical assistance components, reflecting a growing interest in environmental policy on the part of the World Bank and a desire on the part of developing countries to borrow from the Bank for this type of development.²⁴
- Project design has evolved considerably over the years on the basis of learning from previous projects. Examples are the move away from subsidies in credit lines for investments in pollution abatement and toward loans at market rates; the move away from favoring end-of-pipe treatments and toward both pollution prevention and control; and the move away from reduction of industrial pollution in an isolated setting and toward the reduction of industrial pollution to effect an overall improvement in environmental quality in the area.
- The projects studied display a host of innovative ideas. Some examples are the requirement in the *Brazil National Industrial Pollution Control Project* (1992) for enterprises receiving loans to measure and make available to the authorities as well as to the World Bank their own pollution emissions; and the emphasis on information dissemination in many recent projects, such as the component financing a study to review and make recommendations for strengthening the university level environmental education system in the *China Environmental Technical Assistance Project* (1993).

24. This is noticeable in the projects studied in this report, and is despite the fact that we have probably not captured a sufficient amount of policy dialogue, as sector work has not been reviewed here.

Annex 1: Data Gathering

Choice of Projects

A1.1 Projects were chosen from the Bank Reports Database on the basis of specified key words. Note that the numbers of documents given below from each search include non-project documents; in addition there can be more than one document for each project (e.g., Staff Appraisal Report, Project Completion Report):

- Sector: industry, keyword: *environment* (4 documents)
- Sector: industry, keyword: *pollution* (59 documents)
- Sector: industry, subsector: pollution control (11 documents)
- Subsector: pollution control (143 documents)
- Keyword: *industrial pollution* (51 documents)
- Keyword: *pollution* (225 documents).

A1.2 All documents, other than project documents [President's Report (PR), Memorandum of the Director (MOD), Staff Appraisal Report (SAR), Project Completion Report (PCR), and Project Performance Audit Report (PPAR)] were excluded. A preliminary study of the abstracts was then undertaken, and GEF-funded projects (including those funded by the Multilateral Fund for the Implementation of the Montreal Protocol), pure energy-efficiency-related projects, institutional strengthening projects in which the component dealing directly with industries is not specified, and area or regional general environmental projects (these could include an industrial component, such as a sewage works dealing with industrial waste) were excluded.

A1.3 Some 34 projects (a total of 79 available documents) were studied in detail. Of these projects, the dates of the PRs and SARs ranged from 1974 to 1993. The sample included 29 SARs and 5 PRs. The sample also contained 14 PCRs or PPARs; the dates of the corresponding SARs of these reports ranged from 1974 to 1982.

A1.4 Loan and credit amounts discussed in this report are on the basis of those specified in the SAR for the whole project rather than actual amounts disbursed. Note also that projects where a second loan was given for the same project (e.g., due to a cost overrun) are considered as one project in this report. In this case, the date of the earlier SAR is taken as the project date.

The Quality of the Information

A1.5 On the basis of the choice of information, a discussion of the project design and its trends are possible from 1974 to 1993. It is quite possible that environmental considerations were taken into account on earlier industrial projects, but if the keywords in the project summary were not specified by the task manager as one of the above, these projects would not be picked up by the search. An example of this is the *Hungary Fine Chemicals Project* (1985), which included a component to finance the construction of a hazardous pharmaceutical waste incinerator with a capacity of about 25,000 tons per annum. This incinerator, although exceeding its planned budget, is considered as a particularly good investment; indeed it was recently sold at a profit by its owners to a private investor.²⁵

A1.6 There are also likely to be more examples of pollution prevention, in terms of process change, in new plants. However, unless specified as such by the task manager, these will also not show up in the search. Examples are the establishment of mechanical pulp mills as opposed to Kraft mills. Some examples of process change can be found in the existing project sample, and these are discussed in the text.

A1.7 With regard to project performance or evaluation, the PCRs and PPARs are only from the period 1974 to 1982. Progress and evaluations of recent projects are lacking. Therefore, the lessons to be drawn from any changes in project design are limited, particularly with regard to recent experiences.

25. Findings of project audit team (1994).

Annex 2: Summary of Bank Projects Reviewed



Annex 2: Summary of Bank Projects Reviewed

<i>Country</i>	<i>Project name</i>	<i>Report (no.)</i>	<i>Search criteria</i>	<i>Amounts</i>	<i>Year</i>	<i>Description of industrial / environmental component</i>	<i>Outcome of industrial / environmental component</i>
Type 1. Environmental component in industrial projects							
Yugoslavia	Iron foundry expansion project	PPAR (2495) SAR (0256) MOP (P1379)	Sector = industry / keyword = <i>pollution.</i>	\$15m loan	1974	Modernization and expansion of foundry, pattern shop, storage and material handling system, existing utility installations, present infrastructure facilities, and existing pollution control system.	Installation of pollution control equipment.
India	Fourth Trombay fertilizer expansion project	PPAR (3998) SAR (0448) MOP (P1460)	Sector = industry / keyword = <i>pollution.</i>	\$50m credit	1974	Expansion of fertilizer factory. Project provides for adequate equipment to control pollution within Bombay Municipal Authority environmental quality standards.	All required standards met as a result of measures undertaken. In particular, emissions levels adopted for nitric acid lower than anywhere else in India and among the lowest in the world.
Bangladesh	Ashuganj fertilizer project	PCR (6569) MOP (P2568) SAR (0598) MOP (P1554)	Sector = industry / keyword = <i>pollution.</i>	\$33m credit (total \$249.4m); followed by \$29m credit (total \$452.7m) for cost overrun	1975 + 1979	Construction of new urea plant with associated ammonia plant. No environmental regulations in Bangladesh, so plant is to be designed in accordance with U.S. and European standards with respect to solid, liquid, and gaseous emissions. Pollution control equipment accounts for 2% of total project costs, including wastewater treatment units.	No information on environmental part.
Egypt	Tourah cement expansion project	PCR (5656) SAR (0608) MOP (P1540)	Sector = industry / keyword = <i>pollution.</i>	\$40m loan (total \$93m)	1975	Expansion of existing plant and the setting up of new plants to increase cement production. Pollution control component is the installation of modern dust collection units in new and existing plants (electrostatic precipitators to clean kiln exhaust gases).	Electrostatic precipitators did not function properly according to a supervision mission (as noted in the PCR) due to malfunctioning from lack of proper maintenance of the materials handling equipment that removes the collected dust from precipitators.

(continued on next page)

(Annex 2 continued)

Country	Project name	Report (no.)	Search criteria	Amounts	Year	Description of industrial / environmental component	Outcome of industrial / environmental component
India	Fertilizer industry project	PCR (6297) SAR (0928) MOP (P1723)	Sector = industry / keyword = pollution.	\$105m credit	1975	The project aims to assist in removing various limitations facing the industry and thus to raise production at existing facilities, to help in the installation of pollution control facilities consistent with agreed environmental standards, and to provide technical assistance to facilitate fertilizer sector planning at the government level. Subprojects are not limited to public sector companies but also apply to joint (public/private sectors) as well as private sector companies.	The PCR notes that overall the project achieved most of its objectives despite some difficulties in implementation. According to the PCR (p. 6), pollution control equipment was installed in four enterprises, and testing equipment at one enterprise. No detailed information is available on how the equipment is working; a general paragraph on improvement of environmental quality as a result of equipment installation can be found on p. 18.
Turkey	Balikesir newsprint project	PCR (5664) SAR (1046) MOP (P1834)	Sector = industry / keyword = pollution.	\$70m loan (total \$198m)	1976	The project involves the setting up of a wood preparation plant, a sawmill, a pulp mill, a paper mill, pollution abatement facilities, and ancillary facilities. Process technology to be used for pulping is thermomechanical pulping (N.B. not chemical). Pollution abatement facilities include clarifier and aerated lagoon for treatment of water pollution (pollution abatement level for each of these is 95%) and fly ash separators (for combating air pollution). N.B. SO _x emissions are not controlled. (Annex 4.6 in SAR has further details.)	No quantitative details in PCR on environmental factors other than to say that system is operating according to design and that no detrimental effects on the environment have been experienced. The project has not been audited.
Mexico	Fourth industrial equipment fund (FONEI) project	PPAR (7859) SAR (2473) MOP (P2555)	Keyword = industrial pollution.	\$175m loan	1979	FONEI to provide medium- and long-term financing to industrial enterprises through commercial banking system to help finance machinery, equipment, and services for high-priority industrial projects, including projects to help develop technology and control pollution.	No information on environment-related loans. Criticism in PPAR that funds were not used for marginal projects. The PCR of the <i>Mexico Pollution Control Project</i> (see later) notes that \$10 million was allocated in this project to industrial pollution control, of which \$7 million was disbursed.

Country	Project name	Report (no.)	Search criteria	Amounts	Year	Description of industrial / environmental component	Outcome of industrial / environmental component
Tanzania	Mufindi pulp and paper project	PPAR (11481) SAR (1929) MOP (P2436)	Sector = industry / keyword = pollution.	\$ 30m loan and \$30m credit (total \$252m); followed by additional \$18m credit (total \$45m)	1979 & 1983	<p>Project involves the setting up of logging roads and equipment, a mechanical pulp mill, a chemical pulp mill and bleach plant, two paper machines, steam and power generating equipment, a chlorine and caustic soda plant, related pollution abatement equipment, and supporting infrastructure. Chemical and mechanical pulp are to be used for newsprint; chemical for all other grades. Pollution abatement facilities include stripping with steam to remove sulfur compounds, and a clarifier and aerated lagoon for treatment of water pollution (to reduce BOD by 90%).</p> <p>For air emissions, electrostatic precipitators on the recovery boiler, recirculating wet scrubber for lime kiln, and multiple cyclones on the power boiler are to be installed. Digester gases are to be condensed (according to SAR, the most recent odor reduction technology will not be used, as size and location do not warrant its use). International environmental regulations are to be followed.</p>	<p>The equipment is capable of meeting standards. In 1987, water standards were being met, but air emissions did not meet standards. The situation was rectified. From 1985 to 1989, all standards were met. After 1989, lack of spares and consumables led to excessive discharge of solids to effluent treatment plant and consequently resulted in the discharge of low-quality treated effluent. Lack of funds affected the operation of the air pollution control equipment. Therefore, environmental standards were not being met consistently. The PPAR notes that adequate pollution control was related to the mill's process efficiency and financial health.</p>
Pakistan	Fertilizer industry rehabilitation project	PCR (7583) SAR (3865) MOP (P3323)	Sector = industry / keyword = pollution.	\$38.5m loan (total \$49.3m)	1982	<p>The project aims to rationalize and expand fertilizer production. Environmental component (excluding energy efficiency component) is the installation of pollution abatement and monitoring equipment for the Multan complex.</p>	<p>According to the PCR, the loan was reduced to \$25.4m. The PCR also notes successful accomplishment of pollution control in the form of</p> <ol style="list-style-type: none"> Chromate removal from cooling tower blowdown NOx emissions reduction with appropriate technology Installation of a pollution monitoring system.

(continued on next page)

(Annex 2 continued)

Country	Project name	Report (no.)	Search criteria	Amounts	Year	Description of industrial / environmental component	Outcome of industrial / environmental component
Turkey	Second fertilizer industry rationalization and energy saving project	PCR (10760) SAR (3708) MOP (P3259)	Sector = industry / keyword = <i>pollution.</i>	\$44.1m loan (undisbursed \$17.14m canceled)	1982	The project's objectives were as follows: a. Rehabilitation and modernization of six major fertilizer plants and one copper smelter with particular attention to energy saving and pollution control b. Expansion of training programs c. Studies to facilitate institutional and policy reform.	Objectives largely met (no details on environmental part).
Tunisia	SOFOMECA foundry modernization and expansion (fourth industry) project	PPAR (9740) PCR (8456) SAR (4345) MOP (P3573)	Sector = industry / keyword = <i>pollution.</i>	\$16.8m loan	1983	The project aims to develop the foundry industry. New foundry design includes provisions for fume and dust pollution control, sound pollution abatement, and adequate safety and health provisions. Present foundry will also be provided with additional dust, fume, and noise pollution abatement devices.	No details of environmental part.
Nigeria	Refineries rehabilitation project	SAR (7505) MOP (P4938)	Sector = industry / keyword = <i>pollution.</i>	\$27.7m loan	1989	The project aims to improve (a) the national petroleum company's institutional approach to preventive maintenance, etc.; (b) the utilization and efficiency of the existing refineries; and (c) the monitoring and control of environmental pollution in terms of oil spillage from refineries. One component is to improve the functioning of the wastewater treatment systems to cope with increased load of contaminated water and thus to reduce environmental pollution to normal industrial standards.	n.a.

Country	Project name	Report (no.)	Search criteria	Amounts	Year	Description of industrial / environmental component	Outcome of industrial / environmental component
Mozambique	Industrial enterprise restructuring project	SAR (7826) MOP (P5087)	Sector = industry / keyword = <i>environment.</i>	\$50.1m credit (total \$106.7m)	1989	The aim of the project is to restore production and efficiency in the major industries and agro-industries. The project has two components: a. Enterprise rehabilitation, which consists of a credit line for eligible enterprises (eligibility is based on several factors including an undertaking to institute measures to protect the environment) b. Technical assistance, which includes training and various studies.	n.a.
Philippines	Industrial restructuring project	SAR (8989) MOP (P5376)	Sector = industry / keyword = <i>pollution.</i>	\$175m loan (total \$541m)	1990	The project has three components: a. A credit line for modernization, expansion, and new facilities including energy conservation and pollution control devices b. Lease financing c. Training and technical assistance for selected subsectors and environmental protection.	n.a.
Mexico	Mining sector restructuring project	SAR (9428) MOP (P5512)	Sector = industry / keyword = <i>pollution.</i>	\$200m loan (total \$436.5m)	1991	Deregulation of mining sector through the establishment of appropriate policy and institutional framework. Environmental component includes the establishment of environmental standards for the sector and a credit component (\$191.5m) to help fund small- and medium-scale enterprises to acquire assets including pollution control equipment.	n.a.
China	Regional cement industry project	SAR (8260) MOP (P5215)	Sector = industry / keyword = <i>pollution.</i>	\$82.7m loan (total \$265.1m)	1992	Environmental component in the project includes a study to provide technical support to rehabilitate potentially economic small plants in terms of production efficiency and pollution control.	n.a.

(continued on next page)

(Annex 2 continued)

Country	Project name	Report (no.)	Search criteria	Amounts	Year	Description of industrial / environmental component	Outcome of industrial / environmental component
Equatorial Guinea	Second petroleum technical assistance project	PR (P5808)	Keyword = <i>industrial pollution.</i>	\$2.4m credit (total \$2.7m)	1992	The project mainly provides for consultants to help the government maximize revenues from the Alba condensate and gas field and to strengthen the government's technical and financial capabilities to monitor oil companies' activities. Environmental part includes a consultant study of the environmental impact of production from the field and recommendations for environmental protection.	n.a.
Ecuador	Mining development and environmental control technical assistance project	PR (P5988)	Sector = industry / keyword = <i>environment,</i> & subsector = <i>pollution control.</i>	\$14m loan (total \$24m)	1993	The project aims to attract new private mining investment and support environmentally sound increased mineral production, and to arrest mining-related environmental degradation and mitigate damage. The project has a policy management component that includes assisting in institutional structuring, staffing, and coordination, providing advice on the preparation of environmental standards and on privatization, and providing training. The policy implementation component includes development assistance to small-scale miners by demonstrating environmentally neutral technologies and equipment, and an environment and health subcomponent, which is intended to assist the National Directorate of the Environment in mitigating the impact of mining on the environment and on the health of mining communities.	n.a.

<i>Country</i>	<i>Project name</i>	<i>Report (no.)</i>	<i>Search criteria</i>	<i>Amounts</i>	<i>Year</i>	<i>Description of industrial / environmental component</i>	<i>Outcome of industrial / environmental component</i>
Type 2. General environment-related industrial projects							
Finland	Water pollution control project	PPAR (3156) SAR (0648) MOP (P1578)	Subsector = pollution control.	\$20m loan, canceled after \$5.7m disbursed (see results section)	1975	This is the first effort by the World Bank to get involved in programs to improve the environment on a national scale. It tackles water pollution by all industries, particularly pulp and paper. The Bank loan is channeled through the Mortgage Bank of Finland, a subsidiary of the central bank, to industries (mainly in the private sector) for subprojects that deal with pollution control (with zero or negative financial rates of return).	<p>The loan was canceled because of insufficient demand and at the request of the government. The three main reasons for the project not being successful (as noted in the PPAR) are</p> <ol style="list-style-type: none"> The requirement for a negative or zero rate of return (this was later lifted to <10%, but was only marginally helpful); at a time of recession, companies were not interested in unprofitable projects. The Bank's eligibility criteria for "pure" unprofitable pollution control investments, which excluded design, scope, or process changes. The loan was too expensive; it was disbursed by the Bank in hard currencies, and as these appreciated, the cost of funds increased.

(Annex 2 continued)

Country	Project name	Report (no.)	Search criteria	Amounts	Year	Description of industrial / environmental component	Outcome of industrial / environmental component
Brazil	São Paulo industrial pollution control project	PPAR (7720) SAR (2158) MOP (P2378)	Sector = industry / keyword = environment; subsector = pollution control; & keyword = industrial pollution.	\$58m loan (total \$187m). Reduced to \$34m in 1984.	1980	The loan is allocated as follows: \$55m to cover part of capital requirements of lending program to assist existing industries with air and water pollution control systems to comply with state and federal legislation and \$3m for technical assistance directed at the state environmental protection agency (CETESB) for training and laboratory and monitoring equipment, and training for industrial polluters and local manufacturers of pollution control equipment.	80% of the loan disbursed went to the industrial area of Cubatao, and other industrial regions in the state, outside the original Greater São Paulo Metropolitan Area, mainly for large subprojects, after the project was modified in 1984. The effect on water pollution as a result of the project was difficult to measure because of the masking effect of untreated domestic sewage discharged into the receiving waters and the delay in the completion of the Greater São Paulo Sewage Treatment program. In the case of air pollution, sulfur dioxide emissions were reduced by the 60% planned (8% financed by the project), and industrial particulate matter emissions were reduced by 65% during 1980-86; however, not much difference was obtained in particulate matter air quality because of the greater influence of nonindustrial sources, such as dust from roads and open areas. The PPAR, however, does note a higher awareness of the environment in the region as a result of the project.
Mexico	Pollution control project	PCR (9495) SAR (3816) MOP (P3302)	Subsector = pollution control.	\$60m loan (total \$190m). Loan canceled after only \$8.7m disbursed in 1988.	1982	The project was to finance industrial enterprises' acquisition and installation of pollution control equipment, process changes, or plant relocation; finance the acquisition of emissions testing and diagnostic equipment for private automobile garages; finance the acquisition and installation of pollution monitoring equipment, laboratory facilities, and emissions testing and diagnostic equipment for automobile inspection stations; train technical staff of implementing agencies, financial institutions, and industries and auto mechanics; and support studies and technical assistance to help develop long-term control strategies and emissions standards.	The effect of the small amount disbursed was negligible. The project's lack of success has been attributed partly to the change from "command-and-control" type policies of established standards, corresponding regulation and aggressive enforcement to negotiated "social contracts" by the Mexicans.

Krishna
Chadler

Country	Project name	Report (no.)	Search criteria	Amounts	Year	Description of industrial / environmental component	Outcome of industrial / environmental component
Brazil	Second industrial pollution control project	SAR (6673) MOP (P4569)	Sector = industry / keyword = <i>environment</i> ; subsector = pollution control; & keyword = <i>industrial</i> <i>pollution</i> .	\$50m loan (total \$100m)	1987	The project consists of subprojects by industrial enterprise to reduce all types of pollution in São Paulo and technical assistance to strengthen the Special Secretariat of the Environment and state environmental protection agencies in the form of training, monitoring equipment, studies to determine the extent and nature of pollution, and recommendations for control strategies.	n.a.
India	Industrial pollution control project	SAR (9347) MOP (P5485)	Sector = industry / keyword = <i>environment</i> ; subsector = pollution control; & keyword = <i>industrial</i> <i>pollution</i> .	\$124m loan and \$31.6m credit (total \$260m)	1991	The project has three components: a. An institutional component to strengthen the monitoring and enforcement ability of the government by financing training, facilities, and equipment b. An investment component, which finances projects dealing with waste minimization, resource recovery, and pollution abatement, as well as common treatment facilities and demonstration projects c. A technical assistance component, which aims to assist (1) the Ministry of Environment and Forests to evaluate environmental problems and to develop solutions and (2) development finance institutions to assist enterprises with required feasibility studies for pollution control investments.	n.a.

(continued on next page)

(Annex 2 continued)

Country	Project name	Report (no.)	Search criteria	Amounts	Year	Description of industrial / environmental component	Outcome of industrial / environmental component
Brazil	National industrial pollution control project	SAR (10180) MOP (P5695)	Subsector = pollution control.	\$50m loan (total \$100.5m)	1992	The project consists of a credit line for industrial pollution control investments for all types of pollution; technical assistance for the development bank of Brazil (BNDES) to develop its professional staff skills in environmental assessments, environmental project analysis, and analytical frameworks for dealing with the economics of pollution control regulations; and technical assistance for the state environmental protection agencies in the form of funds to develop pollution control strategies, acquire laboratory and monitoring equipment, and upgrade their staff's technical capabilities.	n.a.
Egypt	Helwan industrial pollution control project	SAR (11588) MOP (P5998)	Subsector = pollution control.	\$50m loan and \$50m credit (total \$240.9m)	1993	<p>The project aims to clean up the Helwan industrial area, by</p> <ol style="list-style-type: none">Developing the local environmental monitoring, inspection and enforcement capabilities (\$8.4m)Preparing the Helwan environmental action plan (\$3m)Reducing cement pollution (\$210.4) under an integrated package of restructuring measures, aimed at environmental control, energy conservation, process optimization, management restructuring and labor rationalization, and training. <p>The Bank stopped project processing at green cover stage because of the inability of the government of Egypt to meet certain conditions, including its refusal to shut down a lead smelter, which was a health hazard, in the area.</p>	n.a.

Country	Project name	Report (no.)	Search criteria	Amounts	Year	Description of industrial / environmental component	Outcome of industrial / environmental component
Type 3. Industrial component in environmental projects							
Mauritius	Environmental monitoring and development project	SAR (8996) MOP (P5381)	Keyword = <i>industrial pollution.</i>	\$12.4m loan (total \$20.5m)	1990	The project aims to put in place policy and institutional arrangements for the Environmental Investment Program. A component includes the financing of environmental laboratories to monitor emissions and effluents from industry and design and engineering studies for an industrial park.	n.a.
Poland	Environment management project	PR (P5256)	Keyword = <i>industrial pollution.</i>	\$18m loan (total \$27.3m)	1990	Under this project, finance for technical assistance and monitoring equipment is provided in support of the environmental improvement program in Poland. The project deals with all media (solid, air, and water) with regard to policy development and monitoring. Of interest, too, is a component that introduces a program in some areas for conducting voluntary reviews to help economically viable industrial enterprises identify least-cost ways to move toward compliance with environmental standards.	n.a.
China	Beijing environmental project	SAR (9791) MOP (P5655)	Subsector = pollution control; & keyword = <i>industrial pollution.</i>	\$45m loan and \$80m credit (total \$304.5m)	1991	The project aims to assist Beijing Municipality through several technical and training components in improving the capability of various bureaus and agencies to develop and implement long-term environmental strategies. The project also supports priority physical works, such as the construction of a sewer system, sanitary landfill, hot water system, hazardous waste handling institution, and a credit line of \$45m to help selected industries carry out pollution abatement in compliance with regulations.	n.a.
Brazil	Minas Gerais water quality and pollution control project	SAR (10805) MOP (P5946)	Subsector = pollution control.	\$145m loan (total \$307.6m)	1992	Regional environmental project that includes components such as the financing of municipal and industrial sewage works and solid waste disposal. One part is studies for industrial pollution control.	n.a.

(continued on next page)

(Annex 2 continued)

Country	Project name	Report (no.)	Search criteria	Amounts	Year	Description of industrial / environmental component	Outcome of industrial / environmental component
China	Tianjin urban development and environment project	SAR (10284) MOP (P5710)	Subsector = pollution control; & keyword = industrial pollution.	\$100m credit (total \$195m)	1992	The project supports both environmental technical assistance and training as well as physical works to improve drainage, sewerage, solid waste management, roads, traffic management, and public bus operations. The project also includes a credit line for pollution control investments that yield both pollution reduction and financial benefits for the borrowing enterprise.	n.a.
Indonesia	BAPEDAL development technical assistance project	PR (P5719)	Subsector = pollution control.	\$12m loan (total \$15m)	1992	The primary objectives of the project are to (a) strengthen institutional capacity and role of agencies responsible for environmental management and pollution control and (b) design and implement pollution control measures at the central and regional levels. Components include review of existing laws and regulations relating to pollution control and development of measures to ensure interagency coordination and enforcement of these standards and regulations; design, development, and testing of pollution control systems and procedures, including permits and incentives; planning, establishment, and strengthening of pollution control agencies and laboratories at the regional level.	n.a.

Country	Project name	Report (no.)	Search criteria	Amounts	Year	Description of industrial / environmental component	Outcome of industrial / environmental component
China	Southern Jiangsu environmental protection project	SAR (11370) MOP (P5936)	Subsector = pollution control; and keyword = <i>industrial pollution.</i>	\$ 250m loan (total \$588m)	1993	The main project components consist of (a) a line of credit for large-scale industrial pollution control subprojects in the urban areas of Suzhou, Wuxi, Changzhou, and Zhenjiang, small-scale industrial pollution control subprojects, and pilot township and village industrial enterprise environmental management subprojects in Greater Suzhou and Wuxi; (b) construction of municipal facilities for urban wastewater management; (c) establishment of solid and hazardous waste management and registration centers, a hazardous material emergency response center, and construction of hazardous material storage facilities; and (d) technical assistance and training for the provincial and municipal environmental protection bureaus, municipal sewerage companies, hazardous material storage company, and the industrial subproject financial agent.	n.a.
China	Zhejiang multicities development project	SAR (11282) MOP (P5906)	Subsector = pollution control; & keyword = <i>industrial pollution.</i>	\$110m credit (total \$231m)	1993	This is the first phase of a two-phase project would support improvements in water supply in the cities of Hangzhou, Ningbo, and Wenzhou; land development in Shaoxing; environmental programs; institution building and traffic management in Hangzhou. One interesting component is the establishment of the Zhejiang Environmental Fund (ZEF, \$5m) to provide a sustainable mechanism for financing pollution control measures for small- and medium-sized industrial enterprises. Subproject selection for ZEF funding is based on technical, financial, and economic appraisals. Funding sources of ZEF include fees levied on pollution discharges.	n.a.

(continued on next page)

(Annex 2 continued)

Country	Project name	Report (no.)	Search criteria	Amounts	Year	Description of industrial / environmental component	Outcome of industrial / environmental component
China	Environmental technical assistance project	PR (P6056)	Keyword = <i>industrial pollution.</i>	\$50m credit (total \$76m)	1993	<p>Technical assistance to National Environmental Protection Agency (NEPA) and the Chinese Academy of Sciences (CAS) to strengthen capacities and selected policies and programs of these national institutions. The project has three components:</p> <ol style="list-style-type: none">CAS ecological research and monitoring component, which provided training, equipment, and technical assistance to the Chinese Ecosystem Research Network and to the Biodiversity Research and Information Management program.NEPA technical assistance program component to strengthen management capabilities of NEPA; provide technical assistance to university-level environmental education system; provide technical assistance, equipment, and training to NEPA's environmental monitoring and information systems; support waste minimization and cleaner production programs for industry via institution building, training, pilot demonstration projects, and a policy review; and a line of credit for environmental and ecological studies.Environmental impact assessment system component to assist in environmental assessments of World Bank-assisted projects, the development of new environmental assessment approaches, and training.	n.a.