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INDUSTRIAL POLICY AND THE ENVIRONMENT IN PAKISTAN

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ACRONYMS

ADB	Asian Development Bank
BNRMP	Balochistan Natural Resource Management Project
BOI	Board of Investment
CCI	Chamber of Commerce and Industry
CIDA	Canadian International Development Agency
CO	Carbonmonoxide
CP	Cleaner Production
DEC	Divisional Environmental Committee
EAC	Expert Advisory Committee
EC	European Community
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMS	Environmental Management Systems
EOP	End-of-Pipe
EPA	Environmental Protection Agency
PD	Environmental Protection Division of Punjab
EPRCP	Environmental Protection and Resource Conservation Project
ETPI	Environmental Technology Program for Industry
E&UAD	Environment and Urban Affairs Division
FBS	Federal Bureau of Statistics
FPCCI	Federation of Pakistan Chamber of Commerce and Industry
GEF	Global Environmental Facility
HBP	Haigler & Bailey Pakistan
IEE	Initial Environmental Examination
KESC	Karachi Electricity Supply Corporation
ISO	International Standards Organization
MoELG&RD	Ministry of Environment, Local Government and Rural Development
MoIP	Ministry of Industry and Production
NCS	National Conservation Strategy
NEQS	National Environmental Quality Standards
NGOs	Non-governmental Organizations
NOC	No Objection Certificate
NORAD	Royal Norwegian Development Co-operation
NWFP	North West Frontier Province
OICCI	Overseas International Chamber of Commerce and Industries
Pak-EPA	Pakistan Environmental Protection Agency
PEP-Act	Pakistan Environmental Protection Act
PEPC	Pakistan Environmental Protection Council
PEPO	Pakistan Environmental Protection Ordinance
PPIB	Private Sector Power and Infrastructure Board
PSO	Pakistan State Oil
SDPI	Sustainable Development Policy Institute
SMART	Self-Monitoring and Reporting Tool
SMEs	Small and Medium Enterprises
SMRS	Self Monitoring and Reporting System
SPCS	Sarhad Provincial Conservation Strategy
SRO	Statutory Regulatory Order
UIEP-Project	Urban Industrial and Environment Protection-Project
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
WAPDA	Water and Power Development Authority
WASA	Water and Sewerage Authority of Faisalabad

SUMMARY

The objective of this study is to examine the relationship between industrial and environmental policies in Pakistan, and to recommend policy measures that could optimize economic benefits from industrial development with reduced environmental damage. Although data are scarce, it is clear that industrial pollution is increasing rapidly and that the health and productivity impacts are significant and worsening. Pakistani industries are increasingly contributing to air and water pollution. Major industrial contributors to water pollution are the pulp and paper, chemicals, petrochemicals, refining, metalworking, food processing and textile industries; power generation for various industrial purposes and brick kilns are major sources of air pollution.

The document is structures as follows: a brief introduction on sources of stress on the environment in Pakistan is followed by a discussion of industrial and environmental policies, and a presentation of three case studies covering the districts of Faisalabad and Sheikhupura as well as the Sindh Industrial Trading Estate District West (S.I.T.E. DW) industrial park in Karachi. A final chapter draws conclusions and suggests a number of activities that could contribute to the environmental sustainability of industrial development.

The chapter on industrial policies observes that until the 1980s development policies were formulated irrespective of environmental considerations. A variety of environment-related acts and ordinances existed, but the Pakistan Environmental Protection Ordinance 1983 (PEPO) was the first attempt to tackle environmental problems systematically. But the monitoring and enforcement capacity foreseen by the Ordinance was inadequate, and the emphasis on penalizing entrepreneurs rather than supporting them in adopting less polluting processes and technologies made the Ordinance unpopular. Capacities for making environmental impact assessments were limited and met strong opposition from business.

The 8th Five Year Plan (1993-1998) was the first to clearly incorporate environmental concerns, and urged that environmental protection be made a key criterion in the selection and development of technologies. The 1993 National Technology Policy takes up this theme, but has not been very effective as capacities still had to be built up and as there was no coordination between key ministries.

Similarly, the various policies that were used to stimulate industry during the 1990s did little to limit pollution. Liberalization, privatization and foreign investment promotion were expected to increase the efficiency of industrial operations, and should therefore in principle have had environmental benefits as well, as they help to reduce waste. But foreign investment has been heavily concentrated in industries such as cement, fertilizer and (petro-)chemicals, which have a high pollution potential, and productivity growth has been highest in potentially heavily polluting industries such as industrial chemicals and other non chemicals. Although hard data are lacking, the large, dynamic small enterprise sector may also be a problem, as such enterprises tend to lack the know-how and resources to limit pollution. Location policy has done little to encourage location away from densely populated areas or to provide environmental facilities for industry concentrations. Scarce credit and badly targeted monetary and fiscal incentives have slowed down investment in modern equipment with a low pollution potential. Pricing policies for water and power have not encouraged efficient resource use.

A comparison of Pakistan to other South and Southeast Asian countries shows that while potentially highly polluting industries have grown in neighbouring countries, this category of industries has in most cases exhibited stronger growth in Pakistan. As a category, the less polluting industries have grown less than in the countries, India and the Philippines excepted. On the positive side, the rapid growth of relatively clean industries like wearing apparel and electrical machinery in Pakistan should be mentioned.

The new Trade Policy 2000 emphasizes a number of export products with low pollution potential, such as textiles and software. This would offer opportunities for the adoption of international environmental standards by export-oriented industries, in the context of the Uruguay

Round agreements, notably the Agreement on Technical Barriers to Trade, which provides for the preparation, adaptation and international harmonization of process and production methods, especially under the standards and regulations specified by ISO 9000 and ISO 14000. Though these standards are voluntary, non-compliance may result in lost markets. Environmentally discerning customers of Pakistani exports will force Pakistan to adopt cleaner production techniques if it is to maintain its market share and the issue of eco-labelling must be addressed.

In summary, coping with the challenges of a globalizing economy will require a coherent industrial strategy. The strategy should be base on a realistic appraisal of Pakistan's (potential) strengths and weaknesses, along with an analysis of the reasons why attempts undertaken during the 1990s to promote more technology-intensive industries have not had a more dynamic effect on the sector. A number of industrial development issues are being addressed. The problem is that this has been done in a piecemeal fashion. An effective strategy requires a coherent approach and full acceptance of the private sector as a partner in the process. The capacities of the relevant Government agencies will have to be improved and cooperation among ministries and institutions will have to be intensified.

The review of environmental policies shows that, while environmental legislation goes a long way back, there have been no effective policies until recently. The problems in implementing PEPO have already been mentioned. The 1997 Pakistan Environmental Protection Act (PEP-Act 1997) takes up the key issues of PEPO and in addition provided for a considerable strengthening of institutions at the national and provincial level for the formulation, execution and enforcement of environmental policies. The previous command-and-control approach to environmental protection was partly replaced by mechanisms that actively involved the business sector in pollution control. Under PEP-Act 1997:

- The existing system of National Environmental Quality Standards (NEQS) was revised, in consultation with the private sector;
- A system for self-monitoring and reporting for industry (SMART) has been developed;
- The system of EIAs was reviewed and new regulations for their implementation were drawn up.

Apart from the adoption of PEP-Act 1997, two major environmental policy initiatives were launched in the1990s: the Pakistan National Conservation Strategy (NCS) and the Environmental Planning and Resource Conservation Project (EPRCP) (a new National Environmental Policy was formulated in 1999, but has not been implemented yet). The major objectives of NCS – improved efficiency in resource use and management, natural resource conservation and sustainable development – were incorporated in the Five Year Plans, and programmes were drawn up for specific issues which provided a basis for provincial environmental action plans. EPRCP among others promoted institution building for and broad-based participation in environmental protection.

These laws and policies have unfortunately not been able to make a major impact on environmental problems. Major constraints to effective environmental protection include:

- Political instability;
- Economic stagnation;
- Lack of progress in institution building;
- A weak environmental information system;
- Lack of awareness in the Government administration, bureaucratic hurdles and lack of political will;
- A weak local government tier;
- Budgetary constraints;
- Underpaid environmental agency staff; and
- Indifference among the majority of industrialists.

The chapter on environmental policy concludes with a number of recommendations:

- Strengthening the regulatory system and the capacity of national and provincial environmental protection agencies (EPAs);
- Ensuring than an effective system for self-monitoring and reporting of pollution by the enterprise sector is put in place;
- A training policy for owners and managers of small and medium-size enterprise;
- The establishment of industrial estates with an integrated environmental management infrastructure;
- Strengthening of local government, especially its capacities for environmental protection;
- Encouraging industry to adopt ISO 14000 certification.

The report then turns to the case studies. The first of these concerns Faisalabad District in the province of Punjab. Key industries include fertilizer, caustic soda, tanneries, cotton spinning, yarn sizing, cloth weaving, cloth processing, hosiery, ready-made garments, sugar and distillery, iron and steel, fabricated metal products, chip/particle board, plywood, paperboard, glass products, plastic and rubber products, soap, matches, beverages, milk processing, maize processing and watches and clocks. The total number of units reported in 1998 was approximately 12,300, out of which approximately 10,530 were in the textile sector, the great majority of them small power loom enterprises. Other major sectors were fabricated metals and food products.

With the exception of one small estate, most industries are located in scattered locations in Faisalabad City and along the major roads in the district. During the period of strong industrial growth in the 1970 and 1980s, plants were located outside the built up area – partly as a consequence of legislation restricting their establishment where proper waste disposal facilities were absent or where they would generally constitute a health hazard – but workers have tended to settle near the factories, establishing large informal settlements where they are exposed to air and water pollution from the plants. Industrial wastewater is discharged into public sewers without prior treatment, and little is done to prevent air pollution. Pollution ranges from nitrogen oxides, fly ash and ammonia gas to a variety of chemical compounds, organic matter and heavy metals. Factory management seems generally unfamiliar with their obligations under environmental laws and in the absence of adequate capacities, little is done to enforce these laws.

In the absence of proper treatment and disposal facilities, there is heavy leaching of polluting substances into ground water. Most people in nearby settlements are unaware of the adverse affects of using this water as drinking water or to irrigate crops. In addition, acute respiratory infections are very common. The Faisalabad case study recommends:

- The establishment of a combined wastewater treatment for the Maqbool Road/Sammundri Road area, where the concentration of industry generates very high levels of pollution;
- A cleaner production programme;
- A land use plan which would encourage re-location of industries to areas where pollution can be handled effectively.

The second study concerns the large S.I.T.E DW industrial estate in the capital Karachi. Karachi accommodates 70 per cent of Pakistan’s industry and is the country’s only port. The city´s environmental infrastructure is inadequate and the industrial sector adds significantly to the problems. As elsewhere, large informal residential areas have developed around industrial areas; many small firms have moved into residential areas because of the shortage of industrial plots. This increases the likelihood of impacts from industrial pollution on the lives and health of workers and their families.

S.I.T.E. DW currently houses over 2,200 registered and unregistered industrial units of various sizes, including textiles, heavy mechanical, beverages, automobiles, silk, oil, soap, foodstuffs, chemicals, pharmaceuticals, steel, glass, cigarettes, paints, filament yarn and ready made garments. Also present in the area are many small spin-off industries, warehouses, offices, etc. S.I.T.E. DW contributes substantially to the economy of the country. It is the largest employer of industrial

workers in the country, employing 400,000 people directly. Some 1.5 million people now live near the estate, most of the in informal settlements.

Among the industries on the estate, 16 per cent come in the more polluting and 59 per cent in the somewhat polluting category. Growth has been strongest in the textile sector, which is also by far the largest industrial sector. The textile sector industries come in the less and somewhat polluting categories; a number have adopted the Oeko-Tex Standard 100 certification which limit the concentration of various chemicals and other substances detrimental to human health in the final product. The textile sector is expected to become a major factor in Pakistan's export drive, an as such can have a positive impact on pollution reduction. Some of the other export-oriented industries on the estate have also taken part in conservation, cleaner production and waste pre-treatment programmes.

Most plants at S.I.T.E. DW, however, do very little about their pollution. Sewage flows through open drains into the Lyari River and out into the Arabian Sea. Very little of this wastewater undergoes any pre-treatment. It is mixed with domestic sewage and solid waste. Only some of it goes to Treatment Plant 1 (TP1) on the banks of the Lyari River. Currently, TP1 works at half of its capacity, apparently because the sewage piping system is inadequate. Sampling of the plant's wastewater discharge shows that removal efficiency is poor. It is however used for irrigation of vegetables and sludge is sold as a soil conditioner. Solid waste collection and disposal is also inadequate. Many plants simply dump remnants and scrap from industrial processes over the boundary wall. The poor solid waste collection and disposal system increases air pollution in the area, clogs drainage channels and encourages the spread of pests and disease.

Marine life near Karachi is badly affected as a consequence of wastewater flows. It has been destroyed in some areas; elsewhere, heavy metal concentrations are found in fish. This means a serious economic loss for coastal fishermen. The proximity of unplanned settlements to polluted streams, the use of industrial and domestic sewage for irrigation and the contamination of river and sea fish all constitute serious health hazards. Air pollution in the area due to gaseous emissions from industries and heavy road traffic can have effects ranging from increased respiratory ailments to increased risk of cancer and other deadly diseases.

The management of the estate is looking into several possibilities of reducing pollution, among others upgrading TP1 and promoting cleaner production initiatives and awareness training. More action in a variety of fields, however, is necessary. The S.I.T.E. DW study concludes by recommending:

- Preparation of an environmental management plan for S.I.T.E. DW as a whole;
- Creation of green belts by plants;
- Recycling and better housekeeping in plants;
- Improvements in water supply;
- Awareness campaigns for workers and residents;
- Better and better maintained drainage and solid waste disposal systems;
- More combined effluent treatment facilities;
- Better reporting and information systems.

The last study focuses on Sheikhupura District, located to the northeast of Lahore. Its industries are spread along the main roads joining Sheikhupura to other main urban centres; however, special zones for industry are now being planned. The 1970s and 1980s saw rapid industrial growth in the district, accompanied by strong growth of residential areas near the factories. The largest number of plants is found in the engineering industries and the textile industries. The 1990s saw rapid growth in the textile sector. Potential heavy polluters like paper, chemicals and iron and steel play a relatively minor role, the whole of the more polluting industry category accounting for only 17.4 per cent of the industrial establishments in 1998. However, the relatively large size of the plants in the more polluting category means that its contribution to pollution is considerable.

Most of the pollution in the district is caused by pulp and paper, chemicals, leather tanneries, metalworking, food processing and textile industries. Some of the waste is biodegradable, but much of it is in the form of chemical compounds. Industries discharge effluent containing hydrochloric acid and high levels of organic matter into drains and streams discharging into the Ravi River. Only a few units are treating effluents. Industrial growth has also led to increased solid waste disposal problems, and air pollution is a rapidly growing problem.

Due to data problems it was not possible to clearly indicate which category of local inhabitants is more affected by pollution and which diseases are more common to factory workers than the population in general. Different manufacturing units generate different types of pollutants; hence, their impact on the health will also be different. However, it is clear that acute respiratory disease is more common to the people of Sheikhupura District than elsewhere.

In order to reduce the environmental impacts of industry in the district, the Sheikhupura study recommends:

- Providing knowledge and technology for plant-level and common effluent treatment facilities to encourage industries to reduce pollution, especially the major polluters;
- A uniform reporting system for industrial activities and health facilities;
- Training of staff for monitoring and effective implementation of NEQS through the SMART program;
- Removing financial and capacity constraints of regulatory agencies;
- Improving air and water pollution prevention and resource conservation know-how in industry, and the SME sector in particular;
- Adoption of in-plant control measures by industry;
- A greater role for local research and development institutions in effluent treatment.

The final chapter concludes that the environmental costs of the industrial sector in Pakistan so far remain moderate but are growing steadily. A very large proportion, of the Pakistan manufacturing sector consists of small and medium enterprises (SMEs), accounting for a major portion of industrial pollution, and most of these lack much of the skills and the resources which would enable them to produce more efficiently and minimize their impact on the environment. Industrial and environmental policies should therefore pay special attention to this sector, and government agencies directly associated with the SMEs and affected local government units should work more closely with each other and with the provincial authorities to address this growing problem.

To change the composition of the manufacturing sector progressively toward a less polluting mix and improve the efficiency and quality of processes used, there is a need for a clear national industrial policy which incorporates environmental objectives on a par with the more conventional economic objectives. The “environmental” objectives of sustainability of natural resources and protection of public health are also economic objectives, equally important to the long-term economic viability and competitiveness of a nation.

To minimize the impact of industrial development on the environment, action is urgently needed in a number of specific areas. In order to maximize the effectiveness of these and the many related efforts, however, they must be viewed and coordinated within a national vision and plan for the achievement of cleaner production. The key components of a comprehensive national program should include:

- Improved collection and access to information – for all sectors of society – on the environmental conditions, ecological and health costs of industrial development;
- A system of standards which is more sensitive to actual ambient conditions and different cost structures;
- Better monitoring capacities, in terms of manpower and equipment;

- A comprehensive programme of economic instruments to complement environmental regulations;
- Integration of environmental concerns in economic and spatial planning;
- Building up local enforcement capacities, with emphasis on citizen involvement and peer pressure;
- A coherent programme for industrial estates, improving the environmental infrastructure in existing ones and creating next ones in appropriate locations with a fully integrated environmental infrastructure.
- Promotion of corporate responsibility.
- Establishment of centers for environmental management.

1. INTRODUCTION

While industrial growth is mainly a function of market forces, governments actively pursue policies and activities to accelerate industrialization. These policies, directly and indirectly, affect the natural environment. Sound industrial and environmental policies are not incompatible, even though it is a difficult task either to set (and enforce) environmental standards that do not have some negative impact on industrial development options, or to formulate industrial policies that take environmental issues fully into account.

Optimizing welfare (i.e., development which attains economic, social and environmental objectives) therefore requires studying the relationship between industrial policies and (potential) industrial pollution. In this context, the extent to which environmental policies and management have prevented or mitigated pollution resulting from the chosen industrial policies is an important question to be addressed.

The objective of this study is to examine these issues in order to understand better the relationship between the industrial and environmental policies of Pakistan, and to be able thereby to recommend policy measures that could optimize economic benefits with reduced environmental damage. Although there are other important areas of concern with respect to environmental goals, the study focuses on those industrial policies and environmental policies that relate to industrial activities. It is thus not intended to be a comprehensive study of environmental management and policy in Pakistan.

Five documents were prepared as background material for this report. The first two provide a review of Pakistan industrial and environmental policies as they have affected industrial activities over the past twenty years, with the aim of assessing their net impacts on the environment. The next three documents describe the industrialization process in three selected industrial areas: Faisalabad, Karachi and Sheikhupura. The case studies document the changing nature and type of industrialization that has occurred, the implementation of environmental regulations and related changes in environmental quality.

The findings and observations are used to formulate recommendations for improving environmental and industrial policies to mitigate the pollution potential of accelerated industrial growth. This report summarizes and integrates the findings of the five background documents, supplements those documents as needed, and adds conclusions and recommendations as appropriate.

2. SOURCES OF STRESS ON THE ENVIRONMENT

Pakistan's north and south are connected through two major corridors, one on the right bank of river Indus and the other on left bank. The right bank corridor, called Indus Super Highway, mostly passes through hilly terrain and the left bank corridor is called Grand Trunk Road (GT-road) or the National Highway. Most of the major urban centers are situated on GT-road, and almost 80 per cent of industrial growth has occurred in these major cities, e.g., Karachi, Hyderabad, Multan, Lahore, Gujranwala, Rawalpindi and Peshawar. Other cities, e.g., Faisalabad, Sialkot and Kasur, which are of industrial importance, are connected to GT-road through link roads. The only significant industrial complex that is of importance in Balochistan is the Hub area immediately adjacent to Karachi. All of these major urban centers are located on riverbanks. Most of the industrial development that has taken place does not have adequate controls for emissions. This contributes to urban air pollution problems. At the same time untreated industrial effluents are discharged to the rivers and other streams. The river network is such that all these highly toxic chemical discharges eventually reach the Arabian Sea and all the coastal waters in close vicinity of the Indus Delta and Karachi are heavily polluted.

Pakistan is facing environmental problems of both green and brown nature. The green issues mainly include environmental problems of irrigated agriculture, rain-fed agriculture, forests, and rangelands. Each system is characterized by different resource management and conservation

problems. In irrigated agriculture, water logging and salinity dominate the environmental agenda. Although water logging has receded, salinity has become more acute, a result of increased tapping of brackish groundwater for irrigation. Mining of soil nutrients also threatens the sustainability of irrigated areas, and runoff from fields where agricultural fertilizers and pesticides are used indiscriminately and inappropriately has contaminated ground water and surface water.

Pakistan's brown environmental problems are categorized in five main groups – industrial wastewater pollution, domestic wastewater pollution, motor vehicle emissions, urban and industrial air pollution, and marine and coastal zone pollution. Although data are scarce, it is clear that industrial pollution is not only increasing at a very rapid pace, but also that the health and productivity impacts are significant and worsening.

Most Pakistani industries, located around major cities, are increasingly polluting streams, rivers and the Arabian Sea through untreated toxic waste. Major industrial contributors to the pollution are the pulp and paper, chemicals, petrochemicals, refining, metalworking, food processing, and textile industries. Some of the waste is biodegradable, but much of it is in the form of chemical compounds that do not degrade and cause damage to environment. The industrial pollution discharges combined with mangrove destruction and over fishing have resulted in a sharp decrease in shrimp production, which translates into lower foreign exchange earnings.

In Karachi alone more than 6,000 industrial enterprises, some 60 per cent of the country's industry, are located along the coastal belt. With the exception of only a few units, most of the industries discharge their untreated effluent containing heavy metals and their compounds, detergents, lubricating oils, chlorine and various organic and inorganic toxic compounds into the sewers or directly into the Lyari River, the Malir River, and adjacent creeks leading to the Arabian Sea.

In North West Frontier Province (NWFP), industrial units mainly cluster around Peshawar such as Jamrud Industrial Estate and industrial clusters on Kohat road and Charsadda road. Out of 40 major units, only two have wastewater treatment facilities while others discharge their effluent into lakes and tributaries of the Indus River, mainly the Kabul River.

In Punjab too, the industries located in Lahore and Kala-Shah-Kaku Industrial Estate, including chemical industries, tanneries, textile plants, steel re-rolling mills and others, discharge effluent containing hydrochloric acid and high levels of organic matter into drains and streams discharging into the Ravi River. In addition, the small and medium-scale enterprise (SME) sector, particularly industries in two triangles Lahore-Sheikhupura-Faisalabad and Lahore-Gujranwala-Sialkot, generate a significant pollution load that also finds its way to the streams. More than 250 industrial units in Faisalabad discharge high levels of solids, heavy metals, aromatic dyes, inorganic salts, and organic materials directly into the municipal sewers and open-surface drains, ultimately leading to Ravi River. Discharge from the industries in Sialkot area generally reaches the Chenab River, while from Kasur, where the major tanneries of Pakistan are located, it is disposed off through the Pandoki drain into the Sutlej River. Ground water pollution is often permanent, in that it may take hundreds or even thousands of years for pollutants such as toxic metals from tanneries to be flushed out of a contaminated aquifer.

Unfortunately, systematic and comprehensive data on the discharge of water pollutants by industrial sources do not exist. The best overview that was available for use in this study dates from 1988 and covers only a handful of industrial establishments in several areas in Pakistan (Table 2.1). If the data are to be believed, most all of the units were discharging wastewater that would have been in violation of the recently issued National Environmental Quality Standards (NEQS) for Suspended Solids (SS) and Biological Oxygen Demand (BOD).

Table 2.1: Water Pollutant Effluents From Industry of Pakistan

Sr. No.	Name of The Industry	pH Value	SS mg/l	BOD mg/l	lbs. BOD per day
	NEQS	6-10	150	80	None
	KARACHI				
1	Ahmed Food Industries	6.0	220	1780	20
2	A.G. Fisheries	7.3	4420	11080	-
3	Burma Oil Mills	7.6	1160	4300	9270
4	Adamjee Textile Mills	10.3	1390	5530	750
5	Dadabhoy Paper Mills	7.0	10	130	1930
6	Karachi Tannery	4.1	1140	6780	60
7	Indus Alkalies	9.2	3560	2240	-
8	Buxley paints Ltd.	2.1	10	8080	-
9	Karachi Shipyard	2.1	290	30	-
10	Javedan Cement	6.3	7740	50	-
	MULTAN				
1	Pak Arab Fertilizer Limited	8.3	2200	250	5280
2	Shaikh Fazal Rehman and Sons	6.8	470	600	7210
3	Khawaja Tanneries	7.9	3800	470	90
4	Alpha Industries	10.5	3380	530	30
5	Colony Textile Mills	8.0	610	230	6650
	FAISALABAD				
1	The Lyallpur Dairy Farm	5.1	3140	1790	360
2	Army Welfare Fodd Industries	7.6	690	260	900
3	Crescent Sugar Mills Distillery	3.8	2980	1300	3100
4	The Lyallpur Chemical & Fertilizer Ltd.	3.9	560	30	80
5	Crescent Textile Mills	7.4	280	510	2000
	KALA SHAH KAKU				
1	Kohnoor Oil Mills	8.0	680	530	11400
2	Ravi Rayon Mills Ltd.	5.8	900	830	4870
3	National/W. Pakistan Tanneries	6.7	1970	590	1410
4	Ittehad Chemicals	9.0	150	290	3950
5	Lasani Steel Mills	7.8	50	190	20
6	Govt. Weaving and Finishing Center, Shahdara	7.8	1720	450	300
7	P. Leiner & Sons Chemical and Food (Pak) Ltd.	6.5	1600	390	4200
	PESHAWAR				
1	Sarhad Fruit and Vegetable Products	6.9	430	510	-
2	Khazana Sugar Mills	6.7	960	30	640
3	Makk Beverage & Mineral Waters	8.7	390	50	260
4	New Frontier Punjab Tanneries	6.1	4060	770	8790

	NOWSHERA				
1	Associated Industries Ltd.	7.5	840	140	2400
2	Colony Sarhad Textile Mills	11.7	5830	480	480
3	Adamjee Paper and Board Mills	6.7	21100	930	34900
4	Sarhad Development Authority Leather Factory	7.6	1690	840	10
5	Adamjee Chemical Industries	2.0	4040	1020	7660

Source: "Environmental Profile of Pakistan".Prepared by Government of Pakistan (Environment & Urban Affairs Division), Islamabad and reprinted by USAID in December 1988.

Table 2.2 indicates toxic substance concentrations in effluent from a sample of industries in Karachi.

Table 2.2: Toxic Substance Concentrations in Effluent from Industries in Karachi

INDUSTRY	COPPER	CADMIUM	ZINC	NICKLE	LEAD
	(milligrams per liter)				
Suggested Standards*	1.000	0.100	5.000	1.000	0.500
Food Processing	0.430	0.028	0.024	0.270	0.320
Oil Mills	0.027	0.028	2.187	0.648	0.480
Beverage	0.090	0.035	2.060	0.407	0.035
Textile	0.020	0.045	5.320	0.514	1.800
	0.300	0.153	7.000	1.142	0.660
Tannery	0.138	0.028	0.220	1.180	
Chemical Alkali					
Paint Manufacture	0.065	0.940	0.480	0.203	3.880
Karachi Shipyard	0.280	0.100	1,342.500	0.740	11.750
Cement	0.330	0.330	2.660	1.000	0.790

Source: Nature, Power, People: Citizens' Report on Sustainable Development, 1995 by SDPI Based on EC report to E&UAD

Water quality in Pakistan is generally poor and is believed to have worsened dramatically because of pollution from industrial, municipal, and agricultural sources. A recent survey by the Environmental Protection Division, Government of Punjab, revealed that, even under the WHO's relaxed guidelines, water from 10 of the 11 surface sample and 2 of the 4 ground water samples was chemically unfit for human consumption.

The primary emission sources relating to both consumption and production of energy are vehicles, industries and oil and coal fired power plants, brick kilns, household fuel consumption and agriculture. The key factors contributing to increasing air pollution are lack of awareness about potential health impacts, rapid population growth, the high rate of urbanization, an inefficient and diesel based private transport system and institutional failure in implementing NEQS.

The discharge of air pollutants has increased significantly over the past 20 years as can be seen in Table 2.3. Looking at the industrial sector alone, the emissions of CO_2 increased by a factor of four and emissions from the industrial sector now account for about one-third of total CO_2 emissions the country. Emissions of SO_2 from the industrial sector increased by a factor of 500 over the same period and now account for about one-half of the total SO_2 emissions in the country.

Table 2.3: Estimated Air Pollutants by Sector

(Thousand)

SECTOR	1977/78			1987/88			1997/98		
	CO_2	SO_2	NO_X	CO_2	SO_2	NO_X	CO_2	SO_2	NO_X
Industry	12,300	19	N.A.	26,700	423	N.A.	53,400	982	N.A.
Transport	7, 100	52	N.A.	10,300	57	N.A.	19,000	105	N.A.
Power	3,600	4	3	11,200	95	10	53,100	996	76
Domestic	16,600	5	N.A.	24,100	16	N.A.	40,000	40	N.A.
Agriculture	850	5	N.A.	4,500	28	N.A.	6,400	40	N.A.
Commercial	1,700	11	N.A.	2,600	13	N.A.	4,300	25	N.A.
	42,150	96	3	79,400	632	10	176,200	2,188	76

Source: *NCS Sector Paper on Energy* *Note:* *N.A.: not applicable*

Mobile sources alone contribute significantly to the degradation of ambient air quality. In this category, diesel vehicles emit 2.8 times more SO_2 and 5.8 times more suspended particulate matter (SPM) over the same distance as gasoline engines. The vehicle fleet is increasing at the rate of 10 per cent a year, the increase being concentrated in urban areas[1]. As a result, the emission loads per kilometer traveled are high, reflecting high vehicle densities and low speeds. In Lahore city vehicles are the dominant emissions source, contributing about 96 per cent of CO_2, 76 per cent NO_2 and 28 per cent of SPM[2].

Traditionally air pollution was considered to be an urban phenomenon. More recently, with the expansion of industry in the rural areas, penetration of transport into rural areas, and the growth of brick kilns, air pollution is fast becoming a rural problem as well. In addition, rural areas are turned increasingly into peri-urban areas and it would be difficult to find an uninhabited stretch of more than five miles along the GT-road between Lahore and Islamabad. To all intents and purposes, such areas have become urbanized, with the attendant environmental problems.

Data about the ambient impact of industrial and other source emissions in Pakistan are scarce. The most recent published data show high levels of air pollutants, usually exceeding WHO standards, around industrial complexes in three areas of the country (Table 2.4).

Table 2.4 : Ambient Air Pollution Data

	Site	**Ozone ppb**	**SO_2 Ppb**	**CO_2 Ppm**	**NO_2 ppb**	**Nox Ppb**	**Meth ppm**	**NMETH ppm**	**PM10 mg/m³**	**TSP mg/m³**
Lahore (June 1996)	Road Side	39.2	4.2	3.8	13.5	43.5	3.6	0.3	465	780
	Residential	27.4	2.3	2.1	7.4	21.3	4.7	0.1	210	470
	Industrial	34.4	3.1	2.7	11.4	24.5	4.1	0.2	290	585
	Sub- urban/rural	31.2	1.6	0.9	5.2	8.9	4.3	0.1	260	440
Faisalabad (August 1996)	Road Side	31.6	6.8	2.9	8.2	38.9	4.1	0.3	490	870
	Residential	22.2	4.2	2.0	6.3	17.3	3.6	0.1	330	560
	Industrial	26.7	5.5	3.0	7.1	30.2	3.3	0.2	440	685
	Sub-urban/rural	24.3	2.3	0.9	5.6	8.1	4.8	0.1	185	290
D.G. Khan (December 1996)	Road Side	19.7	2.6	1.4	5.7	14.5	2.8	0.2	750	1240
	Residential	16.9	2.1	1.2	4.5	12.6	2.1	0.1	413	810
	Sub-urban/rural	18.0	1.2	0.6	3.6	7.1	3.6	0.1	790	1350

Source: Federal Bureau of Statistics – 1999, Compendium on Environmental Statistics of Pakistan 1998, Islamabad

Table 2.5 summarizes the information on industrial pollution by sector and location. The bulk of the industrial production is in cotton and textile products, although leather, cement, paper and

[1] World Bank report by Mr. Bouzaher, 1998

[2] Sustainable Policy Development Institute (SDPI): "Nature, Power, People: Citizen Report on Sustainable Development", Islamabad, 1995

board and chemicals have also grown quite steadily. In 1970-71, 62 per cent of the industrial value added came from three groups: textile, tobacco, and food and beverages. By 1990-91, this share had fallen to below 50 per cent, while chemicals, petroleum products, and machinery contributed over 40 per cent.

Table 2.5: Major Industries of Pakistan Identified with Type of Potential Pollutants

Major Sectors	Location	Potential Pollutants
Chemicals	Karachi, Lahore	Sulfuric and Nitric Acids, Ammonia, Fluorocarbons
Pesticides	Karachi, Lahore	Organohalogens, Organophosphates, other toxic organic, Arsenic
Textiles	Karachi, Lahore, Faisalabad	Hydrochloric, Sulfuric acids, High BOD (organic content), dyes, various organic chemicals and detergents.
Pharmaceuticals	Karachi,Lahore, Quetta	Ammonia, Acids, Zinc
Leather Tanning	Karachi,Lahore, Sialkot, Kasur	Heavy Metals (Chromium, etc.), various organic chemicals, acids, high BOD.
Food Processing	Karachi, Lahore, Quetta, Peshawar	Ammonia, Sulfur dioxide
Cement	Karachi, Lahore, Peshawar	Alkaline, limestone dust
Electrical/Electronics	Karachi, Lahore, Gujranwala, Gujrat	Fluorocarbons, heavy metals (cadmium, nickel, selenium)
Glass/Ceramics	Karachi, Lahore, Peshawar	Arsenic, Fluorine
Petroleum Refining	Karachi, Multan, Rawalpindi	Phenols, sulfides, oily residues, ammonia
Pulp and Paper Board	Karachi, Lahore	Merceptans (organic sulfides), high BOD, and organic solids, mercury

Source: "National Environmental Policy of Pakistan, June 1999".

3. INDUSTRIAL POLICY, INDUSTRIAL GROWTH AND THE ENVIRONMENT

3.1 Introduction

The various ways in which the public sector has an impact industrial development can be categorized under three headings:

- Laws, regulations and policies which have a direct or indirect impact on economic exchanges;
- Modification of the price system through taxes, tariffs and subsidies; and
- Provision of goods and services, ranging from steel and electricity to investment promotion and R&D.

The trend in recent decades has been for the government to move out of the last category, especially the involvement in the production of goods and services which can be profitably undertaken by the private sector, to limit the role of fiscal and financial instruments which may distort competition and to liberalize economic policies while at the same time taking better account of the environmental consequences of economic development. This trend is reflected in Pakistan. Public sector intervention has an impact on different aspects of industrial development. The most important of these are:

- Overall growth;
- Sectoral composition;
- Technological change;
- Industrial location; and
- Enterprise scale.

These in turn have impacts on the environment. Pakistan's policy makers are increasingly aware of the direct or indirect environmental consequences of policies, measures affecting the price system and the provision of public goods.

Since the 1980s a number of policy statements and regulations have been adopted to tackle the issue. But the creation of a coherent set of policies and regulations that are properly targeted to ensure both industrial growth and environmental sustainability, supported by all relevant ministries and backed up by an effective monitoring and enforcement system, remains a great challenge. In addition, international cooperation should ideally be an element in policies that have an environmental impact beyond a country's political borders. In this respect, policy making in Pakistan still has a long way to go.

Policies, measures affecting the pricing system and the provision of public goods will be discussed in more detail in the sections that follow. A brief summary of the impact of government intervention is given in Table 3.1. The actual causal link between government action and the different aspects of industrial development has not been studied empirically in all cases and periods, and the values assigned are therefore sometimes tentative.

The analysis that follows will primarily attempt to identify the environmental consequences. In addition, trends in manufacturing and their environmental consequences will be compared to other countries in South and Southeast Asia.

Table 3.1: Impacts of Government Intervention on Industrial Development and the Environment in Pakistan

Period	Impact on industrial development					Environment Impact
	Overall growth	Sectoral composition	Technology Change	Enterprise scale	Location	
1940s-1960s	+	+	?	?	?	-
1970s	-	+	?	-	-	-
1980s	+	+	-	+	-	-
1990s	-	+	+	+	-	+

Note: + = positive or improvement in comparison to previous period; - = negative or deterioration in comparison to previous period. Sectoral composition: general shift towards more capital-intensive industries. Enterprise scale: differentiation through SME growth.

3.2 Earlier Industrial Policies and the Environment

Pakistan's industrial development has been characterized by repeated shifts of emphasis between private sector initiative and public sector intervention. Import substitution and export promotion policies were used in early years to develop an industrial base in the country. The private sector took the lead in industrial development. Instruments supporting industry included exchange rate policy, financial incentives, tariffs, quantitative and non-quantitative controls. The sector grew at an annual average of 9 per cent, the industries that produced capital and intermediate goods exhibiting strong growth from the mid-1950s onwards. By 1965 Pakistan's manufacturing exports were greater than those of S. Korea, Turkey, Thailand and Indonesia combined. However, this growth led to a concentration of industrial power and an inequitable distribution of resources, both among population groups and spatially.

Changes in government resulted in an emphasis on public-sector led development in the 1970s, during which industrial growth decreased to 3 per cent. In the 1980s, the government embarked on a programme of partial de-regulation and economic liberalization, resulting in an annual average growth rate of over 7.6 per cent. A number of agro-based industries were de-nationalized and institutional reforms were initiated to attempt to make the industrial sector more efficient as well as to stimulate exports of higher value added products. In the 6th Five Year Plan (1983-88), export-led industrialization was for the first time an explicit policy goal for which various incentives were provided. At the same time the government continued with its policy of selective import substitution and employed quotas and tariffs to shore up the balance of payments, generate revenues and maintain some degree of influence on the pace and pattern of industrial development. There was also an attempt to move to the higher stages of import substitution, with devaluation to support the process – higher import prices were expected to stimulate backward linkages with producers of inputs and factory equipment.

Until the 1980s development policies were formulated irrespective of environmental considerations. A variety of environment-related acts and ordinances existed, but the Pakistan Environmental Protection Ordinance 1983 (PEPO) was the first attempt to tackle environmental problems systematically (see Chapter 4). It created a legal basis for comprehensive environmental policy making, the establishment and enforcement of standards, environmental impact assessments and the inclusion of environmental considerations in development policies. But the monitoring and enforcement capacity foreseen by the Ordinance was inadequate, and the emphasis on penalizing entrepreneurs rather than supporting them in adopting less polluting processes and technologies made the Ordinance unpopular. Similarly, the instrument of environmental impact assessments does not appear to have been effective, as capacities for making the assessments were limited and there was strong opposition from business to the long drawn-out process.

Industrial policy and environmental policy not only remained unrelated – they were also unsuccessful. In spite of the efforts, industrial growth in Pakistan fell behind the countries mentioned above. Protectionism had resulted in an inefficient manufacturing sector. A 1991 study stated that, on average, it takes more that three times as much to produce final output domestically as to produce it

abroad[3]. Looking back, the 1992 National Conservation Strategy points to energy prices (which) have not reflected the scarcity of resources, leading to wasteful habits and detrimental technologies and the lack of policies to encourage sound natural resource use and to penalize polluters. The setting for the policy initiatives of the 1990s was therefore not a promising one.

3.3 Recent Industry-related Policies and the Environment

3.3.1 General Industrial Policy Trends in the 1990s

Industrial policy objectives of the early 1990s were employment generation, dispersal of industries, SME development and promotion of key industries (biotechnology, fibre optics, solar energy equipment, computers and software, electronic equipment and fertilizers). A more liberal business climate prevailed, but – in spite of repeated policy statements on these issues in earlier years- there was no serious, systematic attempt at export orientation or regional development yet; and with the possible exception of fertilizer, the country had no clear comparative advantage in the major industries targeted. It has also been argued that the incentives were biased toward new firms. Apart from stimulating unviable activities, this has had a negative impact on the modernization and acquisition of new environmentally friendly technology in existing firms. This bias is now disappearing.

The objective of the 8th Five Year Plan (1993-1998) for the industrial sector was to increase its competitiveness by adopting an outward looking strategy, liberalizing the economy, privatising industries and promoting technological innovation and productivity growth. Its text incorporates all salient features of the National Conservation Strategy (NCS – see below) and it stated that:

> "…environmental problems that have arisen due to unintended side effects of development would be addressed through proper environmental planning. The emphasis would be on controlling and correcting industrial discharge of residues and wastes, handling of toxic chemicals, etc... Environmental protection will be one of the key criteria in the selection and development of technology".

The Plan expressed strong concern about the heavy concentration of industries and commits itself to improving the spatial balance of industrial location through, among others, estates and EPAs – which in principle would also increase the possibilities to tackle industrial pollution in an organized way.

The 1997 statement on Industrial Policy and its Objectives was intended to give a boost to liberalization and the outward-looking strategy and to provide a set of incentives for the sector, suffering from a downturn after the sustained growth of the 1980s. But new incentives offered no solution to the underlying structural problems of an industrial sector where many enterprises are not internationally competitive; and the continued tension between Pakistan and India has led to a decline in investor confidence which the policy measures have not been able to revert so far.

3.3.2 Investment and Privatisation Policies

The promotion of domestic and foreign private investment is a core element of Pakistan's industrial policy. The Deletion Programme, which drastically reduced the number of industries controlled by the public sector, has resulted in some investment in pollution reduction and energy saving products by the private sector, such as an increase in the construction of water treatment plants and the production of energy saving lamps.

The Investment Policy of 1997 provides fiscal incentives such as accelerated capital depreciation for value added and export industries, electronics, priority sectors including engineering, edible oils, hybrid seeds, chemicals and petro-chemicals, and agro-based industries, and other tax

[3] *A.R. Kemal, Protectionism and Efficiency in Manufacturing, a Case Study of Pakistan, ICEG/PIDE*

concessions. Further incentives provided to attract foreign direct investment include permission for full foreign ownership and repatriation of profits, and removal of sanctioning requirements except for arms and ammunitions, high explosives, radioactive substances and currency printing. The Policy has had limited success. This is partly due to factors mentioned in Section 3.3.1. In addition, one should mention the perception of foreign investors that declared policies do not reflect actual practice and shortcomings in the field of physical infrastructure, labour skills and governance.

Table 3.2 shows foreign direct investment by economic and industrial subgroups[a]. After peaking in 1995-96, with US$ 1.1 billion, investment has decreased and most of the recent investment has been in power and financial services rather than manufacturing. Within industry, the potentially highly polluting cement, (petro-) chemical and fertilizer industries have attracted much of the foreign investment, although investor interest in cement decreased after 1997.

Table 3.2: Inflow of Foreign Direct Investment by Industrial Subsector (US$Million)

Economic Group	1996-97	1997-98	1998-99
Power	244.8	239.5	131.4
Construction	14.5	21.5	8.3
Mining & Quarrying _ Oil Exploration	37.7	99.1	69.2
Financial Business	106.5	20.4	11.3
Trade	0	12.6	5.5
Industry			
Electrical Machinery	4.1	8.7	1.9
Chemical, Pharmaceutical and Fertilizer	51.7	72.1	54.1
Food, Beverages and Tobacco	51.5	19.1	7.4
Textile	12.4	27.3	1.7
Transport and Storage	6.4	10.2	11.9
Machinery other than Electrical	2.0	-	0.9
Electronics	0.0	2.7	1.2
Petro-chemical and Refining	1.5	1.6	38.8
Tourism	7.4	5.7	-
Cement	49.4	3.0	2.0
Others	92.2	57.8	30.4
Total	682.1	601.3	376.0

[a] Figures for the fiscal year 1999-2000 up to Jan. 2000.
Source: Board of Investment

The process of privatisation began in the 1990 with the establishment of the Disinvestment and Deregulation Committee, later replaced by the Privatisation Commission. A total of 103 state-owned units have been privatised since then and by the late 1990s, the share of the public sector in total industrial investment had fallen below 10 per cent. At the time of writing, 43 industrial enterprises remained in the public sector. Among these are a number of major machinery, automobile, cement, steel and food processing industries in addition to some joint ventures with foreign firms.

The early process was marked by scandals resulting from a lack of transparency in the privatisation procedure, favouritism and “capital cronyism”. Many of these allegations are credible especially in the light of the many instances of asset stripping by the new management or wilful defaults on counter-guarantee conditions with public sector financial institutions. Over recent years, there have been concerted efforts to improve transparency.

It has been observed that an efficiency levels across industries are independent of the locus of ownership[4]. Some economists have pointed to the absence of a systematic approach to the timing,

[a] subsectoral breakdown for foreign direct investment was only available since 1996.

[4] A. R. Kemal, “Recent Developments in the Manufacturing Sector of Pakistan”(1993, p.54), Aian Development Bank.

privatisation, sequencing, classification of unit valuation and modes of privatisation. Naqvi and Kemal in their assessment of the degree to which privatisation yielded economic benefits found that in most cases a decrease in the productivity of the privatisation concerns was accompanied by a price rise. Efficiency had not necessarily improved. The cement plants are now operating below full capacity and have hiked up prices. One positive point, in the fertilizer sector, is the higher environmental consciousness of the private enterprises relative to their public sector counterparts (information confirmed by ETPI, see text box 1). But the efficiency benefits of privatisation which should in principle also be environmental benefits can only be achieved through transparent, judicious investment and appropriate regulation.

Text Box 1

Public vs. Private sector ownership _ The Fertilizer sector example

There are ten fertilizer producing units operating in the country. Production has increased by 4.8 per cent during the previous fiscal year. The plants in the private sector, unlike those which are under Federal government control, have made some impressive investments in environmentally friendly technologies (both end-of pipe and in-house) as well as monitoring systems. This is partly a result of changes in the structural environment of the fertilizer industry as a whole: the prices of major inputs utilized by the fertilizer sector, notably natural gas have increased over the years (the fertilizer industry consumes some 55 per cent of total gas used by the manufacturing sector). Subsidies provided by the government have also been steadily removed over the years.

One state-owned fertilizer unit has been privatized during the 1990s (Pak China Fertilizer) while another major fertilizer unit (Engro) was divested from its parent company (Exxo) a few years back. The experience of both is indicative of the future path for the privatization of the remaining state owned fertilizer units. Pak China was privatized in 1993 and handed over to the Schon Group which because of recurring management problems was eventually forced to shut it down. Since then the unit has been under the control of the National Fertilizer Corporation. In contrast Engro was divested through a management-buy-out (MBO) and the company has built itself up into an efficient profit making concern. Furthermore, as opposed to nationally owned fertilizer units, Engro and Fauji Fertilizer (another private concern) have had excellent records in terms of investments in environmentally friendly in-house and end-of-pipe pollution abatement technology. Aside from the fact that both are in the private sector and hence are subject to pressure from the competitive dynamics of the market place, both units have also been receiving funding from the International Finance Corporation (IFC) which usually incorporates an environmental component in its credit / loan disbursements. A point of interest is of course that the MBO of Engro was facilitated by the IFC.

3.3.3 Trade Policy and Tariffs

The earlier protectionist industrial policy, it is argued, resulted in high effective rates of protection and also afforded the industries in question breathing space necessary to grow without the threat of international competition. Furthermore the overvalued exchange rate resulted in cheap inputs and intermediate goods for industries which were heavily dependent upon imported inputs. But this very protection, according to some economists, that led to an inefficient, wasteful and hence inherently problematic industrial structure characterized by high domestic resource costs and environmental costs, overcapitalisation and industrial concentration. The pattern is now reversing as trade is liberalized.

Trade liberalization under the successive structural adjustment programs involved the gradual replacement of Non Tariff Barriers (NTBs) with tariffs, phasing out of all tariff exemptions and concessions including statutory regulatory orders and cascading the tariff structure. The maximum tariff rate was reduced from 125 per cent in 1988 to 35 per cent in 1998 and the number of slabs (steps) was reduced to four. This included the internalisation of para-tariffs such as the import fee, “iqra” (education) surcharge and flood relief fund. Simultaneously, greater export incentives such as duty free input status for exporters, soft export credit, export houses and export-processing zones were provided in order to encourage export led growth.

The Trade Policy 2000, introduced in June 2000, is intended to dismantle many trade restrictions and simplify remaining regulations, both on formal sector import-export activities and on “suitcase trade”; the latter is of considerable importance for the small-scale sector and in trade

relations with Afghanistan and Central Asia. The new policy emphasizes textiles and non-traditional exports, some of which, such as software, have a low pollution potential (but chemicals are also included and procedures for imports of ozone-depleting substances have been simplified). It foresees increased support to the introduction of quality standards and skills development to help boost export industries. The textile sector will receive special attention to be able to face the challenges of international competition in a quota-free world by 2005.

Trade policies should be brought in line with international environmental standards. In the context of the Uruguay Round agreements, the Agreement on Technical Barriers to Trade (the TBT Agreement) provides for the preparation, adaptation and international harmonization of process and production methods, especially under the standards and regulations specified by ISO 9000 and ISO 14000. Though these standards are voluntary, non-compliance may result in lost markets. Customers in the first world – and OECD countries account for about 60 per cent of Pakistan's exports – are becoming increasingly sensitive to the environmental consequences of production. In 1994, for example, the US banned imports of surgical goods from Pakistan because of inadequate product quality assurances and certification. The issue of eco-labelling must therefore be addressed as well. Environmentally discerning customers of Pakistani export will force Pakistan to adopt cleaner production techniques if it is to maintain its market share.

Export promotion could, in short, have significant positive impacts on environmentally friendly manufacturing. This is already noticeable within industry branches. For instance, export oriented textile firms in Pakistan are mostly ISO 9000 certified and use relatively more environmentally friendly production techniques than their counterparts who focus only on the domestic market (information confirmed by ETPI environmental auditors). The importance of this sector is underlined by the fact that, in 1998, textiles and clothing accounted for more than 60 per cent of Pakistan's manufactured exports and about two-thirds of all exports.

Although it has contributed little to technological progress, Pakistan's tariff structure has always provided incentives for the import of machinery. Because of low environmental awareness, most imported technologies caused environmental damage; at best, they did not incorporate modern environmental standards. Capital import schemes, for example, were used to import second hand machinery – though even without such schemes, the price incentive is often enough to lure industrialists. Controls have now been placed on the import of most second hand machinery due to its inherent technological lag, but exemptions are often made. It would probably make economic sense not to ban import of second hand machinery completely but to strengthen the monitoring institutions which ascertain the machinery's working capacity and life.

3.3.4 SME Promotion

The vital role of SMEs as generators of employment and income, and as a force in domestic and export markets, has been recognized by successive governments in recent years. SME promotion is a key element in the new economic policy announced at the end of 1999. An important objective is to increase competitiveness by the adoption of international standards and quality requirements, which again should help to reduce the environmental impact of the sector. There is a need for localized, communal solutions to the sector's environmental problems. Cluster councils and cluster parks have been suggested by the GoP in recent years and could make a useful contribution here, but the policy suggestion still needs to be implemented.

A variety of SME support mechanisms have been put in place, culminating in the establishment of the Small and Medium Scale Enterprise Development Authority (SMEDA) in 1998. With an appropriate policy environment, SME development could make a major contribution to the decentralization of industry (see Section 3.3.6), with potential beneficial environmental effects. Provincial governments outside Pakistan´s economic heartland, such as the Northwest Frontier Province, are keen to support SME development. Moving small industries to different locations is not recommended as it could hurt cluster development.

3.3.5 Technology Policy

Apart from giving a lead role to the private sector, a major element of the 1993 National Technology Policy is the promotion of technologies for environmental sustainability. The technology drive would be based on both the development of domestic technological capacities and the facilitation of technology transfers through imports and foreign investments. Public R&D institutions would be made more autonomous and research was to be based on market demand for technological innovations. The creation of science parks that would allow productive networking among firms and scientists was to be encouraged. Regulations governing the terms and conditions for the payment of royalties and fees for technological transfers were simplified.

Although bureaucratic obstacles to the acquisition of foreign technologies have to a large extent disappeared, and although institutions such as the National Institute of Power and the National University of Science and Technology now have adequate capacity to start making an impact, many obstacles to the realization of the Policy objectives remain. These include the fact that private sector R&D has not taken off yet and the fragmented implementation of the Policy by a large number of institutions that were often not even able to use the resources made available to them.

Finally, while the technology drive is primarily the responsibility of the Ministry of Science and Technology, the Ministry of Environment, Urban Affairs, Forestry and Wildlife has a major role in the adoption of environmental technologies by the industrial sector. The cooperation between these ministries and the Ministry of Industries should therefore be intensified.

3.3.6 Location Policy

Location policy, which has an impact on the concentration or dispersal of industries, is an important factor in local pollution levels and may lead to conflicts with other forms of land use (residential, agricultural, etc.). Another aspect of location policy is the promotion of industrial estate or export processing zones (EPZs), which can help control pollution, as these types of industrial infrastructure allow centralized monitoring and provision of environmental services to firms, from wastewater treatment to advice on cleaner production. Decentralized policy making requires that local and provincial governments have the capacity to deal with industrial location issues from this point of view.

Successive federal and provincial governments have since 1959 tried to stimulate industrial activity in areas with an abundance of natural resources and manpower and/or where economies of scale, agglomeration economies as well as markets for industrial output are available. Although regulations for controlling both the type as well as extent of industrial activity exist, they are sometimes overlooked. For example although the Capital Development Authority of Islamabad has specific regulations concerning the location of industrial units near the city, an exemption from these rules was made in the case of the location of a cement plant in a residential area of the capital city[4]. The commission working on the 8th Plan noted that permits which had been issued for locating sugar mills in cotton growing areas had led to damage to some of the best of these areas.

Apart from setting up Export Processing Zones (EPZs), of which only the Karachi EPZ is fully operational, the government has also designated certain areas as industrial estates (currently numbering 72) and created special industrial zones. A one window facility for investors in Pakistan's estates and zones has been foreseen since1989, not only make it easier to set up a business, but also to

[4] The Citizen's Association of I-9/I-10 area in Islamabad have registered a case against the against the steel rolling mills in the I-9/I-10 industrial area, due to their obviously polluted air emissions, with a potential negative impact on health. The steel industry argues that the scrap available in Pakistan - mainly supplied by the informal sector - is contaminated with rubber which when burnt leads to toxic emissions. Importing cleaner scrap is not financially feasible due to the high customs duty, originally intended to prevent industry from importing machinery as scrap. This problem could be solved by placing compressors at ports. However, a better long-term solution would be to develop capacities for clean scrap.

speed up permitting, coordinate the provision of environmental infrastructure and monitor compliance with environmental regulations. The introduction of these facilities, however, is quite slow.

There is a negative location list specifying that permission must first be obtained from the provincial government for industrial units in areas where raw material or energy inputs are inadequate or where there are special environmental considerations. The ability or capacity of regions to absorb or treat industrial pollution has however not been a major consideration, nor has location policy been very successful in dispersing development: 85 per cent of all industrial fixed assets remain concentrated in or near six major cities. Karachi alone accounted for 45 per cent of the country's fixed industrial assets in 1984/85, and it remains the most important industrial location in Pakistan. Of the remaining industrial capacity, about one-third was located in Punjab. Not surprisingly, industrial pollution is concentrated as well. Furthermore heavily populated settlements have tended to emerge around these sites, such as SITE in Karachi and Badami Bagh in Lahore.

The NCS has advocated that uniform regulations and standards should be applied to the emissions of various industries, taking into consideration the polluting category to which they belong, to ensure that provinces do not compete "for industries by applying less stringent standards". Furthermore, in the case of those industries where the effective imposition of penalties would either render the industry non competitive or make the provision of subsidies too costly, then an alternative could be to encourage such units to locate or site in areas of low bio-mass productivity where their "discharges will cause the least damage to the environment and to the people".

3.3.7 Financial and Monetary Policy; Fiscal Incentives

Pakistan began liberalizing the financial sector in the late 1980s. The reforms specifically aimed at[5]: (1) switching from administered to market based interest rates; (2) allocation of credit in response to market forces and removal of directed and subsidized credit schemes; (3) creation of a secondary market for debt instruments; (4) improving the health and competitiveness of the banking system by restructuring nationalized commercial banks (privatising some of them) and allowing new private banks to enter. Credit ceilings were replaced by the Credit/Deposit Ratio[6] (CDR) in January 1992, and even this has been withdrawn recently.

Interest rate liberalization has resulted in increases in the cost of long-term and working capital to 22-24 per cent and 28-35 per cent, respectively. Moreover, there has been an increasing shortage of credit because of government action and institutional constraints. Government has used high-return financial instruments to attract private savings to finance the fiscal deficit. This has, among others, starved the manufacturing sector of funds for investment. In combination with high interest rates and the present weak investor confidence, shortage of credit has caused a decline in gross fixed capital formation in large-scale manufacturing in recent years. Finally, the depreciation of the rupee by some 120 per cent between 1991 and 1999 associated with exchange rate liberalization has resulted in a sharp increase in the price of imported raw materials and equipment. This of course all had repercussions with respect to industry's access to modern, environmentally friendly machinery.

Fiscal incentives are area and sector based. Enterprises in EPZs enjoy substantial fiscal and monetary incentives, including tax holidays and exemption from all federal and municipal taxes and duties. Location in backward areas has been encouraged by ample tax and credit concessions. As Section 3.3.5 has indicated, these incentives have not been particularly successful: only one EPZ is fully operational and dispersal of industry has hardly taken place. In addition, areas which were not

[5] Ashfaque Hassan Khan, "Need and Scope for further Reforms in the Financial Sector in Pakistan"1995.

[6] At least 30 per cent of the bank's deposit base had to be invested in government securities as part of this liquidity ratio.

eligible for incentives have complained of distorted competition. The incentives for relocation have now been withdrawn.

A selection of industries, including bio-technology, electronics, fertilizers, fibre optics and solar energy, are eligible for incentives such as exemptions from import duties on equipment and income tax. Concessional credit and targeted credit allocations were available for selected key industries as well. Credit targeting was abolished some years ago. The absence of proper project selection criteria and credit monitoring has resulted in serious misallocations and a large volume of bad debt, contributing to the scarcity of industrial credit mentioned above. The (potential) environmental impact of the industries selected obviously varies widely, and it is difficult to say what the overall contribution of this category of incentives has been.

3.3.8 Pricing of and Access to Inputs

The Government's intervention in, among others, the prices of utilities and agricultural products has implications both for the industrial sector and for the environment. It has, among others, led to the development of inefficient sugar and cotton spinning industries which both damage the environment.

Prices of inputs need to reflect both economic, environmental and social costs to provide an incentive for conservation and efficient allocation. However, given the present recession in the Pakistan economy and the slowdown in demand and excess capacity of industry (sugar and cement), increasing prices may not prove to be an appropriate solution in the short run and should be harmonized with the Pollution Charge. The text below is limited to water and energy.

3.3.8.1 Water

When discussing water it is important, from an environmental point of view, not only to look at price and access, but also at wastewater discharge. Water is under-priced in Pakistan, leading to inefficient use and wastage. Access to ground water is free while water provided by state-owned water supply lines is available at a low price; therefore, industries have little incentive to conserve water.

With respect to Punjab, more than 90 per cent of industry uses underground water which is accessed by installing tube wells (information confirmed by Director Industries Punjab and Water and Sewerage Authority [WASA]). There is no water charge as such, but a tax has recently been imposed by the local government on aquifer extraction. This is paid to the local WASA office. For Faisalabad this tax is Rs. 7424/-per cusec per month; the textile processing industry is provided a rebate and is taxed at Rs. 6050/-per cusec per month. For Lahore the charge is Rs.5000/-. While the tax appears to be volume-related, in the absence of water meters an estimate based on the delivery size of the installed tube well is made and this standard amount is charged irrespective of actual water consumption. This flat-rate aquifer charge is levied only in two divisions of Punjab. The tax varies from district to district and may be completely absent in some areas. In Faisalabad the private sector has taken the local government to court for imposing the above tax on the use of tube wells, on the pretext that as they own the land, have themselves installed the tube wells and pay for the running costs, they should not have to pay WASA.

In Karachi (Sindh), extraction and pumping costs are high (require at least 300ft. boring) and additionally this water needs to be treated. The two realistic alternatives are access to Karachi Water and Sewerage Board (KWSB) water supply lines and tanker water. KWSB water is of good quality and cheap, but supply is limited and has to be complemented by water tankers, which is much more expensive (Rs. 200/300 per tanker) and of suspect quality. Water tankers are supplied by the informal sector and it is suggested that either KWSB should itself consider providing water tankers and improve/repair its supply lines, or to manifold the distribution of water. KWSB, being a state-owned enterprise, may however be unable to deliver its tanker water efficiently and hence the "tanker mafia" may simply continue. Privatisation of water distribution would require an adequate regulatory mechanism.

The higher price of good water in Sindh has forced the textile industry in Karachi to use water more economically than the processing industry in Punjab[7]. Brackish water is used for the washing steps and better quality water for the more sophisticated steps. In Punjab such differentiation rarely takes place. For effective water conservation in Punjab, the rather ad-hoc flat rate tubewell tax should be converted into a volume-related water charge and exemptions should then be introduced based on the volume of recycling achieved by individual industries. This would however require an effective monitoring system with, among others, water metres.

The installation of tube wells in Punjab has helped to combat water logging and salinity. The tube well tax does not take this positive externality into consideration. This should be done as part of a systematic approach towards aquifer tariffs.

With regard to wastewater discharge it must be noted that the NEQS only specify the concentration of the effluent and thereby provide an incentive for dilution. Though industries pay an industrial wastewater tariff in Faisalabad and Lahore (Rs. 26,000/- per cusec per month for Faisalabad and Rs. 35/- per thousand gallons for Lahore), these charges in practice again amount to a flat rate estimated on the basis of the installed capacity of the tubewell. A volume-related tariff is needed as an incentive to conserve and recycle water.

The implementation of the above suggestions would need an effective monitoring system. This may be achieved by forming a tariff committee with the tax inspector, EPZ and local private sector associations. The involvement of the latter will stimulate individual companies to monitor each other, while transparency will reduce the possibility of evasion.

3.3.8.2 Energy

Pakistan provided a package of incentives in 1994 to encourage private power generation. The Power Purchase Agreements overestimated electricity demand and agreed to a fixed capacity charge to be paid by the public utilities Water and Power Development Authority (WAPDA) and Karachi Electricity Supply Corporation (KESC) to IPPs (Independent Power Producers). But in the meantime industry set up captive units which proved to be cheaper and more reliable than the public electricity supply. The excess generation capacity and the cross subsidization of household, agricultural and other users by industrial and commercial users have led to calls for a rationalization of tariffs.

Given Pakistan's present excess electricity generation capacity, it is suggested that the best economic instrument to prevent energy wastage would not be a tariff increase but better monitoring. In the case of natural gas, the cross subsidization by industrial and commercial consumers of household and agricultural consumers must be tackled. In addition, the subsidized use of gas (as feed stock) by the fertiliser sector must be questioned, given the pollution potential of this industry.

3.4 Sectoral Change and its Impact on the Environment

At aggregate level, gross fixed capital formation in Pakistan is very low by the standards of developing countries, particularly in the Asia region. It decreased from about 16 percent of GDP in 1970 to below 12 percent at the end of the 1990s. Economic growth during the past three decades seems essentially to have resulted from larger intakes of natural resources and labour, neglecting capital investment and resulting in increased pressures on physical infrastructure and slow technological progress.

At the industrial branch level (ISIC three-digit classification), productivity growth during 1985-1998 has been very uneven across industries, ranging from a negative yearly average of 7.77 per

[7] Information confirmed by environmental auditors of ETPI.

cent in non-metallic furniture (ISIC 332), to no less than 17.82 per cent in printing and publishing (ISIC 342). The figures in Table 3.3, quoted from UNIDO's website (www.unido.org/data/stats) measure real value-added growth per employee; a negative figure, as in the case of the beverages industry, indicates that value-added per employee in 1998 had fallen; it suggests that this particular industry is marked by low levels of investment, resulting in outdated machinery.

As newer technologies can be expected to be more environment-friendly, higher productivity growth and deeper capital intensity means that the same industrial output is produced at lower cost to the environment. But some industries, such as paper and pulp processing, are inherently more polluting than others such as glass manufacturing; thus technological progress in the former is in principle of more interest than in the latter.

Table 3.3: Productivity Growth and Pollution Intensity in the Industrial Sector

Industries		Share in total MVA in 1996 (per cent)	Average annual growth rate of value-added, in real terms 1985-1998
More Polluting Industries			
341	Paper and products	1.6	8.75
351	Industrial chemicals	8.6	1.19
353	Petroleum refineries	2.1	7.05
369	Other non-metallic minerals	7.2	1.21
371	Iron and Steel	4.2	n.a.
372	Non-ferrous metals	0.0	n.a.
	Subtotal	**23.9**	**>weighted= growth: 2.45**
Somewhat Polluting Industries			
311	Food products	15.4	-1.81
313	Beverages	1.6	-4.26
321	Textiles	23.8	0.44
323	Leather Products	0.8	n.a.
342	Printing and publishing	2.0	17.82
352	Other chemicals	7.8	3.51
381	Fabricated metals	0.7	n.a.
383	Machinery, electrical	7.8	-0.61
384	Transport equipment	2.3	1.17
	Subtotal	**62.2**	**>weighted= growth: 0.61**
Less Polluting industries			
314	Tobacco products	6.3	3.86
322	Wearing apparel	1.4	n.a.
324	Footwear	0.5	n.a.
331	Wood products	0.2	-3.09
332	Furniture	0.0	-7.77
354	Misc. Petroleum and coal	1.0	-7.63
355	Rubber products	0.9	14.1
356	Plastic products	0.4	n.a.
361	Pottery	0.2	0.59
362	Glass	0.3	2.23
382	Machinery, except electrical	1.6	-4.2
385	Prof. And scientific equipment	0.3	n.a.
390	Other	0.8	n.a.
	Subtotal	**13.9**	**>weighted= growth: 2.17**

Source: UNIDO (2000)

In the absence of the raw data underpinning the productivity growth calculations, the table provides proxies of weighted productivity growth under the three categories of pollution intensity. Such measures are artificial constructs, as they do not relate to physical entities. However, they are

consistent with the intuitive idea that, for the sake of capturing the impact of technological progress on the environment, productivity growth across industries must be balanced by each industry's share in the total value-added of the sector.

The outcome reveals that productivity growth has been the highest in the traditionally heavily polluting industries, driven by paper processing and petroleum refining (with real annual growth rates of 8.75 and 7.05 per cent, respectively). However in the second group of somewhat polluting industries, the mediocre performance of the textile industry, which accounts for nearly a quarter of manufacturing value-added, brings down the weighted average to 0.61 per cent.

In other words, by virtue of differentials in technological progress, the heavily polluting industries have become relatively less harmful to the environment, while the middle category of somewhat polluting industries have in the meanwhile increased their pollution levels in relative terms. Of course, only a detailed analysis of the actual environmental impact of the technologies used can confirm whether the modernization process has indeed resulted in lower pollution levels, and output growth (see Table 3.6) may outstrip environmental gains per unit of output. But it is obvious that an environment-sensitive technology policy must take account of these sectoral patterns of productivity growth.

3.5 Scale of Manufacturing Operations and its Effects

SMEs play a very important role in Pakistan. The sector underwent a period of rapid growth after liberalization measures in the late 1970s, the1980s witnessing the emergence of many of the SME clusters that play a prominent role in the manufacturing sector nowadays. The dynamic informal sector is thought to account for 28 per cent of value-added in manufacturing. Key industries include reconditioned batteries, leather tanneries, electroplating, spinning and light engineering. The first three categories may be classified as more polluting due to the use of toxic chemicals in their production processes, while spinning and light engineering may be classified as less polluting.

Estimates with respect to pollution contribution of the informal industrial sector range from 10 – 50 per cent of total industrial pollution. But concrete data are lacking, as on other aspects of SMEs, so the accuracy of these estimates provided by EPZ and ETPI is doubtful. Most economists and environmentalists believe that SMEs contribute much less in terms of actual toxic emissions and effluents. However, their technology levels tend to be low, they are often located in heavily populated areas and they use the municipal drainage system for industrial wastewater; elsewhere, their wastewater forms polluted ponds that contaminate the groundwater. Generally speaking, moreover, small enterprises are more likely than large enterprises to lack the know-how and capital for minimizing their environmental impact. In short, they will often constitute a serious environmental problem.

3.6 Industrial Growth and Pollution Potential – an International Comparison

The five key factors determining the environmental impact of industrial development – growth, sectoral change, technological development, scale of operations and location – would form a good basis for comparing the likely environmental impacts of the industrial sectors of Pakistan and other Asian countries. Unfortunately, only data on growth and sectoral change were available for such a comparison.

During 1976-1996, Pakistan´s industrial output increased almost fourfold. During roughly the same period, that of other South Asian countries doubled or trebled; industrial output in Southeast Asian countries grew five or six-fold, the Philippines excepted (see Tables 3.3 – 3.4). The comparatively high growth figure for Pakistan may seem surprising given the fact that various industry-related policies do not appear to have been very effective. This may be an indication of a fundamental dynamism which has not been affected by ineffective policies of the 1970s and 1980s. It could also be that industrial policies in other South Asian countries are even less effective.

Table 3.4: Shares of Industry Branches in Total Manufacturing Output by Pollution Potential Category

		Output (1990 US$, in Mill)			Share (In per cent)		
More Polluting Industries		**1976**	**1986**	**1996**	**1976**	**1986**	**1996**
341	Paper and products	36	53	136	1.7	1.1	1.6
351	Industrial chemicals	108	392	721	5.1	8.4	8.6
353	Petroleum refineries	93	334	178	4.4	7.1	2.1
369	Other non-metallic minerals	79	307	605	3.7	6.5	7.2
371	Iron and Steel	73	187	351	3.4	4.0	4.2
372	Non-ferrous metals	1	1	2	0.1	0.0	0.0
	Sub-total	**390**	**1275**	**1993**	**18.3**	**27.2**	**23.9**
Somewhat Polluting Industries							
311	Food products	487	808	1284	22.8	17.2	15.4
313	Beverages	33	104	134	1.6	2.2	1.6
321	Textiles	554	832	1985	26.0	17.7	23.8
323	Leather products	23	80	66	1.1	1.7	0.8
342	Printing and publishing	25	53	170	1.2	1.1	2.0
352	Other chemicals	110	368	654	5.2	7.8	7.8
381	Fabricated metals	35	40	58	1.6	0.9	0.7
383	Machinery, electrical	69	159	648	3.3	3.4	7.8
384	Transport equipment	74	118	189	3.5	2.5	2.3
	Sub-total	**1412**	**2563**	**5190**	**66.2**	**54.6**	**62.2**
Less Polluting Industries							
314	Tobacco products	182	479	522	8.5	10.2	6.3
322	Wearing apparel	6	53	115	0.3	1.1	1.4
324	Footwear	3	10	42	0.1	0.2	0.5
331	Wood products	4	13	20	0.2	0.3	0.2
332	Furniture	3	4	4	0.1	0.1	0.0
354	Misc. Petroleum & coal products	4	19	81	0.2	0.4	1.0
355	Rubber products	27	73	74	1.3	1.6	0.9
356	Plastic products	4	27	34	0.2	0.6	0.4
361	Pottery	4	11	17	0.2	0.2	0.2
362	Glass	5	30	27	0.2	0.6	0.3
382	Machinery, except electrical	64	114	136	3.0	2.4	1.6
385	Professional & scientific equipment	11	7	21	0.5	0.6	0.3
390	Other	12	16	71	0.6	0.3	0.8
	Sub-total	**330**	**858**	**1164**	**15.5**	**18.8**	**13.9**
	Total	**2131**	**4696**	**8348**	**100.0**	**100.0**	**100.0**

Source: UNIDO Industrial statistics

Table 3.5: Shares in Industrial Output by Pollution Potential Category

SOUTH ASIA	Absolute value (Mil. US$ 1990)			Share %		
	1975 - 1977	1985 – 1987	1995 – 1997	1975 – 1977	1985 – 1987	1995 – 1997
BANGLADESH						
More polluting industries	171	252	425	13.8	16.2	13.2
Somewhat polluting industries	838	1036	1476	67.2	66.2	46.2
Less polluting industries	237	274	1300	19.0	17.6	40.6
Total	***1247***	***1562***	***3201***	***100***	***100***	***100***
INDIA						
More polluting industries	6869	12369	25468	27.7	31.9	34.1
Somewhat polluting industries	12786	19254	37210	51.5	49.7	49.9
Less polluting industries	5155	7151	11917	20.8	18.4	16.0
Total	***24810***	***38774***	***74595***	***100***	***100***	***100***
NEPAL						
More polluting Industries	23	61	43	19.1	21.6	16.2
Somewhat polluting industries	88	185	146	72.3	65.6	54.7
Less polluting industries	10	36	78	8.6	12.8	29.1
Total	***121***	***282***	***267***	***100***	***100***	***100***
SRI LANKA						
More polluting Industries	89	163	258	16.0	18.3	14.5
Somewhat polluting industries	269	427	830	48.0	47.9	46.4
Less polluting industries	201	300	699	35.9	33.7	39.1
Total	***559***	***890***	***1788***	***100***	***100***	***100***
INDONESIA						
More polluting Industries	2763	5795	16530	42.4	44.4	39.8
Somewhat polluting industries	2446	3952	15451	37.5	30.3	37.1
Less polluting industries	1312	3310	9615	20.1	25.3	23.1
Total	***6521***	***13057***	***41596***	***100***	***100***	***100***
PHILIPPINES						
More polluting Industries	2427	5382	6355	24.6	30.4	26.0
Somewhat polluting industries	5826	9190	13990	58.9	51.9	57.4
Less polluting industries	1641	3116	4039	16.5	17.7	16.6
Total	***9894***	***17688***	***24384***	***100***	***100***	***100***
SINGAPORE						
More polluting Industries	2867	9533	8508	33.5	39.6	20.1
Somewhat polluting industries	3301	10018	19130	38.6	41.6	45.1
Less polluting industries	2394	4584	14823	27.9	18.8	34.8
Total	***8562***	***24135***	***42461***	***100***	***100***	***100***
THAILAND						
More polluting Industries	4122	6646	19599	25.3	20.7	20.6
Somewhat polluting industries	10115	19945	51435	62.1	62.0	54.2
Less polluting industries	2080	5557	23848	12.6	17.3	25.2
Total	***16317***	***32148***	***94882***	***100***	***100***	***100***

Source: UNIDO Industrial Statistics

Judging by growth figures alone, the environmental impact of Pakistan´s industrial sector will have worsened faster than in neighbouring countries. But changes in the sectoral composition of output and advances in technology would modify that picture; the latter factor has been discussed in Section 3.6 and information on technological change is not available for the other countries. During 1976-1986, the share of the more polluting industries in Pakistan in total output increased from 18.3 per cent to 27.2 per cent, and although the 1996 share fell to 23.9 per cent, the sector grew by 30 per cent over the twenty year period. Among the major industries, the largest increase has occurred in the non-metallic minerals sector (ISIC 369), which almost doubled its output share, followed by industrial and other chemicals. The shares of both the somewhat polluting and less polluting industries declined over the twenty year period; in the latter case, the rapid growth in what has become the third most

important branch, wearing apparel (ISIC 322) was outweighed by a decreasing share of most other branches and the low growth of the largest branches in the less polluting sector, tobacco products and non-electrical machinery (ISIC 314 and 382).

The figures for Pakistan often contrast strongly with those of most of its South and Southeast Asian neighbours. India and the Philippines excepted, the more polluting industries had a lower output share in 1990/94 than in 1970/74, in spite of a growing share during the first ten years. With regard to the moderately polluting industries, the picture is more mixed. But with the exception of India and the Philippines, the less polluting industries have grown in the other Asian countries; in Bangladesh, Thailand and Nepal that growth has been quite strong.

In conclusion, it can be said that while the overall trend appears to have been towards more industrial pollution (on the basis of growth and sectoral composition figures), technological progress as well as some industries which combine great dynamism with low or modest pollution potential may help Pakistan to reduce the environmental impact of its manufacturing sector in the future.

3.7 Towards a strategy for the manufacturing sector

While it has made progress in a number of areas, Pakistan's industrial sector is in many respects less dynamic than many of its Asian neighbours and in spite of structural changes it remains low-tech dominated. Although textile exports have recently received much attention, textiles are not an industry on which dynamic development can be based; it is not even certain that the industry will be able to maintain its position in the face of increasing trends towards high quality products and rapidly changing demand.

Coping with the challenges of a globalizing economy will require a coherent industrial strategy. The strategy should be based on a realistic appraisal of Pakistan's (potential) strengths and weaknesses, along with an analysis of the reasons why attempts undertaken during the 1990s to promote more technology-intensive industries have not had a more dynamic effect on the sector. The strategy would have to:

- Establish a macro-economic and regulatory regime which supports industrial development more effectively;
- Exploit regional trade opportunities, including closer economic relations with India, more intensively;
- Stimulate the upgrading (management, technologies, products, marketing) of existing export industries and diversify exports;
- Stimulate enterprises operating in domestic markets to become more efficient;
- Design a foreign investment strategy which will encourage regular transfers of new technologies and management methods;
- Improve the industrial skills and know-how basis;
- Create a stronger domestic base for technological development by making greater efforts to promote R&D, industry-university links, SME support services and innovation financing schemes in cooperation with the private sector and technical assistance agencies;
- Improve physical infrastructure and provide specialized industrial infrastructure in a more effective way;
- Integrate environmental considerations in industrial policy.

As the previous sections have shown, a number of these issues are to an extent already being addressed (software exports drive, facilitation of technology imports, etc.). The problem is that this has been done in a piecemeal fashion. An effective strategy requires a coherent approach to all these issues. If, for example, foreign investment is to shift from industries based on cheap low-skilled labour to industrial activities involving technology transfers and long-term partnerships with domestic suppliers, then Pakistan must have a stable macro-economic climate, an efficient Government administration, a well-developed skills base, and so on.

Developing an effective strategy will require that the private sector is fully accepted as a partner in the process. For the execution of policies and measures based on the strategy, the capacities of the relevant Government agencies will have to be improved and their operations made more efficient; the cooperation among ministries and institutions will have to be intensified; and there would have to be more scope for private-sector execution of industry support measures. An independent council might be charged with coordinating/supervising the strategy formulation and capacity building process. The private sector should be represented on this body.

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4. PAKISTAN'S ENVIRONMENTAL POLICY AND REGULATIONS AFFECTING INDUSTRY

Effective environmental policy and regulations have a potentially greater impact on industries than industrial policy itself because they attempt to directly address the environmental problems at the source and force industries to internalize environmental costs. This chapter reviews Pakistan's environmental policy and regulations affecting industrial pollution as summarized in Figure 4.1. It describes the important laws and regulations and makes some assessment of their effectiveness. The case studies in Chapter 5, 6 and 7 provide more details on the impact of relevant policies and regulations.

4.1 Environmental Legislation

The Constitution of the Islamic Republic of Pakistan itself contains no statement of principles or policy about the rights and obligations of the state and its citizens with respect to the environment. It does however confer concurrent legislative power on the Federation and the Provinces to legislate in respect of environmental pollution and ecology.

Prior to promulgation of Pakistan Environmental Protection Ordinance (PEPO) of 1983 and the recent passage of Pakistan Environmental Protection Act (PEP-Act) 1997, Pakistan had laws that contain provisions for environmental protection. These laws dealt with land use, water quality, air quality, noise, toxic and hazardous substances, solid waste and effluents, marine & fisheries, forest conservation, mineral development, energy, public health, etc. They were not effective; punishment for violations was mild and easy to circumvent. The laws included:

- The Pakistan Penal Code, 1860
- The Canal Drainage Act, 1873
- The Punjab Local Government Ordinance, 1979
- The Motor Vehicles Ordinance, 1965; and The Motor Vehicles Rules, 1969
- The Factories Act, 1934
- The West Pakistan Fisheries Ordinance, 1961
- The Forests Act, 1927
- The Boilers Act, 1923
- The Pakistan Petroleum (Exploration and Production) Rules 1986
- The Antiquities Act, 1975
- The West Pakistan Epidemic Diseases Act, 1959, etc.

4.1.1 The Environmental Protection Ordinance (PEPO) No. XXXVII of 1983

Before the Pakistan Environmental Protection Act of 1997 (PEP-Act, 1997), PEPO of 1983 was the only piece of Pakistani legislation dealing specifically with the environment, and it was the principal statement of Pakistan's national commitment in the field of environment. Its objective was "to provide for the control of pollution and the preservation of the living environment" in Pakistan.

The key components of this Ordinance are as follows:

- The establishment of a high level Environmental Protection Council (PEPC) at the federal level to form national environmental policy and ensure enforcement of National Environmental Quality Standards (NEQS);
- The establishment of Federal Environmental Protection Agency (FEPA), under MoELG&RD, headed by a Director General, with wide ranging functions including powers to set and enforce National Environmental Quality Standards (NEQS). These include the preparation and coordination of environmental policy.

The Ordinance was designed to establish an environmental policy and management structure and to install the Environmental Impact Statement (EIS) as the central component of environmental protection in Pakistan. Under clause 8 of PEPO, Environmental Impact Assessments (EIAs) are required for all projects that may pollute the environment. Essential elements of an EIA are measures to identify, tackle and monitor adverse environmental impacts of a project during design, construction and operation.

4.1.2 Pakistan Environmental Protection Act, 1997

PEP-Act of 1997 is an improvement over PEPO of 1983. The Act provides for sustainable development through the protection, conservation, rehabilitation and improvement of the environment. After the passage of PEP-Act 1997, the following major steps have been taken:

- The Pakistan Environmental Protection Council (PEPC) was re-constituted to give more representation to provinces, trade and industry and NGOs.
- Two Environmental Tribunals have been set up, one in Lahore and the other in Karachi. The Karachi Tribunal has its jurisdiction in the Provinces of Sindh and Balouchistan, while the Lahore Tribunal has jurisdiction over the Provinces of Punjab, NWFP and Federal Capital Territory.
- Three of the four provinces have designated Environmental Magistrates under the provision of Section 24 of the PEP-Act 1997.
- The Federal Government has delegated powers to the provincial governments for implementation of the Act.
- A system for self-monitoring and reporting for industry has been developed, which includes a Self Monitoring and Reporting Tool (SMART). SMART is a software and information package to streamline data reporting. This would facilitate monitoring and networking with industries and Federal and Provincial EPAs.
- A National Coordination Committee headed by the Director General, Pakistan Environmental Protection Agency has been constituted under Section 7(k) of the PEP-Act, 1997 to supervise implementation of environmental policies and enhance inter provincial coordination.
- Analytical methods and sampling procedures have been formulated.

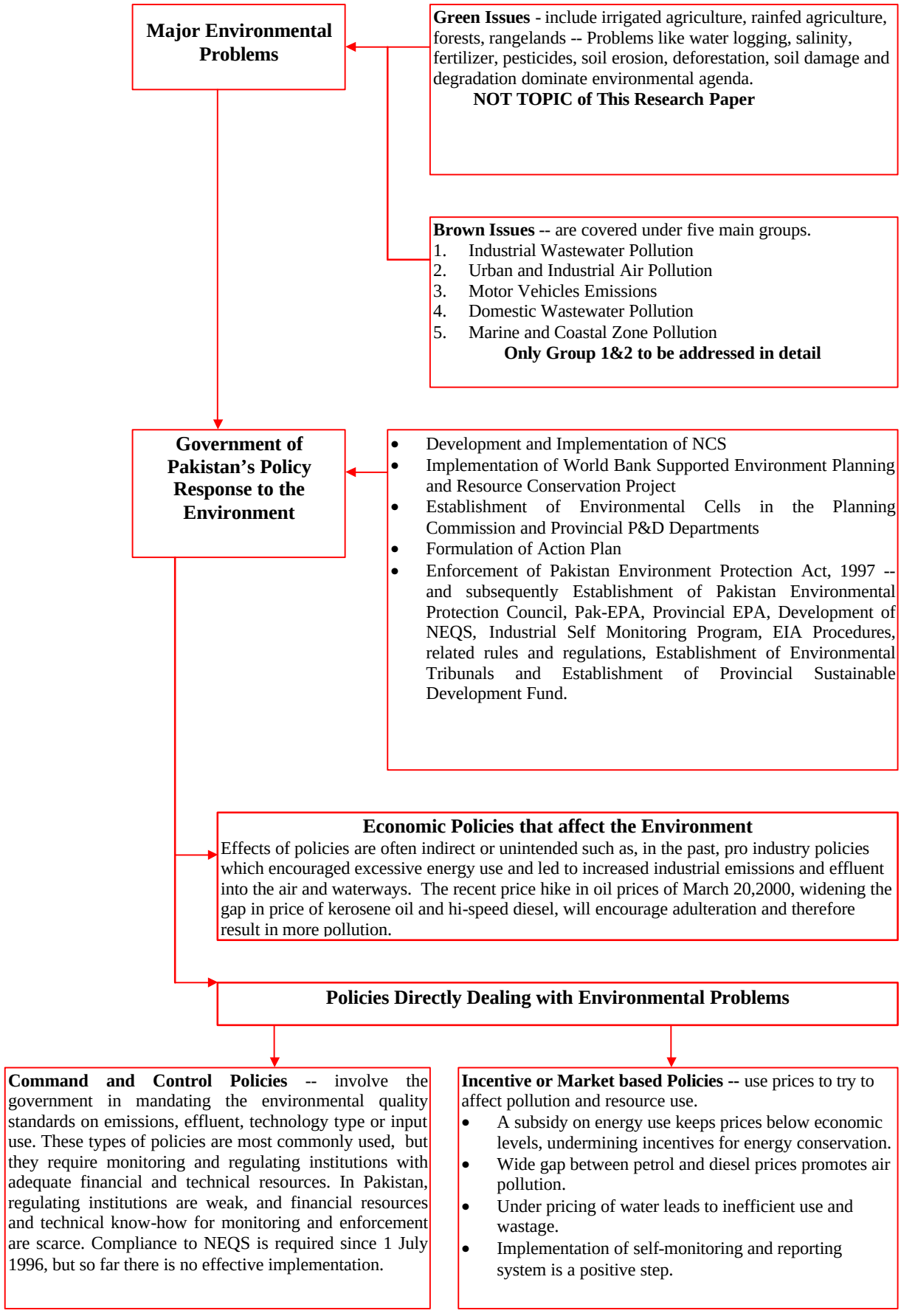
4.1.2.1 National Environmental Quality Standards

One of the functions of Pak-EPA under the provisions of PEPO of 1983 was to issue NEQS for municipal and liquid industrial effluent, industrial gaseous emissions and motor vehicle exhaust and noise. The Pak-EPA, however, did not issue a Statutory Regulatory Order (S.R.O) until 1994. It required all units coming into production after 1st July 1994 to comply immediately with the new standards. Those already in production at the time of the S.R.O. were required to comply starting 1st July, 1996. The Pak-EPA was not able to implement the NEQS effectively for many reasons, including lack of implementation capacity and resistance from industry.

With the PEP-Act of 1997, the Pak-EPA revised the NEQS with full consultation of the private sector: industrialists, trade and business associations and NGOs. The municipal and liquid industrial effluent standards cover 32 parameters. The standards for industrial gaseous emissions specify limits for 16 parameters, and the standards for motor vehicles prescribe maximum permissible limits for smoke, carbon monoxide and noise. Revised standards cover discharge limits of effluents into inland water, sewage treatment plants (where these are operational) and the sea.

Pakistan Environmental Policy

Figure 4.1



The NEQS are primarily concentration based. Unfortunately, the limits on liquid industrial effluents are neither industry-specific nor do they have any relationship with the quantum of production. NEQS prohibit dilution, but this can be easily circumvented.

4.1.2.2 Self Monitoring and Reporting System

The self-monitoring and reporting system (SMRS) of the Pak-EPA takes into account the resources and interests of both the EPA and industry. It classifies industries into categories A, B, and C, each corresponding to a specified reporting frequency. Category A industry will report their effluents and emission levels every month, Category B industry quarterly and Category C industry biannually. Industries must have their effluents tested by a Pak-EPA certified/accredited laboratory and enter the results in the electronic forms included in the software package. The data must be sent to the respective provincial EPA via email or on a floppy disk. Sampling and analysis requirements and procedures and the reporting format are also prescribed.

SMRS makes the country's industry owners and operators responsible for systematic monitoring and reporting of their environmental performance, saving EPAs expense, time and effort, as well as enabling industry to make long-term provisions for environmentally friendly production.

Pak-EPA started implementation of SMRS with SMART on a pilot basis on 1st January 2000. For this purpose, a list of more than 100 hundred industrial units comprising all the three reporting categories was provided by Federation of Pakistan Chamber of Commerce and Industries (FPCCI), the Overseas International Chamber of Commerce and Industries (OICCI) and other stakeholders. Out of these, 50 units were selected for pilot phase.

4.1.2.3 Pollution Charge Programme

The modalities for the implementation of the pollution charges have evolved through a unique process of coordination among representatives of industry, government, environmental NGOs and academic researchers. The consensus of all stakeholders has been to adopt a market based approach, i.e. a pollution charge or tax combined with fiscal incentives to industries, rather than a command and control approach through regulations to ensure compliance with NEQS. Appreciable progress has been made towards operationalising the process. Unfortunately, the January 1999 date for commencing implementation was exceeded due to procedural and departmental hurdles.

The pollution charge payable by an industrial unit will be determined in accordance with guidelines to be prepared by the Pak-EPA. Industrial units liable to pay the pollution charge will themselves be responsible for ensuring the correct calculation, reporting and payment.

4.1.2.4 Pakistan Environmental Assessment Procedures

Pursuant to the provisions of PEP-Act of 1997, all Government ministries, departments, agencies, and establishments and private sector project sponsors are required to prepare Initial Environmental Examinations (IEEs) and Environmental Impact Assessments (EIAs) prior to the approval of their proposals for projects. The primary purpose of the environmental assessment process is to provide proponents and decision makers, as well as members of the public, with an understanding of the potential environmental effects of proposed action, so as to avoid or minimize adverse effects, bearing in mind the costs and benefits of using the environmental resource in this particular project wherever possible. Pak-EPA has developed a complete package of Environmental Assessment Procedures. It has also developed IEE/EIA regulations (1998) for implementation of EIA process.

One problem has been the ten-year period of inactivity of the PEPC, which has meant that the environmental impact assessment system has not worked effectively. EIAs have been carried out in a rather haphazard manner, and it has been left largely in the hands of the developer to decide whether an EIA is needed and what the scope of the investigation would be.

4.2 Environmental Policy Initiatives

Two major policy initiatives, the Pakistan National Conservation Strategy (NCS) and the World Bank funded Environmental Protection and Resource Conservation Project (EPRCP), were launched in 1992. The NCS started with the ambitious goal to transform the basic approach to development, ensuring that it does not destroy the natural resource base on which it rests. The aims of EPRCP were twofold: upgrading and strengthening of Pakistan's environmental protection institutions and the rehabilitation of several watershed and rangeland areas.

4.2.1 The Pakistan National Conservation Strategy and its Implementation Status

The major objectives of the NCS were improved efficiency in the use and management of resources, conservation of natural resources and sustainable development. The NCS had a clear set of priorities and 14 core program areas for implementation during the 1990s. In addition, a total of 68 specific programs were identified in these areas, each with a long-term goal and expected outputs and resource investments required within the next decade. Each program also had communication, extension, research and training components. Pakistan's 8th (1993-98) and 9th (1998-2003) Five-Year Plans have been developed keeping in view the overall development framework envisaged in the NCS.

The Government of NWFP was the first province to invite IUCN and its team to develop a Provincial Action Plan for Sustainable Development and Environmental Management (Sarhad Provincial Conservation Strategy) on the basis of NCS. As a result, the Chief Minister of NWFP approved the Sarhad Provincial Conservation Strategy, the official environmental policy document for conservation of provincial natural resources, on 12 November 1995.

Provincial Conservation Strategies are under preparation in other provinces. In addition, efforts are underway to develop district conservation strategies in Balochistan, Punjab, Sarhad and Sindh. The Punjab Government, for example, has established Divisional Environmental Committees (DEC) to identify the need of environmental protection and raise awareness about the issues at the grass root level[8]. Commissioners of all divisional headquarters are the chairpersons of these DECs. The members of DECs are local NGOs and government officials from Health, Regional Transport Authority, Local Government, Local Chambers of Commerce and Industry, Environmental Protection Department and Local Administration. The DECs will implement key Provisions of PEP-Act of 1997 and will ensure compliance with NEQS by industries. In other provinces EPAs have also become very active in implementing NEQS.

To fulfill one of the objectives of SPCS and to address the "brown environment" issues, the Improvement of Urban Environment in Peshawar (UIEP) program has been developed as a combined effort by the Provincial Government of NWFP, the Federal Republic of Germany and the GOP. It is now in its second phase of implementation.

The implementation status of policies and measures proposed by NCS in the area of industrial policy, urban air pollution and vehicle emissions is given in Appendix A and briefly described in Section 4.3.

[8] The News of February 8, 2000, news item on the establishment of Divisional Environmental Committees in Punjab

4.2.2 Environmental Planning and Resource Conservation Project

This project aims to initiate the upgrading and strengthening of Pakistan's environmental protection institutions and also the rehabilitation of several watershed and rangeland areas. Again, it is difficult to make an assessment of this initiative because of poor monitoring mechanisms. However, the information that exists indicates that many of its objectives were achieved. Environmental institutions have become stronger, public awareness of environmental issues has increased, participatory approaches and sustainable management practices were introduced on a pilot basis both at community and watershed levels, and an adequate legal and regulatory framework has been developed. On the institutional side, provincial EPAs were either created or strengthened. Implementation and enforcement of key provisions of the PEP Act of 1997 were delegated to provincial governments and provincial EPAs. In addition, a "National Environmental Policy of Pakistan", finalized in 1999, is presently under review.

The EPRCP did not specifically include or address sectoral policy objectives, but these were implicit in its design through policy studies, public awareness and cross-sectoral coordination and exchange. One of the important contributions of the project is that awareness of government officials in key federal and provincial agencies and to some extent among the general public has been increased.

The EPRCP was implemented in three provinces, i.e., Punjab, NWFP and Sindh; in Balochistan it was implemented under the name of Balochistan Natural Resources Management Project (BNRMP). In Balochistan, experience has shown that due to a lack of technical capabilities, frequent transfers, political interference and inefficiency of the implementers, several project objectives were not achieved, such as a special studies component including a baseline air pollution study in Quetta; solid waste management in five selected cities of Balochistan; a Quetta Valley groundwater management study, which would have developed a mathematical model, community water supply schemes, environmental studies in Hub and Gadani area and Balochistan EPA´s mass awareness projects.

An important weakness on the part of MoELG&RD, the ministry in charge of overall policy making and coordination, was the lack of close coordination with project implementing agencies, with other ministries/departments and civil society. Staff turnover was high and the project persistently failed to pass on project funds to implementing agencies in a timely manner. Frequent transfers of key staff and delays in the procurement of consultancy services also affected project performance.

4.3 Current Implementation Status of Laws, Rules and Regulations

Pakistan has taken some major steps towards environmental protection with the implementation of NCS and EPRCP. Until now both of these two initiatives have focused on capacity building and institutional development. As a result, a complete regulatory machinery to implement the command and control policies of the GOP is in place. Comprehensive legislation in the form PEP-Act of 1997 has been developed and NEQS for municipal and industrial effluents and industrial gaseous emissions have been formulated.

With the help of the Environmental Standards Committee, the Expert Advisory Committee, SDPI and FPCCI, the SMRS has been developed and a pilot phase of this program has started. MoELG&RD, federal and provincial EPAs, NGOs and private sector institutions including representatives from industries have developed rules and procedures to implement the provisions of PEP-Act, 1997.

The Government of NWFP has completed the preparation of Sarhad Provincial Conservation Strategy (SPCS). Similarly, provincial conservation strategies for Sindh, Balochistan and Punjab are being prepared. The Punjab Government has established Divisional Environmental Committees (DECs) to implement the provisions of the 1997 PEP-Act, identifying environmental protection needs, ensuring industry compliance with NEQS and raising grassroots awareness of environmental issues.The chairpersons of the DECs are the commissioners of divisional headquarters; members

include government officials from the Health Department, Regional Transport Authority, Environmental Protection Department, local governments and local Chambers of Commerce as well as NGOs. EPAs in other provinces have stepped up their efforts to implement the NEQS. Section 4.4.2 contains additional information about Pakistan's response to the problem of industrial pollution.

4.4 Analysis and Recommendations with Comments on the Direction of Environmental Policies

4.4.1 Constraints to Effective Environmental Protection

The following constraints to effective environmental protection can be identified:

- An Unstable Political Situation: In 52 years of independence, shifts between military government and democracy have been frequent and it is still not clear what kind of governing system Pakistan will have in the long run. In short, political instability prevails. Additionally, there are tense relations with India;
- A Deteriorating Economy: Partly as a consequence of the large defense budget, foreign debt continues to mount. Pakistan's per capita income is US$ 400 (1998-99) and has decreased in recent years. This has a direct impact on industrial pollution. According to World Bank research, there is a one per cent decline in the intensity of organic water pollution (the amount per unit of industrial output) for each per cent increase in per capita income. Overall, the data reveal that pollution intensity falls by 90 percent as per capita income rises from $500 to $20,000. Most important, the fastest decline occurs *before* countries reach middle-income status;
- Shortcomings in Institutional Capacity: Although in the past two decades a complete regulatory machinery has emerged, it is unable to implement environmental policies effectively. Technical know-how, training opportunities, planning capacity, adequate staff, infrastructure, monitoring systems and most importantly adequate budgets are lacking. For instance, the Pak-EPA has a well-equipped laboratory, but it is non-functional because of inadequate trained staff. Moreover, the current government has stopped funds for paying contracted staff. Although Pak-EPA was established in 1984, it is still housed in a rented building. Environmental regulatory institutions in Pakistan have been unable to enforce NEQS in Pakistan's industrial sector since 1994;
- Lack of Information: Environmental information has to be processed and organized and made useful for the policy maker, the manager, the technical expert, or the citizen. But the quality of the processed information – its reliability, representativeness (lack of bias), periodicity, and comparability – cannot be better than the quality of the primary data. Primary data collection (e.g., water quality data from various point sources, organic content of soils at various sample points, and so forth) is unfocused and scattered. Lack of information on cleaner technologies, sources of funding and assistance, and access to markets for environmental friendly products is also a major constraint for environmentally sound and sustainable development;
- Job Dissatisfaction: According to a recent analysis. "Officer level salaries in Pakistan have declined dramatically over the last three decades... At present, public sector salaries (for mid to senior levels) as percentage of private sector salaries are about 20 per cent in Pakistan compared to 110 per cent in Singapore and 70 per cent in Korea; they do not provide an adequate living. Salaries have [not] kept pace with inflation..."[9]. Corruption is one consequence of this situation;
- Financial Constraints: Budgetary cuts due to austerity measures, sanctions imposed by international community and cuts in development assistance programs are affecting the environmental agenda;
- System Hurdles: The cumbersome procedures of the administration seriously affect the implementation of new initiatives;

[9] The News of February 6, 2000, analysis on existing salaries in Pakistan

- Lack of Awareness and Political Will in Government: Although there is significant environmental awareness among the general public (particularly among the educated), environment is still a low priority area in government. Government ministries and line departments are unaware of the need for mainstreaming conservation in annual development plans. Budgetary allocations for the environment are low. In the last four years, the PEPC, the highest environmental policy making body, met only once. The GOP has been unwilling to stop subsidies on energy and water prices, which encourage inefficient resource use, as this may impact on industrial production costs, etc.;
- Inactive Local Government Institutions: The lowest tier in the government machinery can play a vital role in environmental protection and pollution control activities as they are close to the communities. But most of the time local governments have remained inactive. The present government is trying to revive local governments, so far without results; and
- Indifferent Attitudes of Industrialists: Industrialists are reluctant to accept suggestions for improvement, which is a major constraint for implementing pollution control measures.

4.4.2 Pakistan's Response to Industrial Pollution

In the past, environmental agencies in developing countries adopted a traditional command-and-control approach rather than formulating one that would be effective. By the early 1990s, regulators in many countries had concluded that these methods were too expensive and often ineffective, and more effective approaches to curb pollution are now being formulated. Pak-EPA's implementation of the SMRS, with the help of NGOs and private sector institutions, is a recognition of this situation. The consultative process in the case of NEQS involves the FPCCI, OICCI and industrial associations. To make this approach a success, an industrial development policy which integrates environmental concerns must be complemented by a first-class information system and an effective regulatory system. Regulatory agencies like Pak-EPA have also realized that conventional discharge standards would not be effective because they do not take account of actual abatement costs and local environmental conditions. The SMRS and Pollution Charge Programme help to solve this problem.

SDPI's working paper on NEQS[10] indicates that the establishment of transparent, broad-based national consultative process has helped the implementation of the program for NEQS. It further indicates that the most important lesson learnt has been the usefulness and effectiveness of the participatory policy making process, even though it has taken time and great deal of negotiation. A wide cross-section of the stakeholders permitted a wider understanding and greater sense of ownership in the design of the program. A neutral, business-government round table forum (the Environmental Standards Committee) ensured balanced representation, unbiased mediation and full transparency for developing the implementation program.

Recently, the relevant stakeholders and the concerned government departments have reviewed the implementation status of current laws and regulations. This review was summarized in Section 3.7. It is difficult to find substantial information on implementation because there are no appropriate monitoring mechanisms. But there are indications that there is progress in the form of legislation, regulatory agencies, NEQS, environmental tribunals, and related rules and regulations. In addition, informal regulations are also being adopted, and a new Environmental Policy of Pakistan is under review. Some of the policies/activities could not be implemented due to flaws in contract award procedures.

There is a need for more action particularly in the areas of priority setting, monitoring and enforcement and institutional capacity building. Some regulatory agencies like provincial EPAs (Punjab and Sindh) have

[10] Haroon Ayub Khan, "Implementing NEQS: Pakistan's Experience in Industrial Pollution Control, November 1998", *Sustainable Development Policy Institute (SDPI) Working Paper Series* # 38

started collecting baseline data on industrial effluent, but there is still a lack of meaningful data. Finally, ambient air and water quality standards and industry specific standards are yet to be developed along with a monitoring infrastructure.

4.4.3 Policy Recommendations

A recent World Bank Policy Research Report "Greening Industry"[11], has highlighted several innovative programs that demonstrate the potential for pollution reduction. It suggests that coordinated action on three fronts – economic reform, formal regulation, and informal regulation – can reduce industrial pollution significantly even in very poor countries.

The new approach proposed by the World Bank pays particular attention to the problems of the poor, who suffer heavily from pollution. Evidence from Mexico, China, and elsewhere has shown that education provides a powerful lever for improvement. Even poor people will not passively accept pollution if they are well informed about its sources and impacts. Through public education and maintenance of appropriate environmental standards, governments can help assure basic amenities and human dignity for the poor during the transition to greener industry. This is of direct relevance to Pakistan.

Most of the recommendations made below are of medium and long-term. The short-term recommendations in the following sections are in italics.

4.4.3.1 Strengthening of the Regulatory System and Institutional Capacities

The standards presently in use are not adequate and the monitoring and enforcement capacity of national and provincial EPAs is still weak. The following areas are identified for particular emphasis:

- Development of ambient air quality standards and drinking water quality standards;
- Strengthening of monitoring infrastructure for air and water quality, e.g., strengthening of laboratories and establishment of air monitoring stations;
- Updating existing monitoring protocols on the basis of the latest developments, for effective monitoring;
- Strengthening of staff capabilities in the areas of cleaner production, pollution prevention and monitoring, environmental audits, EIAs, public disclosure, community handling procedures and generally for the effective implementation of environmental policies;
- Procedural reforms for implementation of environmental laws, etc., with emphasis on increased responsibility, accountability and decentralization of authority;
- Effective government action to remove the financial constraints of regulatory agencies; and
- Improving job satisfaction and recruitment procedures (including safeguards against political pressure).

4.4.3.2 Self-Monitoring and Reporting and Pollution Charges

Experience in developing countries shows that pollution charges work well because they combine economic incentives for cleanup with maximum flexibility to factory managers. Pak-EPA should keep in view the lessons learned on similar programs in other developing countries such as Indonesia's PROPER, Brazil's FEEMA and Philippines Eco-Watch. Indonesia's PROPER led to remarkable results and suggests that performance ratings and public disclosure can be powerful tools

[11] "Greening Industry: New Roles for Community, Markets, and Governments", *World Bank Policy Research Report*, October 1999

for improving environmental conditions. FEEMA, the pollution control agency of Rio de Janeiro State, has ranked several thousand factories according to their contribution to the overall volume and risks of local air and water pollution. The analysis suggests that targeting only 50 factories in the top group could control 60 per cent of industrial pollution. Controlling pollution from 150 plants in the next group would eliminate another 20 per cent of the total. The Philippine experience with pollution charges was that plant managers, faced with a continuous payment rather than sporadic legal action, moved quickly to reduce pollution to the point where the marginal cost of abatement was equal to the pollution charge.

In view of the above, the following is recommended:

- *To be credible and effective, regulatory agencies should focus their effort, be transparent and encourage community participation;*
- *Target a small group of serious polluters, limit regulation to a few critical pollutants, effectively measure these pollutants for regulatory compliance and publicly document the activities;*
- *Pak-EPA should make efforts to raise public awareness in communities and markets, through public education on environmental quality, goals, progress and major polluters;*
- *Information on the pollutant discharge of factories and its effects on the health and economic status should be made accessible to general public and local governments;*
- *Information on possible actions by the industry to minimize those effects and the role of community should be made available through setting up special offices, awareness raising seminars/workshops, and use of media*;
- *In the Pollution Charge, more attention should be given to factors such as marginal social damage (MSD) vs marginal abatement cost (MAC) and the impact of marginal expected pollution penalties (MEP)***.**

4.4.3.3 Training for Small and Medium Enterprises

No formal survey of the SME sector in Pakistan has been undertaken in recent times, but it is estimated that about 9 to 10 million people are engaged in the rural informal sector and over 30,000 light engineering facilities exist[7]. SMEs mobilize community resources and help revitalize the local economy by catering to domestic and export markets. The two industrial triangles, Lahore-Sheikhupura-Faisalabad and Lahore-Gujranwala-Sialkot, are a witness to this phenomenon. SMEs however also generate a sizable amount of industrial pollution.

- There is a need to develop a specific policy for SMEs. It is recommended that a training program for SMEs be developed for cleaner production, pollution prevention at source and in-house environmental management. Industrial associations and the Small and Medium Enterprise Development Association (SMEDA) at provincial level can play a vital role in this regard. Specific focus should be on creation of mechanisms to help SMEs select and adopt least-cost process and pollution control technologies and appropriate management techniques;
- It is also recommended that economic incentives be provided to SMEs, such as easily accessible credit lines and import facilities for new technologies.

4.4.3.4 Establishing Industrial Estates

Firms benefit through industrial estates from land development, construction and common facilities such as power, security and communications. Industrial estates can provide centralized environmental services such as sewage systems, effluent treatment, and pollution prevention assistance and energy conservation measures. Such facilities can be particularly for SMEs, which may not be able to afford them individually. In Pakistan, industrial estates exist in all the four provinces,

[7] The News of February 7, 2000, article on (SMEs)

but they are deficient in several facilities and most importantly environmental infrastructure and services are not provided. Through the Board of Investment (BOI), the GOP has launched a scheme of National Industrial Zones (NIZs), including industrial estates, free industrial zones, free trade zones, export oriented units and estates for SMEs. There are however no location restrictions to export oriented enterprises. MoELG&RD needs to coordinate activities with BOI in this regard. The following measures are recommended:

- Help BOI in identifying locations where industrial estates would be an economical solution to the infrastructure needs of industries and where their developmental impacts can be maximized while their environmental impacts are minimized;
- Plan and establish estates, ensuring that environmental services and infrastructure are fully integrated in the design and operation of the estates;
- Attach advisory services to estates, including service points for information on cleaner production and environmental management;
- Establish integrated infrastructure and services on existing estates;
- Develop programs to promote industrial ecology within and among estates, including investment incentives for co-location of complimentary processes and design of processes to facilitate the cross-use of wastes; and
- Develop a national policy to regulate the number of industrial estates to correspond to the demand such that all are financially viable and can provide appropriate services and infrastructure for firms.
- *Pak-EPA should encourage carrying out programmatic EIAs for the proposed industrial estates*. For this purpose coordinating links should be established with the BOI. The programmatic EIA applies to an entire industrial estate is based on a carrying capacity analysis. This determines the maximum waste load that the local ecosystem can assimilate, the maximum amount of ground water extraction that can be allowed, or the level of air emissions ensuring acceptable ambient air conditions (determined from modeling techniques). From the carrying capacity of the area, a determination of the appropriate type or mix of industries, as well as the allowable intensity of development, can then be made. This should be incorporated into a management plan, which becomes the basis for issuing an environmental clearance for the industrial estate. The management plan can serve as a reference for compliance monitoring;
- *It is also recommended that a very clear policy indicating site selection criteria, zoning and type of industries be developed for selection of industrial estate sites, keeping in view long-term objectives for environmental protection; and*
- *For existing industrial estates, complete environmental reviews (including industrial audits) are recommended, followed by the development of environmental management plans that include identification of installation/operational costs for common treatment facilities.*

4.4.3.5 Strengthening Local Governments

Although this tier of government is not functional at present, the new national government is trying to revitalize them. Local governments can play a vital role in pollution control at the grass root levels. The following is recommended in this regard:

- Initiating a process of devolution of authority to the local governments;
- Establishing capacities in local governments for developing environmental performance criteria, cleaner production methods and public information/disclosure;
- Training of local governments in the interpretation and enforcement of environmental regulations, and the collection and use of community-based information.

4.4.3.6 Encouraging Industry to Adopt ISO-14000 Certification

- It is recommended that industries be encouraged to work towards achieving ISO 14000 Certification. This will require industries to follow standards for environmental management systems (EMS) and comply with NEQS.

Annex A: Implementation Status of Industrial Policies and Measures Proposed by NCS

Recommended Policy/Measures	Status
DEVELOP AND ENFORCE EFFECTIVE POLLUTION CONTROLS	
Collection of Statistics on Industrial Pollution	• Federal Bureau of Statistics: Compendium on Environmental Statistics of Pakistan 1998 indicates data on air and water pollution collected by Federal and Provincial EPAs. • EPAs have collected data on a number of variables including key air pollutants (CO, SO2, NOx, SPM, Ozone) in selected urban locations: chemical and organic contaminants in urban drinking water, major water courses and wastewater drains. Noise levels have also been collected at certain locations. Data is in uneven format, still it provides a useful baseline to estimate the cost of air and water pollution. • Punjab EPA has collected statistics on industrial wastewater for industries in Punjab. • Sindh EPA has collected data and has compiled water quality results for 118 industries. In addition, it has also recorded data on stake emissions for 5 Power Plants. • NWFP EPA's UIEP project has collected some statistics on the brick kilns in the surroundings of Peshawar. • Studies on water quality of river Ravi, River Kabul and Nullah Lehi have been caried out.
Establish government regulations and NEQS in consultation with industries	• Pollution Charge for Industry (Calculation and Collection) Rules, 1998. • Environmental Samples Rules, 1999 • Hazardous Substance Rules, 1999 • Environmental Laboratories Certification Regulations, 1999 • National Environmental Quality Standards (Self Monitoring and Reporting by Industry) Rules, 1998. • Pakistan Environmental Impact Assessment Procedures including Initial Environmental Examination and Environmental Impact Assessment Regulations 1998. The above mentioned rules and procedures have been developed and finalized through proper consultation with the private sector institutions and industry. The Law Ministry is reviewing the drafts of these rules and regulations.
Implementation program to control pollution by the government.	Pak-EPA with the help of Environmental Standards Committee, Expert Advisory Committee, SDPI and FPCCI has developed Self-Monitoring and Reporting System for Industry. Through this program the industry will examine and evaluate environmental performance on its own, and shall make the information on environmental parameters available to the EPAs. Originally this program was to be launched for implementation starting 1-1-2000 but due to some procedural formalities the launching of this program has been delayed. However, currently it has been decided that self monitoring and reporting system shall be introduced as a pilot activity. So starting January 1, 2000 a pilot phase has been started. The objective of pilot phase is to test the efficacy of the program.

Establish industrial wastewater treatment plants	In Karachi, Korangi Industrial area a water treatment facility is being planned for leather tanneries. Similarly, Kasur Tanneries Pollution Control Project is in advance stage of completion. This project is being implemented with the assistance of UNIDO.
Incorporate a program with the concerned government agencies for environmentally safe products	No action yet.
Promote latest industrial processes and technology	1. A Joint Program of FPCCI and the Government of Netherlands: "Environmental Technology Program for Industry" has made significant strides in this direction. The ETPI has completed its 1st phase and the Netherlands Embassy has recently signed an agreement with FPCCI for its 2nd Phase. The ETPI offers: • DATABASE DEVELOPMENT for comprehensive profiles of industries, Institutions and Environmental Markets on 'who is who' basis. • INSTITUTIONAL NETWORKING (INET) for smooth development and implementation of environmental policies/regulations from public to private sectors. • INSTITUTIONAL SUPPORT AND TRAINING (IST) to create Environmental Cells in the most relevant private sector institutions and train professionals to facilitate the realization of ETPI goals over a longer period of time. • DEMONSTRATION PROJECTS to demonstrate the viability of Cleaner Production (CP) options and End-of-Pipe (EOP) treatment technologies in sixteen selected industrial sectors of Pakistan. 2. UNIDO is helping to open a Cleaner Production Technology Center (CPC) for Oil an Gas Sector at Attock Refinery, Rawalpindi and is working on both a national CPC & sectoral CPCs for industries like sugar, textile, etc. 3. Project on Ozone Depleting Substances (ODS) -- with funding from GEF, UNIDO and World Bank is also an initiative in this direction., for instance: • GEF funds cleaner fuels & tune-up stations for cars. • Montreal Protocol Fund is ODS implemented by UNIDO, UNEP, WB and UNDP.
Incentive for old industries to shift to latest technologies.	Proposal submitted by SDPI to PEPC in March 1995. No information on the action.
PROMOTE CLEAN INDUSTRIAL PROCESSES AND RECYCLING	
Promote Recycling Technology and its dissemination.	1. So far no specific action in this direction has been observed. However, a very strong and efficient recycling community exists in Pakistan, which operates through scavengers, who collect paper, glass and steel products from general waste and sold back to the related industries. 2. In addition, there is a non-formal sector that treats the waste lubricants and oils and re-introduce it into the market. The observations about this sector are. There is an urgent need to do research in this area and streamline it on modern lines.
Encourage waste trading networks.	No Progress

<table>
<tr><td>Develop institutions to transfer environmentally benign technologies</td><td colspan="2">1. National University for Science and Technology (NUST) has made significant developments in the area of Solar Energy, particularly successes have been achieved for solar cookers and water heating systems. NUST is unable to commercialize its products due to financial constraints.
2. ENERCON plans to undertake study in the area of Fuel Cell Technology under UNDP funded Fuel Efficiency in Road Transport Sector Project. This study could not be implemented yet due to cumbersome contract award procedures.</td></tr>
<tr><td>Insist international organizations having business in Pakistan to meet or do better then the environmental standards in their home countries.</td><td colspan="2">1. Engro Chemicals Pakistan Limited (ECPL), the demonstration unit from the fertilizer sector has started implementation of environment improvement measures. Engro is also actively coordinating with SDPI and Pak-EPA for Self-Monitoring and Reporting Program.
2. ICI Pakistan has also started their environmental improvement Program in PTA Plant Karachi, and is also actively participating & Coordinating with SDPI and Pak-EPA for Self-Monitoring and Reporting Program.</td></tr>
<tr><td rowspan="4">Provide special incentives to industries having recycling technologies</td><td colspan="2">So far no special incentives package for recycling technologies has been announced. However, as a result of extensive negotiations between Environmental Standards Committee (ESC) and industry representatives, the PEPC has approved a detailed proposal of fiscal incentives to industry for pollution abatement or compliance with NEQS. The agreed incentives are given as follows:</td></tr>
<tr><td>Agreed Incentive/Recommendations</td><td>Current Status</td></tr>
<tr><td>1. National Development Finance Corporation may be designated as the Development Finance Institutions (DFIs) for channeling soft-term credit to industries for environmental purposes.
2. Purchase of equipment for pollution abatement may be given the most favored treatment, i.e., 10% with regard to import duty, sales tax, and no regulatory duty.
3. Most favored tax treatment may be extended to those developing indigenous technology for pollution control.</td><td>State Bank regretted to extend the credit line to industry through National Development Finance Corporation (NDFC) for this purpose
Presently pollution equipment are subjected to 10% customs duty with no regulatory duty.
No action has been taken.</td></tr>
<tr><td>4. The amount collected from pollution charges and other sources for the Provincial Environmental Trust Fund may be matched by proportional grants from the government.</td><td>This proposal was deferred due to financial constrains of government.</td></tr>
<tr><td></td><td>5. The use of the Provincial Environmental Trust Fund may be decided by the respective governing boards in accordance with the guidelines laid down in the recommendations of ESC.</td><td>No information</td></tr>
</table>

	6. Provision of accelerated depreciation of anti-pollution equipment within three years of income tax purposes.	Existing depreciation of plant/machinery is allowable as follows: - normal depreciation 10% - initial depreciation 25% - extra depreciation for double shifts 50% - triple shift 100%
ESTABLISH INCENTIVES FOR ENVIRONMENTALLY BENEFICIAL OR BENIGN INDUSTRIES		
Apply the current incentives of the national industrial policy to environmentally beneficial industries	No information	
Grant specific fiscal and trade incentives for defined categories of environmentally sustainable industry.	No information yet	
Develop incentives to offset the cost of environmental control equipment.	• CBR has given custom rebate on import of environmental equipment. Anti-pollution equipment has been placed under lowest tariff bracket • Efforts are being made to develop soft term credit line for industry.	
DEVELOP A POLICY TO SITE INDUSTRY IN AREAS OF LOWER ENVIRONMENTAL SENSITIVITY.		
Control on the location of industry in urban areas	• Government of Punjab, Environment Protection Department through Notification Number SO(G)E.P.D./4-27/98, Dated 20th August 1998 has imposed ban on the establishment/installation of new industrial units or expansion/extension in existing industrial units within the municipal limits of urban areas. This action has been taken keeping in view the acute environmental degradation due to the operation of industrial units. • Until recently any one planning to setup an industry in any area in any province had to obtain a "No Objection Certificate" from the provincial authorities. Punjab and Sindh had established elaborate locational rules, while NWFP and Balochistan placed no ostensible restriction on where an industry could be located. The 1984 Industrial Policy Statement of the Federal Government spells out these requirements in fuller detail. The locational restrictions in practice were exceedingly cumbersome and frustrating. After protracted negotiations, all provincial governments have finally agreed that the system of 'NOCs' was counter-productive. An official guide to invest now provides that "there is no requirement for obtaining NOC from the provincial governments for locating the industrial projects anywhere in Pakistan except in certain areas which are notified as negative areas such as within the municipal limits of urban areas.	
	• The effort of the authorities to promote industrial estates and export processing zones and the steps being taken to establish one window facility, at least among these industrial areas is a part of more promising actions to facilitate industrialization and at the same time protect the environment. • Aside from the above, the Environmental Impact Assessment Process which Pak-EPA is planning to implement as a necessary tool for future industrial developments, adequately addresses the location of an industry. The EIA process always offers appropriate mitigation measures and/or an alternate solution or shifting of project site to an environmentally acceptable place.	

Protect agriculture and sweet ground water area from pollution by industries	There is no such policy.
Clear demarcation between industry and residential area.	BOI's policy to develop industrial zones is a step towards this direction.
BUILD AWARENESS WITHIN INDUSTRY	
Awards for environmentally clean industry	No information -- Idea was discussed in PEPC in March 1995.
Sustainable development awareness through mass media.	Some action taken through workshops and seminars. There is still a lot to be done.
Promote pollution control systems as potential opportunities for business.	• ETPI Program of FPCCI and Netherlands government is working in this direction. • Dutch funded environmental marketing of textiles is an other initiative in this direction.
DOMESTIC AND INDUSTRIAL WASTEWATER POLLUTION	
Promote municipal wastewater treatment technology as industry.	Projects for sale of manure after treated municipal water are being developed in several cities. The CDA's treatment plant in I-9 sector already sells the manure to general public.
Focus the regulatory approach on industrial toxic effluents.	Implementation of NEQS through Self-Monitoring and Reporting System would be step towards this direction once implemented.
Stop industrial effluents from entering municipal sewers by providing alternate disposal methods.	No action yet.
Establish legal institutional and pricing system to support these measures.	No action yet.
Adopt biological treatment technologies	Research initiated at National Institute of Biological and Genetic Engineering Faisalabad.
URBAN AIR POLLUTION	
Change import duties/adjust taxes to favor fuel-efficient engines.	No action - but ENERCON is working to introduce the energy efficient technologies in the country.
Require new vehicles to meet lowest possible emissions levels achievable without catalytic converters.	Daewoo is introducing a new vehicle of smaller size in year 2000 for local use in Pakistan -- time will tell whether it is energy efficient or not.
Reduce the subsidies for kerosene to prevent its mixing with diesel.	Ministry of Petroleum and Natural Resources has taken action to reduce subsidy for kerosene to prevent its mixing with diesel. Impact is yet to be seen.
Consider terrain and wind characteristics when siting factories and generating stations.	Implementation of EIA process is a step in this direction. Pakistan Environmental Procedures has already been developed, which contain sectoral guidelines for EIAs of industries. However, formal implementation is still pending as presently IEE/EIA rules are under review by Law Division. Private sector Power plants are taking action in this direction.

VEHICLE EMISSIONS	
Promote good maintenance of motor vehicles and industrial boilers and furnaces	ENERCON is working in this direction. Setting up Vehicle tuning stations. Slow progress on industrial boilers. NWFP-EPA's Urban Industrial Environmental Protection (UIEP) program is working on vehicular emissions controls by introducing a concept of Vehicular Emissions Testing Stations in Peshawar.
Introduce lean urban engines	Ministry of Petroleum and Natural Resources Policy to encourage Compressed Natural Gas (CNG)/Liquid Petroleum Gas (LPG) use and conversion of two stroke Rickshaw engines to CNG is step towards this direction. CIDA is planning to export two Rickshaws to CANADA for research purposes.
Encourage the installation of catalytic converters in the vehicles.	No action
PROMOTE ENERGY EFFICIENT AND ENVIRONMENTALLY BENIGN TRANSPORT SYSTEMS.	
Develop and upgrade economical mass transit system.	Lahore Development Authority is in the planning stage for developing such a system for Lahore.
Upgrade public transit by providing comfortable bus/tram operations	Punjab government has introduced an Urban Transport System in Lahore with the help of Private Sector. Similar programs are underway for Rawalpindi and Karachi
Develop safe bike/bicycle ways as a health and environmentally benign mode of transport.	Action taken by Punjab Government at limited scale to develop bicycle lanes along major urban roads in Lahore, particularly Gulberg area.
Encourage a demand for small (highly fuel-efficient) cars that are on the drawing board of manufacturers through duties and incentives.	No action yet -- ENERCON plans to act in this direction.

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5.0 FAISALABAD CASE STUDY

5.1 Introduction

The objectives of this case study of Faisalabad District were twofold: to assess the actual environmental impact of industrial growth, particularly as influenced by GOP industrial policies, and to assess the effectiveness of environmental policies in reducing the environmental consequences of industrialization over the past 20 years. In addition, the case study identified measures that could mitigate environmental damage and adverse health effects due to industrial pollution.

The case study describes the nature and types of industrial units in the Faisalabad District, types of pollutants discharged by these units and abatement measures taken by them. The team also attempted to evaluate the impact of industrial pollution on the natural environment and human health. Lastly, it examines the awareness of the community about environmental degradation and personal mitigation measures.

The study used both primary and secondary data. The study team collected primary data through personal interviews with government and industry personnel, factory owners, laborers, and community members. The team collected secondary data from national, provincial and regional offices.

5.2 Background

5.2.1 Profile of the District[1]

Faisalabad District is a part of Faisalabad Division, which is one of the eight divisions of the Province of Punjab. There are two other districts in the Division, Jhang and Toba Tek Singh. The Faisalabad District in turn is divided into six sub-divisions, Faisalabad, Faisalabad Sadar, Chak Jhumra, Jaranwala, Samundri and Tandliawala. Figure 5.1 shows the Faisalabad district with its six sub-divisions and the approximate location of the two other districts as well as that of the two adjoining divisions of Gujrnawala and Sheikhupura.

The population of Faisalabad City in 1981, according to government census, was about 1.1 million. Some other government agencies estimate it to have been around 1.3 million. It was estimated to be growing at a rate of almost 4.6 per cent per year and the estimated population now is above 2.7 million.

5.2.2 Infrastructure and Facilities

There is one small industrial estate in Faisalabad in which Punjab Small Industries Corporation has provided infrastructure and facilities. Most of the industry located in this estate is producing value-added textile products like hosiery and ready-made garments.

There is discussion about the establishment of an industrial estate in the area of Khurrianwala in order to relocate textile processing units outside of the City.

All other industrial units are located in different parts of the City and/or along main roads. No infrastructure was provided to such industries as they grew up without any government assistance. Industrial units located within existing municipal limits mostly use domestic sewage lines for their wastewater. Major consumers of fresh water use their own tube wells for extracting ground water.

[1] Sources: Faisalabad Master Plan, FDA, and History of Lyallpur now Faisalabad, 1996

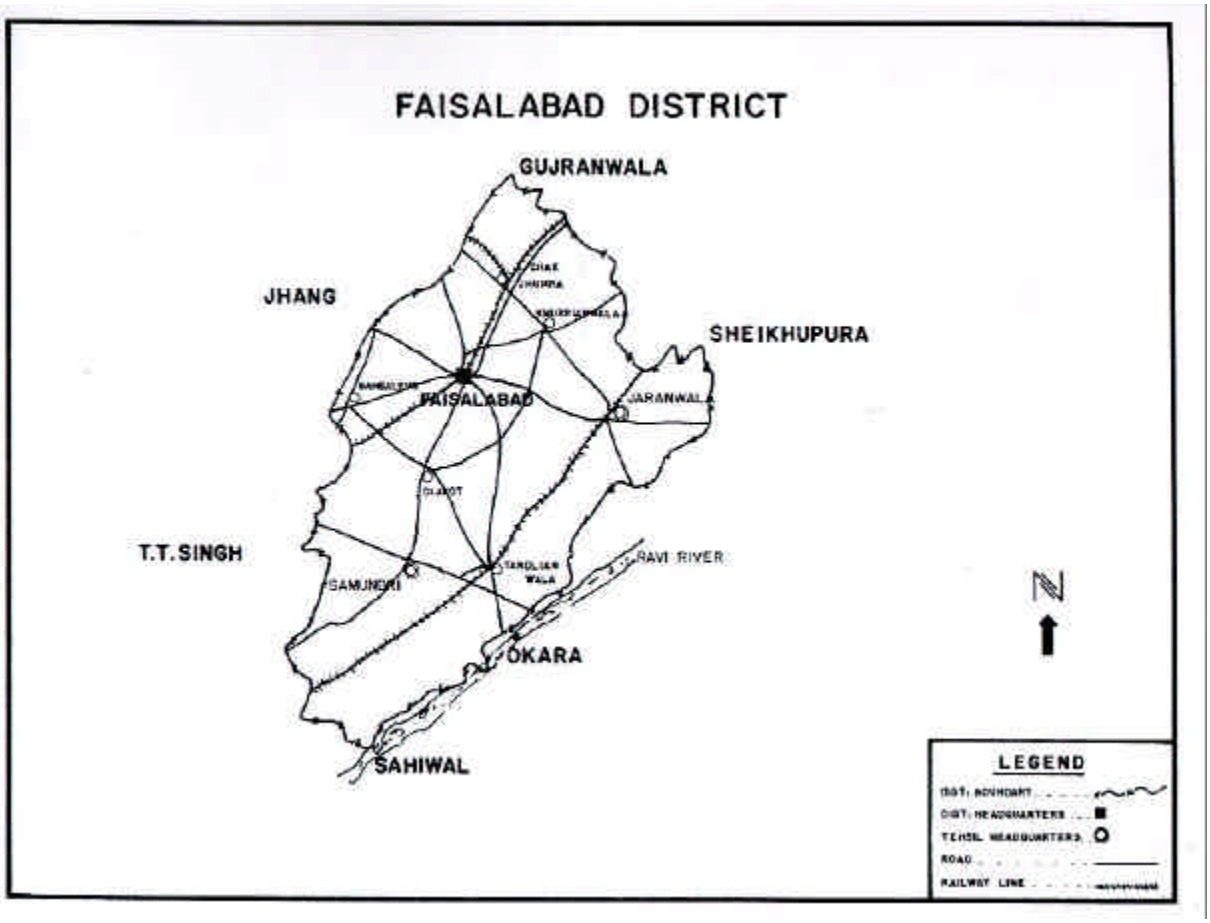


Figure 5.1: Map of Faisalabad District

5.2.3 Water Supply and Sewerage System

The Water and Sewerage Authority (WASA) is responsible for providing these facilities. Existing water supply systems serving Faisalabad are based on a combination of ground water and surface water sources. The major source of water, 56 million gallons per day (mgd) out of a total of 62 mgd, is drawn from the Chenab well field about 17 kilometers from the City. WASA has supplied only negligible quantities of water to the industrial sector in the past. Presently, they are serving 75 commercial and industrial units. Others are drawing their own ground water.

The existing sewerage system of Faisalabad is divided into Eastern and Western zones, formed by the Rakh Branch Canal passing through the middle of the City. Each zone has its own independent sewage collection and disposal system. Due to the flat topography, there are several sewage-lifting stations in the system. The raw sewage collected at these lifting stations is pumped into the disposal channels, which discharge it into two main seepage-drains, Paharang in the west and Maduana in the east, and ultimately into, respectively, the rivers Chenab and Ravi.

WASA has laid the western trunk sewer from the Nishatabad area of the City to the Paharang drain. It has a capacity of 40 cubic feet per second (cusec). Only a small quantity of this sewage water is industrial. WASA completed a sewage treatment plant for this wastewater in 1998 at a cost of Rs 130 million. This treatment plant covers 450 acres and has a treatment capacity of 90,000 cubic meters per day. The treated water is fit for irrigation and WASA has auctioned off about 20 per cent of this capacity to farmers. According to the personal interviews, a quantity of eight cusec was auctioned at Rs 450,000 per annum.

The industrial wastewater from Maqbool Road and its surrounding areas in the Eastern zone is estimated to be around 25-30 cusec. An estimated 15-20 per cent of this domestic. It is currently discharged into a public sewer leading to a pumping station at Satiana Road. WASA has also laid a

trunk sewer starting from the Abdullahpur area to the pumping station Satiana Road. The maize processing complex located in this area is discharging its wastewater into this trunk sewer.

5.2.4 Human Settlements

Population growth in different areas depended mainly on the level of available employment. Most of the factory workers are male and relatively young. They reside mostly in nearby localities and in small houses. Due to the usually long working hours in privately owned factories, responsibilities for household purchases mostly lie with women and elderly family members. Three wheeler transport, rickshaws and private buses are the normal means of transportation within the city.

Available information suggests that, starting in the 1980s, factories were generally established outside municipal limits and then attracted people. The growth of population in these areas remained unplanned. Basic facilities for health, water, sewage and education were gradually provided later. When the population increases, there is a natural pressure to extend municipal limits so that local government can provide facilities. Unfortunately this does not always happen; the Maqbool Road area and its adjoining streets still have semi-finished roads.

The population of Khurrianwala has also increased rapidly during the last ten years as a result of new industrial units. Apparently, there were about 60 houses in this area with a population of 4,000-5,000 persons ten years ago; now there are about 10,000 houses and 100,000 residents. Prices of land in the area have reportedly increased from Rs 150 to 70,000 per marla (250 square feet).

5.3 Industrial Profile

Important industrial sectors located in Faisalabad District are: fertilizer, caustic soda, tanneries, cotton spinning, yarn sizing, cloth weaving, cloth processing, hosiery, ready-made garments, sugar and distillery, iron and steel, fabricated metal products, chip/particle board, plywood, paperboard, glass products, plastic and rubber products, soap, matches, beverages, milk processing, maize processing and watches and clocks.

The only complete census of manufacturing is the one conducted in 1998 (Table 5.1). There are also data for 1992 in a booklet for investors, but these are only for some industrial units. The total number of units reported in 1998 was approximately 12,300, out of which approximately 10,530 were in the textile sector. Other major sectors were fabricated metals and food products.

The power looms sector is the backbone of industry in the Province of Punjab, especially in the case of Faisalabad District. It provides most of the job opportunities and exports 90 per cent of its final output. It is estimated that about 80 per cent of the industrial activity in Faisalabad is directly or indirectly connected with the power loom industry. Of the textile units, 95 per cent were classified as small and five per cent as medium size units. Of the other sectors, 89 per cent are classified as small and 10 percent as medium size. Industry in Faisalabad is therefore dominated by SMEs.

All these units are scattered throughout the city. However, some large factories, like fertilizer and caustic soda, are located well outside the municipal areas.

Table 5.1: Pollution Classification of Industries in Faisalabad District

		1998		1992	
		No. of Industries	**Per cent of Total**	**No. of Industries**	**per cent of Total**
More pollutant industries					
341	Paper & products	21	0.2	-	-
351	Industrial chemicals	6	0.0	5	0.1
353	Petroleum refineries	-	-	-	-
369	Other non-metallic products	19	0.2	11	0.1
371	Iron & steel	34	0.3	4	0.0
372	Non –ferrous metals	10	0.1	6	0.1
	Subtotal	**90**	**0.7**	**24**	**0.3**
Somewhat polluting industries					
311	Food products	570	4.6	150	1.6
313	Beverages	3	0.0	3	0.0
321	Textiles	10531	85.6	8363	90.4
323	Leather products	55	0.4	4	0.0
342	Printing & publishing	121	1.0	-	-
352	Other chemicals	178	1.4	122	1.3
381	Fabricated metals	286	2.3	317	3.4
383	Machinery, electrical	3	0.0	3	0.0
384	Transport equipment	-	-	-	-
	Subtotal	**11747**	**95.5**	**8962**	**96.8**
Less polluting industries					
314	Tobacco products	-	-	-	-
322	Wearing products	122	1.0	102	1.1
324	Footwear	2	0.0	-	0.0
331	Wood products	40	0.3	3	-
332	Furniture	-	-	-	-
354	Misc. petroleum & coal products	-	-	-	0.0
355	Rubber products	8	0.1	2	0.1
356	Plastic products	13	0.1	6	-
361	Pottery	10	0.1	-	0.0
362	Glass	4	0.0	4	1.6
382	Machinery, except electrical	224	1.8	148	0.0
385	Professional & scientific equip.	1	0.0	2	1.6
390	Other	40	0.3	-	-
	Subtotal	**464**	**3.8**	**267**	**2.9**
	Total	**12303**	**100**	**9255**	**100**

Source: Directorate of Industries, Lahore

There are no comprehensive data on the rate of industrial growth either for Faisalabad Division or District. One set of data, available from the Directorate of Industries, consists of data that does not account for power looms (which accounts for 85 per cent of the industrial units) and poultry farms (Figure 5.2). Assuming that these two sectors experienced growth similar to other sectors, it is clear that growth was strongest during the period 1981-90, and that there was a decline in the rate of growth during the period 1991-99. Another set of data, provided by the Faisalabad Development Authority in the Faisalabad Master Plan, 1986, shows industrial growth within Faisalabad City only up to the year 1985 (Figure 5.3). These data show that industrial growth started to accelerate in the mid 1960s, that maximum growth occurred during the period 1971-80 and that it started to level off in the 1980s. Personal interviews with residents and industry workers indicate that, during the 1980s, industry was generally established outside declared municipal limits.

Figure 5.2:

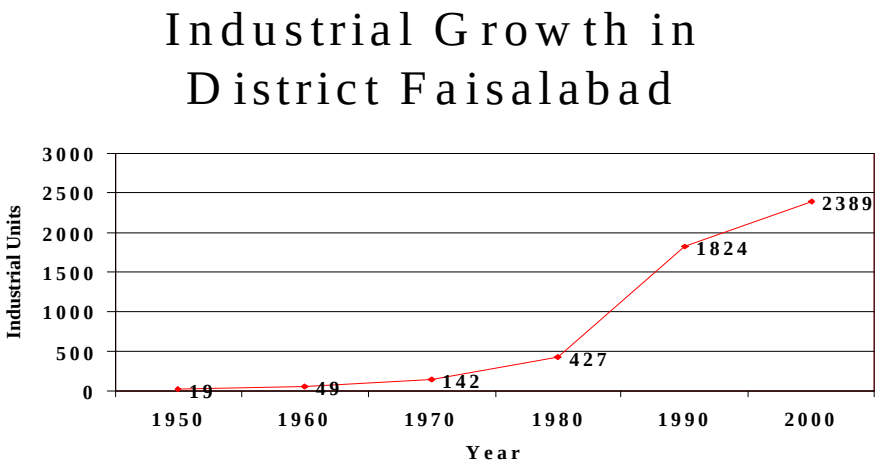
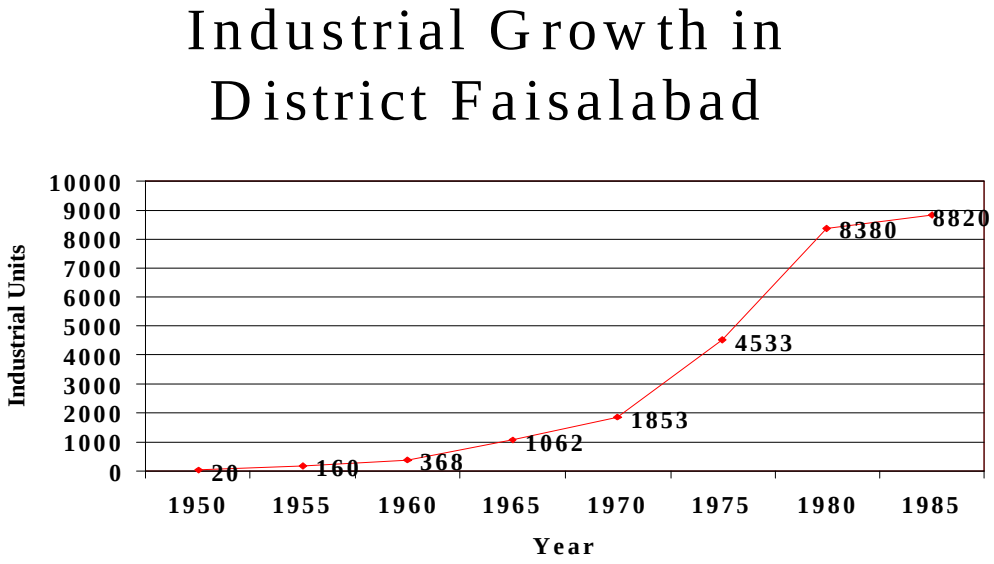


Figure 5.3:



5.4 Industrial Pollution Profile

Important industrial groups and their pollution potentials are described below in the most general terms. The case study team did not assemble the available data on industrial effluents and emissions.

5.4.1 Overview

Based on the pollution classification of industrial units in Faisalabad District, there are relatively few industrial establishments that are heavily polluting (Table 5.1). However, even a few of these establishments can cause serious local environmental problems. Most of the industrial units (almost exclusively textiles) are classified as somewhat polluting industries. Given their large number (particularly in textile processing), one would anticipate a significant discharge of chemicals, dyes and heavy metals into the environment.

5.4.2 Subsector Information

Fertilizer: There were two fertilizer plants in 1988. One of these, in Faisalabad City, was closed down in 1997. The only running plant is located at Jaranwala, some 30 kilometers away from the City.

Generally speaking, major pollutants from different fertilizer production processes are thermal effluents, ammonia gas and solution in water, sulfur compounds, nitrogen and carbon oxides, oil and particulate matter. Heavy metals like spent catalyst and chromate sludge are also produced as solid wastes.

Caustic Soda: There is only one plant in the district, located about 30 kilometers away from the City.

Caustic soda manufacturing process poses serious environmental problems. Mercury cells are still in use in Pakistan although membrane cells are now appearing as well. Major pollutants are chlorine gas (both as fugitive gas and point source) and solid sludge generated during brine preparation and purification. In the case of mercury cells, additional pollution potentials are mercury concentrates in the wastewater streams (typically ranging from 0 to 20 ppm) and generation of hazardous solid wastes containing mercury.

Cotton Spinning: There were 15 composite spinning/weaving units in 1988 and 20 in 1992. The latest figures indicate that there are 47 such units in Faisalabad Division with a 135,0000-spindle capacity and providing employment to about 38,000 workers.

The pollution problem associated with dry spinning process is air contamination due to dust and lint. Most of the large mills have installed filtering systems for dust collection.

Cotton Weaving and Sizing: The total number of weaving units was 7,722 in 1988 and 8,000 in 1992. Almost all of these units are small, family-run units working in congested areas. The number of yarn sizing units working for the power loom sector was 97 in 1988 and 101 in 1992. It is estimated that the current number is about the same.

Liquid effluents from this sector are moderately polluting as some sizing agent is drained into the sewage system. Noise pollution is associated with the weaving operation.

Textile Processing: Textile processing includes operations like de-sizing, bleaching, mercerizing, dyeing, printing and finishing. The number of processing mills was 150 in 1988 (9 large, 48 medium and 93 small units) and 152 in 1992. The number of units reported in 1999 was also 150. These mills process about 500 million meters of cloth annually and provide employment to around 6,000 persons.

Liquid effluents from processing mills are highly polluting due to the presence of chemicals, dyes and heavy metals used during different process steps. Combined wastewater is usually hot and alkaline and contains substantial pollution loads in terms of organic matter, fibers and grease. The presence of heavy metals like copper, iron and lead also makes these effluents highly toxic.

Sugar and Distillery: There are three sugar mills and one distillery in the district. One sugar mill with a distillery is located within the municipal limits and the other two sugar mills are outside the City. The crushing capacity of these mills is 2,000-2,500 tons daily, whereas the distillery has a capacity of 2.8 million liters.

Liquid effluents from sugar mills originate from processes in the mill house, process house and distillery. Major pollutants generated are organic matter, suspended solids, oils and greases and dissolved solids. Wastewater from the distillery is particularly problematic from environmental point of view due to very high levels of organic chemicals in it.

Bagasse constitutes about 30 per cent of the crushed cane. This contains around 50 per cent moisture and is mostly burnt in boilers as fuel. This operation produces heavy air pollution in the form of fly ash. This is a serious environmental problem for the surrounding community. The problem is only partially addressed by water spraying. At some places, this problem is partially controlled by using bagasse as raw material for chipboard manufacturing.

Tanneries: There were 55 leather-tanning units in 1988 in the Faisalabad District. The small units in this sector mostly used an indigenous vegetable tanning process to produce textile parts like pickers and buffers. With the passage of time, these operations have been replaced with more durable imported synthetic products and most of these units are now closed.

Tannery wastewater is highly polluted, mainly due to high level of sludge that contains 3.5-6.5 per cent solid content, 20 to 50 per cent volatile matter and 50-75 per cent inorganic matter. Chrome tanning produces highly toxic effluents due to the presence of chromium.

Plastic, Glass, Rubber: There were five small plastic products and polythene producers in 1988, and six in 1992. The number of employees per unit is between two and nine. Four medium-size factories are producing glass products, with an annual installed capacity of 1,800,000 pieces. These units employ 42-75 persons. The factories are scattered in different localities. Seven small units were producing miscellaneous rubber products and one medium-size unit was producing rubber belts for different applications in 1988. Only two such units were reported in1992.

Environmental concerns in plastic, glass and rubber products are potential air contamination due to release of chemicals.

Paper Board: Twenty-one small units, producing paper cones and packing material mainly for textile industry, were reported working in 1988. Employment at these units was between five and twelve persons. No recent data on this sector are available. Personal inquiries revealed that some of these units are now working intermittently, producing unbleached paperboard products.

Wastewater from paper and paperboard mills is also very polluting and contains very high organic matter and suspended solids. The bleaching process is a very environmentally unfriendly process as it produces complex chlorinated compounds, which are very dangerous for human health.

Steel Casting, Re-rolling and Fabricated Metal Products: Twenty-nine small foundries were reported in 1988. Apart from many cottage-scale units, one medium-size foundry with an annual installed capacity of 5,400 tons is presently in operation. Small units employ between two and nine persons and can produce 10 to 100 tonnes annually. Steel casting units feed a number of industries making ferrous and non-ferrous products like textile machinery and parts, agricultural equipment and parts, auto parts, blocks and crankshafts.

An estimated number of 139 fabricating units are producing agricultural equipment and parts. Nine of these are medium-size units and the others are small. Thirty-two units are producing textile machinery and parts. Units producing other fabricated metal products number 237. Most units are operating on a single shift basis with a capacity to produce 5,800 wheat threshers and 8,000 power looms and their parts annually.

Air emissions from furnaces are highly polluting as they contain organic and inorganic materials. Toxic inorganic and heavy metals are also emitted from induction furnaces. Air emissions from electric induction furnaces contain heavy metals like zinc, lead and nickel in the range of 5 to 50 kg per ton of scrap melted.

Vegetable Ghee, Edible Oil and Soap: Twelve vegetable ghee and cooking oil units were reported in 1988 and 10 units in 1992. All vegetable ghee units are large units, each producing about 120,000 tons annually and employing between 250 and 550 persons. Cooking oil units are each producing about 100,000 tons of edible oil annually, with 10-32 employees per unit. In addition, there were 119 soap factories in 1988. Six of these were medium in size, all others were small. In 1992, there were 111 soap and silicate plants with total annual installed capacity of 3,900 tonnes. This figure apparently includes around 25 units producing 38,800 tonnes sodium silicate annually.

Wastewater from edible oil processing is highly polluting due to a high organic and inorganic matter, solids and oil and grease content. Nickel has also been documented. Non-process water (about 95 percent of the total quantity) mixes with process water to make combined effluents moderately polluting.

Maize Products, Beverages, Milk Processing and Food Products: There is one maize-processing complex in Faisalabad, which has an annual installed capacity of 80,900 tons. It is producing starch, glucose, corn oil, glutton, dextrose and custard powder. This unit has been established with foreign collaboration. There are three units producing soft drinks, with a capacity of 1,540 bottles per minute. About 500 workers are employed. There are four small units processing 32 million liters of milk annually. Four dairy farms are producing an estimated quality of 2.2 million tons of milk annually. Nine small ice cream factories have annual installed capacity of 35.5 ton on a single shift basis. There are 10 small factories producing an estimated quantity of 90,000 bottles of fruit juices and squashes annually. Two soda water factories have annual installed capacity to produce 200,000 bottles.

Liquid effluents from food processing units are moderately polluting due to high organic matter and total suspended solids.

The limited data collected on industrial effluents confirm the impression that all industrial units discharge pollutant loadings that currently exceed NEQS and have probably done so far quite some time (Table 5.2). These high pollutant loads to the environment pose a serious threat to the surface as well as sub-soil water.

Table: 5.2: Wastewater Analysis of Industries and Receiving Drains in Faisalabad

S. No.	Industry/Source	Discharge (Cusec)	Sample Date	pH	BOD5 mg/l	COD mg/l	TDS mg/l	TSS mg/l	Cl mg/l	SO4 mg/l	S mg/l	Others mg/l
	NEQS			**6-9**	**80**	**150**	**3500**	**200**	**1000**	**600**	**1.0**	**O&G = 10**
	Textiles											
1.	Sitara Textile Mills	0.8	18.8.1998	9.9	480	1230	4810	970	2400	370	1.3	
2.	Ihsan Yusuf Textile	1.5	14.7.1998	11.8	210	900	5250	1620	1050	750	3.5	
3.	Al-Karim Dyeing & Printing	0.25	14.7.1998	8.0	210	810	3460	930	1100	660	0.5	
4.	Al-Rafiq Dyeing	0.8	25.9.1997	7.7	1100	2600	4790	370	1150	710	0.5	
5.	Chenab Fabrics	0.25	7.10.1997	8.2	190	380	4200	130	1050	500	0.5	
6.	Hilal Corporation (Dyeing Unit)	0.10	4.6.1998	6.7	540	2460	5560	470	1600	580	12.0	
7.	Hilal Corporation (Printing Unit)	0.25	4.6.1998	8.8	480	2300	5280	200	1010	800	0.2	
	Food and Beverages											
8.	Aizad Beverages	0.5	20.5.1999	10.9	460	830	3820	170	340	410		
9.	Rafhan Maize Products	-	March 2000	-	1390	2810	3130	370	-	-		
	Chemicals											
10.	Captain Chemicals (Sod. Silicate)	0.25 0.10	18.8.1998 19.7.1999	8.8 10.4	100 50	350 130	4100 12420	670 340	1100 1000	800 790	0.5 -	
11.	Sitara Chemical Ind. (Chlor-alkali)	0.06	22.9.1997	5.4	360	4400	100160	2600	46000			
	Others											
12.	Rehan Straw Board	0.25	16.3.1999	7.3	600	1520	4900	1810	1801	922		
13.	Madni Ghee Mills	0.25	28.1.1999	6.8	480	1072	4050	210	1101	-	-	O&G = 60
14.	Dawood Flour Mills	0.5	18.8.1998	6.5	570	1200	3790	2880	550	440	3.0	
	Receiving Drains											
15.	Maduana Drain after mixing with Satiana Road Pumping Station Wastewater	-	11.6.1999	7.4	252	560	3350	1250	580	832	280	
16.	Maduana-Smundri (Mixed) Drain	10.54	10.4.2000	8.4	161	180	-	152	-	-	-	D.O = 0.4

Sources: Environmental Protection Department, Punjab (EPD), Pakistan Environmental Protection Agency (PEPA), Joint Study with JICA

5.5 Environmental Effects of Industrial Pollution

The Agricultural University of Faisalabad conducted two studies to determine the levels of total dissolved solids (TDS), sodium, chloride and heavy metals like iron, copper and lead in the wastewater, mainly from textile processing, and their leaching into ground water. The study was conducted on the main sewage carrier water from the Sammundri Road/Maqbool Road factories along with industrial and domestic wastewater from surrounding areas like Ghulam Rasool Nagar and Peoples Colony #1. The study shows that the annual incoming quantity of heavy metals and rate of their leaching into the ground water is quite high.

The results also show that leaching of salt and metals through the unlined portion is 3.5 times more than the seepage losses in the lined section. The annual incoming quantity of toxic metals, rate of their leaching and total leaching of salts and metals per annum through eight-kilometer length are given in tables 5.3 and 5.4

As a result of this contamination, ground water was found unsuitable for drinking purposes within a strip of 300 meters on both sides of this open sewerage line. It has been documented, and also checked through personal visits, that hand pumps have been installed within this strip for drawing water for drinking purposes. In addition, the sewerage water, which is unfit for agricultural purposes, is also used in this area to supplement canal water during short supply periods.

Random samples of subsoil water from different areas of Faisalabad City found that water quality on either side of Rukh Branch canal was better than all other areas, probably due to surface water seepage from the canal into underground water[2].

Table 5.3: Total incoming quantity of metals and rate of their leaching

Metal	Total incoming quantity Tonnes	Leaching per km/ tonnes
Iron	107.39	6.66
Copper	122.08	8.40
Lead	19.43	1.20

Reference: Niaz Ahmad et.al, Faculty of Agri.Engg. and Tech., University of Agriculture, 1994

Table 5.4: Annual leaching through eight kilometer length of open drain line

TDS Tonnes	Chloride Tonnes	Copper Tonnes	Lead tonnes	Sodium Tonnes	Iron Tonnes
3222	897	67.17	8.14	2165	53.30

Reference: Niaz Ahmad et.al, Faculty of Agri.Engg. and Tech., University of Agriculture, 1994

5.6 Impacts on Health and Livelihood

Through personal visits and interviews, it was observed that only a few large industrial units (like Sitara Chemicals, Jaranwala Fertilizer and Nishat Textile) are providing health and safety facilities to their workers. A majority of workmen are using dyes and chemicals without any protective arrangements.

Only limited data are available to provide information on the actual effect of these unsafe practices on the health of the worker. It was concluded through interviews with factory management and workers that they are mostly unaware of adverse health effects of various dyes and chemicals. Similarly, a large majority of the population living on both sides of Satiana Road, which carries industrial effluents eight kilometers through to Maduana main drain, is unaware of adverse effects of contaminated drinking water and the effect on agricultural products when industrial effluents from open drains are used for agricultural purposes. There is, however, an interesting observation in this regard. It is common practice in Faisalabad that residents prefer to use drinking water from tube wells drilled around Rukh Branch canal, as if they appear to be aware of its relatively better quality.

Data were collected from the District Health Officer and the Medical Superintendent, Social Security Department on the number of patients treated for 18 priority diseases during the period 1998 and 1999. They refer to First Level Health Care Facilities (FLHCF) treating non-workers and Social Security Facilities (SSF) treating factory workers and their families respectively (Table 5.4). Analysis suggests that cases of suspected viral hepatitis and cough are much higher in the worker category. Further study is needed to determine the factors responsible for the rising trend of these diseases in workers category.

[2] Khalil-ur-Reham et.al, Department of Chemistry and Biochemistry, University of Agriculture, 1991

Table 5.5: Health data

No.	Priority Disease	FLHCF (Non-workers)		SSF (Workers)	
		1998 (per cent)	**1999 (per cent)**	**1998 (per cent)**	**1999 (per cent)**
1	Acute Respiratory Infections	59.12	62.04	21.11	41.34
2	Diarrhea	11.92	11.34	18.84	10.42
3	Dysentery	7.76	7.20	13.88	3.39
4	Fever (Clinical Malaria)	9.72	8.85	-	11.81
5	Cough (more than two weeks)	1.40	1.63	15.66	11.02
6	Suspected Viral Hepatitis	0.11	0.04	24.19	9.38
7	Dog bite	0.58	0.45	-	8.02
8	Scabies	9.28	8.34	-	3.88
9	Goiter	0.03	-	6.33	-
	Total number of patients	308,872	479,973	18,411	12,895

Sources: District Health Officer and the Medical Superintendent, Social Security Department

5.7 Assessment

5.7.1 Impact of Industrial Policies

There were seven cotton ginning factories and one textile mill in Faisalabad Division when Pakistan was created in 1947. As a result of people migrating from India brought substantial entrepreneurial abilities in this field and industrial policy to ameliorate the situation of extreme backwardness, the city soon grew up to be known as 'Manchester of Pakistan'.

Most of the financial investments in SMEs in the textile sector were made from family sources. As a result of nationalization of large/medium units in 1972, investment was diverted towards sectors that were not covered under nationalization policy, such as textile processing units.

Under economic liberalization policy after 1980, government controls on establishment of industry were gradually reduced. The Government of the Punjab issued a notification for this purpose in 1984 that was amended later from time to time. This order removed the restrictions of prior approval in general with the exception of only specified type of industries in specified areas. Industry, except some service units, could not be set up within municipal limits. Through subsequent amendments in 1986,1989 and 1991, the restrictions were gradually reduced to apply to only four industry groups. The investment limit for industries to be set up outside municipal limits was increased from Rs.100 million to 700 million in 1989. In 1991, this limit was totally removed.

Location is forbidden where no suitable effluent disposal arrangements are available, where there is any public nuisance or where there are restrictions on location. As a result, industry started growing along the main roads outside Faisalabad City. One of the main locations where textile-processing mills were established is the Khurrianwala-Jaranwala Road, about 20 kilometers from the City. These mills are generally large and mainly cater for exports, encouraged by economic liberalization and benefits for exporters.

5.7.2 Water Charges and Fees

A survey was conducted on water and sewerage charges within and outside city areas. These charges are much higher within municipal limits. WASA is charging Rs.6,050 per cusec per month for extracting ground water and Rs.26,000 per cusec per month for wastewater disposal by the textile industry. This is practically a fixed tax, as both these quantities are estimated on the basis of installed capacity of tube wells. At Khurrianwala, there are no charges on ground water extraction, whereas wastewater charges are Rs.11,000 per cusec per year. This is only 3.5 per cent of WASA charges. Textile processing units within the City also have to pay an indirect tax in the form of clearing frequently choked sewerage lines at their own expense.

5.7.3 Environmental Awareness and Practices in Faisalabad

This study found that only a few large industrial units are familiar with their environmental obligations under the existing laws. None of the factories, except few large units, have made separate organizational arrangements for addressing environmental issues. In addition to two large units producing caustic soda and fertilizer, only two textile mills (Nishat and Sitara) and one other factory (Rafhan Maize Products) have established environmental sections. This survey also found that informal contact between provincial Environmental Protection Department (EPD) staff and industry/associations is practically non-existent. Most of the factory staff are not aware of the heath hazards associated with industrial pollution. A majority of units have limited technical capacity and financial resources for environmental management. Information about environmental issues normally does not travel down to the technical staff of such factories.

As indicated above, all the industry in and around Faisalabad City is discharging untreated wastewater into sewerage or public water sources. In most of the areas within the City, there is no space for individual or combined wastewater treatment facilities. None of the factories, except large textile mills, have installed any air pollution control system.

5.7.4 Compliance with Environmental Regulations

Environmental Impact Assessment: Preparation of EIAs was required both by PEPO of 83 as well as in Pep-Act of 97. However, none of the existing factories in Faisalabad, including the several built after 1983, prepared EIAs.

Environmental Monitoring/Self-monitoring: The majority of the industrial units are not monitoring their discharges and emissions. Two large units producing caustic soda and fertilizer, two textile mills (Nishat and Sitara) and one other factory (Rafhan Maize Products) in Faisalabad are monitoring their liquid effluents. One of them (Nishat) is also voluntarily participating in SMRS.

National Environmental Quality Standards (NEQS): In the absence of regular monitoring, no reliable record is available on compliance or non-compliance with NEQS. Limited available data on different sectors indicate that majority of industrial units in potentially polluting sectors are not complying with NEQS. No data are available on total pollution load being generated by these sectors. There is a general perception that concentration-based NEQS would encourage dilution within production processes.

Environmental Tribunals and Environmental Committees: Two tribunals have already been established under the Pep-Act of 1997, one in Lahore and another in Karachi. The Punjab Government has also constituted Environmental Committees at the provincial and divisional levels. Divisional Environmental Committees (DECs) include members from Chambers of Commerce and Industry, EPD, NGOs and different government departments. The DEC in Faisalabad is fully functional.

Under section 16 of the Act, the EPD has started issuing notices to potential polluters in the province including Faisalabad. Forty-one industrial units in Faisalabad were issued 'Hearing Notices' and, after hearing their point of view, 19 of these units have been issued 'Environmental Protection Orders'. The EPD has also referred some cases to the Tribunal.

5.7.5 Upgrading of Machinery

Interviews with the management of textile processing mills revealed that investments had been made by many of these units to replace old machinery, to improve production capacity or product quality. Any environmental improvements associated with this upgrading were incidental and has not been documented. There has been no upgrading specifically to address pollution.

5.8 Recommendations

5.8.1 Combined Treatment plant for Maqbool Road and Sammundri Road

Maqbool Road and adjoining area is generating about 30-40 tons BOD every day. Industrial effluents are highly toxic due to the presence of heavy metals like copper, iron and lead. Sewage water from this area goes to Satiana Road Pumping Station. Domestic wastewater from other areas like Ghulam Rasool Nagar mixes with this sewage line somewhere in the middle. It should therefore be feasible to segregate this sewage line up to the pumping station at Satiana Road and construct a combined treatment plant there, as open land is still available around that area. In order to design a combined treatment plant, further testing of industrial wastewater is recommended. Similar, plants are recommended for the Sargodha Road and Sammundri Road-Jaranwala Road areas. Segregation of industrial wastewater in the city areas can be further studied with the help of WASA.

5.8.2 Cleaner Production Programme

In addition to the combined treatment plants, a cleaner production programme for textile processing should be initiated. This programme could be implemented quickly to address pollution problems of this sector. Experience in other countries suggests that 30-40 per cent improvement in water consumption and pollution levels could be achieved with relatively small investment. This programme could start with a limited number of units and then gradually be extended to others with the help of trained staff. With the implementation of this recommendation, the cost of combined treatment plants would also be substantially reduced.

5.8.3 Land Use Plan

Environmental problems associated with industrial growth can be best addressed, on long term basis, by preparing integrated an Geographic Information System (GIS) based land use plan for different areas, including Faisalabad. The pollution potentials of different industrial sectors and the increasing volumes of industrial wastewater should be taken into consideration in the plan. This plan should include a decentralization policy that promotes a shift of industries to locations which are suitable for industrial operations (availability of road infrastructure, access to markets, etc.) but where it is possible to keep industrial activities separate from residential areas. The development of industrial zones, based on a well-considered land-use plan, could attract foreign investment from which both industrial growth and environmental management could benefit.

5.9 Conclusions

Faisalabad is one of the many cities of Pakistan where industrial growth remains disorganized. In spite of this, the City is one of the most dynamic areas in the country. It is believed to be the second largest industrial city after Karachi. Till the early 80’s, manufacturing growth was mainly concentrated around the center. SMEs dominated manufacturing. During last ten years or so, major industrial growth has shifted outwards to areas along the main roads, especially along the Khurrianwala-Jaranwala Road. Industrial policies have been successful in influencing a relatively faster growth of export oriented manufacturing groups, but have failed to address environmental impacts associated with this growth.

Faisalabad is now faced with serious environmental problems of air and water pollution, which is partly a result of industrial growth. The profile indicates that several industrial sectors are seriously polluting and hazardous. Industry is not in a position to undertake pollution control measures due to limited financial resources and technical capacity. Moreover, there is no space for combined treatment facilities in built-up areas. Residential areas for the workforce have followed the location of industry, and in consequence residential and industrial land use are mixed with serious public health consequences.

There are several ways of addressing pollution problems and their consequences. One way is to identify the major constraints and recommendations for addressing environmental problems in Faisalabad (Table 5.6). These constraints and recommendations need to be addressed before significant progress can be made in reducing industrial pollution in Faisalabad.

Table 5.6: Constraints and recommendations for addressing industrial environmental problems in Faisalabad

S. No.	Constraints	Recommendations
1.	*Data Compilation and Dissemination System*: There is inadequate cross-section and time series industrial and environmental data available, data compilation and dissemination system is manual and there is no co-ordination while collecting industrial and environmental data.	Industrial and environmental data should be compiled electronically under a uniform system of industrial classification, communities should be given a right to access this data and Divisional Environmental Committee (DEC) should be assigned coordination functions
2.	*Monitoring of Discharges and Emissions*: The majority of industrial units are not monitoring their discharges and emissions	The Government should enforce self-monitoring system and also crosscheck some percentage of these reports for authenticity.
3.	*Awareness and Cost of Inaction:* There is a lack of awareness of environmental problems and their cost to individuals and society.	A series of awareness-raising activities *in local language* such as community education programs, use of mass media and simulative activities.
4.	*Lack of assigned responsibilities within industrial units*: Most of the industrial units have not clearly assigned to any individual the responsibilities of dealing with environmental issues.	Regulatory bodies should issue written instruction in this regard and receive nomination of at least one suitably qualified person from each industrial unit. This recommendation can be implemented in stages.

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6. KARACHI CASE STUDY

6.1 Introduction

This study of the Sindh Industrial Trading Estate (S.I.T.E.) in District West Karachi (S.I.T.E. DW) had two objectives: to assess the environmental impact of industrial growth, and particularly the role of industrial policies in this context; and to assess the effectiveness of environmental policies in reducing the environmental impact of industrialization over the past 20 years.

Environmental legislation has so far gone almost entirely unimplemented in S.I.T.E. DW. Therefore, this case study focused on investigating the awareness of the newly issued National Environmental Quality Standards (NEQS) in S.I.T.E. DW and the anticipated effect of the upcoming implementation of these standards on industrial establishments. In the absence of strong enforcement of environmental laws, other measures to mitigate impacts, such as market instruments, private sector initiatives and community activism were also considered.

S.I.T.E. DW was selected as an area for investigation because it is a large well-established industrial estate close to the sea. The impacts of industrial activity on the marine environment were researched using secondary sources. Data from hospitals in the area were used in order to establish disease patterns for S.I.T.E. DW workers and community members that could be compared to similar hospitals serving populations not as directly affected by industrial pollution. The dynamics of community development were also investigated to improve the interaction between industry and community, and the subsequent effects of industrial pollution on health and livelihoods.

6.2 Background

6.2.1 The City of Karachi

Karachi is Pakistan's only port city and is therefore extremely important as a manifold of commercial and industrial activity. The city accommodates 70 per cent of the country's total industry and provides employment opportunities unparalleled in the rest of the country[1]. Growth in the city has occurred unchecked, the population of the city almost doubling every decade since the 1950s to its current figure of well over 10 million. The high natural rate of population increase is compounded by very high rates of in-migration from other parts of the province and country. The rapid growth of the city, lack of effective land sue planning and lack of investment in and maintenance of essential services have led to grave environmental problems.

Karachi uses approximately 500 million gallons per day (mgd) of water, discharges at least 250 mgd of sewage and generates 3,000-5,000 tonnes of solid waste. Approximately 70 per cent of wastewater reaches the marine environment without any form of treatment, and the city has the capacity to properly dispose of only 20-33 per cent of its solid waste. There are three sewage treatment facilities for the city of Karachi and none of them run at full capacity, due to a deteriorating collection system and the inefficient removal of pollutants. The problem of sewage and solid waste disposal is complicated by the rapid growth of unplanned settlements.

The responsibility for solid waste collection and disposal rests with the Karachi Municipal Corporation (KMC). The city has two landfill sites, each with an area of 500 acres and a combined capacity to absorb 2,000 tonnes of waste per day for 20 years. There are also many undesignated dumping areas, which KMC is attempting to close. Many government and private incinerators also exist, although most deal exclusively with solid waste incineration from hospitals. Although the city's landfills have the capacity to absorb most of the daily waste produced by the city, the collection and

[1] IUCN – The World Conservation Union, "Korangi Tanneries Combined Effluent Treatment Plant," *Proceedings from the Second Consultative Workshop*, Karachi 1993

disposal system is poorly administered with the result that much of the city's waste goes uncollected for long periods. Wastes are scavenged and burned, exposing scavengers to health hazards, adding to the already severe problem of air pollution and creating opportunities for pests to breed and to spread diseases.

Land use planning in Karachi is covered by the Town Planning Act (1935), and the Karachi Building and Town Planning Regulations (1979) under the Karachi Building Control Ordinance. These regulations are currently being amended. The Karachi Building Control Authority, closely linked to the Karachi Development Authority (KDA), is responsible for the implementation of these laws and regulations. New legislation entitled the Karachi Division Physical Planning Agency Ordinance has been proposed and is currently under consideration by the government of Sindh. Karachi has also produced two master plans to direct development and land use in the city. The first was the Karachi Development Plan 1974-1985 and the second, finalized in 1991, the Karachi Development Plan 2000. Both remain largely unimplemented due to lack of funding, difficulties in enforcement and complicated institutional arrangements and co-ordination.

Enforcement of land use and zoning regulations is difficult and the capacity of the authority responsible to do so would need to be greatly enhanced. Although specific areas are earmarked for industrial use, industries have located in areas marked for other land uses (residential, agricultural, etc.), and once they have established themselves they are very rarely relocated. Enforcement is complicated by the fact that the federal government currently controls industrial location, though local authorities are in a better position to judge the proper location of industries within the city or within a particular industrial estate. Requiring a No Objection Certificate (NOC) from the KDA, or at least closely consulting with them in the process, would improve the effectiveness of industrial siting.

One of the biggest problems in land use control in Karachi is the rapid growth of unplanned squatter settlements (Katchi Abadies). These are densely populated and have access to very little, if any, of the city's infrastructure services, such as electricity, water supply and sanitation. Katchi Abadies now cover over 700 square miles of the city's area, and it is estimated that up to 60 per cent of the population resides in them[2]. This complicates the efforts to supply water and provide sanitation services. It also underlines the need for planned, low-cost housing, especially for migrants from other areas of the province and country.

Although Katchi Abadies are recognized as a major problem, there has been little effective action to counter the trend. The Katchi Abadi Authority (KAA) is now implementing a scheme to regularize existing Katchi Abadies. This involves planning the area, providing land rights to settlers and constructing the basic infrastructure for electricity, water supply, and sanitation. The Authority will then levy taxes on the residents. This should improve the poor environmental conditions in the settlements and reduce the impact of the settlements on the surrounding environment.

The haphazard growth of residential colonies adjacent to industrial areas has often blurred the line between residential and industrial land uses. Faced with a shortage of industrial plots, many small industries or supporting processes of larger industries (weaving in the textile sector, for example) have moved from industrial areas into residential ones. This increases the likelihood of impacts from industrial pollution on the lives and health of workers and their families. Worse, industrial processes ten move directly into people's homes. The home becomes the workplace and noise pollution and other environmental effects of industry become inescapable[3].

[2] Karachi Water and Sewerage Board, personal communication with Brigadier Mansoor, Managing Director, 04/02/2000

[3] Planning and Development Department, Government of Sindh, personal communication with Dr. Qazi, Director Planning, 01/02/2000

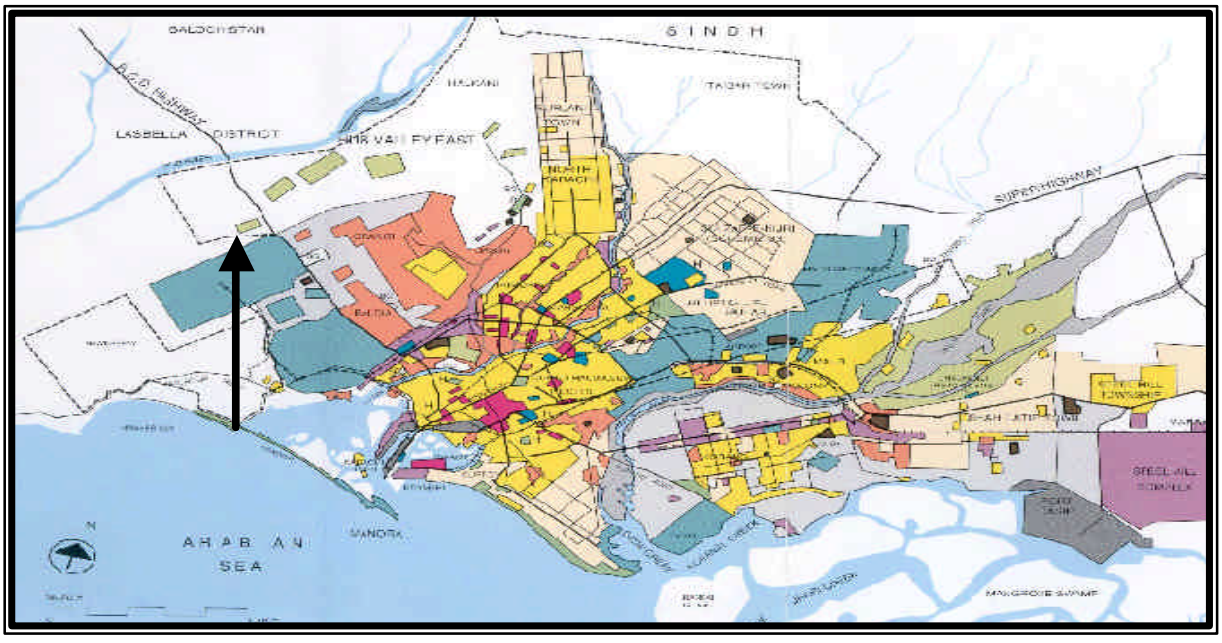
6.2.2 S.I.T.E. DW

Sindh Industrial Trading Estates (S.I.T.E.s) were first established in the 1950s to promote industrialization in the country. They have been established throughout the province, in the areas of Hyderabad, Kortri, Nooriabad, Saakar, Nawabshah, Superhiway (Karachi) and District West Karachi. Other industrial estates exist in the city of Karachi at Port Qasim, Federal "B" Area, North Karachi, and Korangi. Established in 1953, S.I.T.E. DW is the oldest industrial estate in the country. It is located in West Karachi in close proximity to the Karachi Port. It is immediately adjacent to the mouth of the Lyari River, where it empties into the Manora Channel of the Arabian Sea (Figure 6.1).

S.I.T.E. DW covers an area of nearly 4,500 acres, and currently houses over 2,200 registered and unregistered industrial units of various sizes, including textiles, heavy mechanical, beverages, automobiles, silk, oil, soap, foodstuffs, chemicals, pharmaceuticals, steel, glass, cigarettes, paints, filament yarn and ready made garments. Also present in the area are many small spin-off industries, warehouses (go downs), offices, banks, restaurants, shops, gas stations and other services.

S.I.T.E. DW contributes substantially to the economy of the country. It is the largest employer of industrial workers in the country, employing 400,000 people directly and thousands more indirectly. An estimated US$ 3.0 billion is invested there, and the S.I.T.E Association of Industries (S.IT.E Assn.) claims the area generates RS. 1,500 million daily in terms of goods, services, taxes, duties and wages[4].

Figure 6.1: S.I.T.E. District West Location in Karachi City



6.2.2.1 Institutional Arrangements

S.I.T.E. Limited (S.I.T.E. Ltd.) is semi-government limited company responsible for all S.I.T.E. areas, including plot allocation and leasing, road maintenance, bulk water supply and other matters. There is a 99-year lease agreement for all plots, which are currently valued at approximately US$ 250,000 per acre[5]. The KDA controls all other industrial estates in Karachi with the exception of Port Qasim, regulated by the Port Qasim Authority. Recently, there have been discussions about

[4] S.I.T.E. Association, Brief, 1999
[5] Liberty Mills, personal communication with L.F. Poonawala, Director, 30/03/2000

transferring responsibility for all industrial areas to S.I.T.E. Ltd., because of the expertise in estate management it has developed over the last 50 years[6].

S.I.T.E. Assn. Is a private sector organization representing the interests of industries within S.I.T.E. DW. The Association attempts to develop a common approach to problems and to provide a base for collective action by presenting its views to the concerned authorities, such as S.I.T.E. Ltd. and the Provincial and Federal Governments. The Association has various Sub-Committees to cover the diverse interests of S.I.T.E. DW industrialists. The representatives of the Association can also be found on most other important committees, task forces, management committees and boards of infrastructure providers. Various sectoral associations are also represent industries in the S.I.T.E. DW, such as the All Pakistan Textile Processing Mills Association and the Steel Re-Rolling Mills Association.

6.2.2.2 Land Use and Topography

Land use in S.I.T.E. DW is mainly industrial, although there is a substantial amount of commercial and residential land use. Offices and commercial activities use 235 or 12 per cent of allocated plots. Residential use also accounts for a substantial amount of land use in S.I.T.E. DW, in both the planned and unplanned labour colonies, as well as the many Katchi Abadies within the boundaries of S.I.T.E. DW. Other land uses include the social security hospital and the stadium grounds.

Drainage of the catchment area in which S.I.T.E. DW is located occurs naturally through nallahs (natural storm water channels) that drain into the Lyari River to the southeast. The area is mostly even and gradually sloping, draining directly into Orangi Nala and Lyari River. The total catchment area of the Lyari River is about 272 square miles, of which approximately 58 square miles are within the city limits. This is one of the major rivers which carries flood waters through densely populated areas of the city and out to the Arabian Sea[7]. The length of the river is 50 km, and the riverbed consists of sandy limestone, silty shell, gypseous material and beds of high salt content, which leads to a high salt content in the river[8].

6.2.2.3 Water Supply and Sanitation

Water is supplied to industries in S.I.T.E. DW by S.I.T.E. Ltd., which purchases water in bulk from the KWSB. Due to the current water crisis, only 3 to 4 mgd is received by S.I.T.E. DW industrial units against a sanctioned amount of 8 mgd from the KWSB and a total demand of 20 mgd. Most industries do not run at levels near capacity due to the shortage of water[9]. The water shortage in the city is certainly one of the most important factors limiting industrial production.

S.I.T.E. Ltd. Supplements the water supplied by the KWSB with an additional supply of 5 mgd of subsoil water through dedicated supply lines. This additional supply, however, does not meet the demand. The gap of 11-12 mgd that exists between supply and demand is met through supply by tanker. One government company and many private companies charge RS. 200-300 for a tanker of 1000 gallons. The supply is inconvenient, expensive and of variable quality.

Sewage flows through open lined and unlined drains in S.I.T.E. DW. These drains link up with five nallahs, which flow into the Lyari River and out into the Manora Channel of the Arabian Sea. Very little of this wastewater undergoes any pre-treatment before being released. It is mixed with domestic sewage and solid waste. Only some of the flow (that from the nallah running parallel to estate avenue) is directed towards Treatment Plant 1 (TP1). This is situated on the banks of the Lyari

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[6] S.I.T.E. Ltd., Personnal communication with Mir Hussain Ali, managing Director, 19/04/2000

[7] Associated Consulting Engineers (Pvt.) Ltd., *Lyari and Malir Rivers Pollution Study*, Executive Summary vols. I and II, EPA, Govt. of Sindh, 1994

[8] Nazneen, S., M.A. Basit and F. Begum, "Chemical Analysis of Lyari River Water by Trtrimetric Method and Atomic Absorption Spectometry", Proceedings of the National Chemical Conference (II), 1990

[9] Shortage of Water Hits Production in SITE, Dawn, 28 April 2000,p.3.

River adjacent to S.I.T.E. DW. It has been operating since the early 1970's and is currently managed by the KWSB. It has the capacity to treat a maximum of 47.6 mgd and an average capacity of 39 mgd. It is a secondary treatment facility, with two trickling filters, two clarifiers and four sludge digesters. During the site visits in December 1999 and March 2000, only one of the two processes (one clarifier and one trickling filter) was functioning.

Currently TP1 treats only 20 mgd of a mixture of domestic and industrial effluent from S.I.T.E DW and its surrounding communities, in spite of the fact that it has the capacity to treat almost double this volume. The KWSB attributes the low volume to the sewage piping system, which, if upgraded, could capture much more of the flow that currently reaches the Lyari River. Although the KWSB is hesitant to increase the flow of industrial waste to TP1, a recent feasibility study shows that the plant is capable of biologically treating industrial wastewaters mixed with domestic sewage as long as industrial effluent does not exceed 25 per cent of the total effluent. This may require some form of effluent pre-treatment by industrial units[9].

Effluent leaving TP1 is not tested for the presence of pathogens or heavy metals. Sampling of the plant's wastewater discharge shows that removal efficiency is poor for a secondary treatment facility and that levels of metals and other pollutants entering the Lyari River from the treatment plant are high. In addition, effluent from the plant is used for irrigation of the 100 acre KMC sewerage farm adjacent to TP1, commonly referred to as Gutter Baghicha. This area is used for vegetable production for local consumption. The sludge from the digesters at TP1 is used by the Karachi Municipal Corporation (KMC) itself and sold to others as a soil conditioner for parks and other areas. Again, the levels of human pathogens and metals content of the sludge is unknown, and it may therefore not be appropriate for agricultural purposes.

Solid waste collection and disposal in S.I.T.E. DW is the responsibility of S.I.T.E. Ltd. There are approximately 100 garbage collection points within S.I.T.E. DW, where garbage dumped for pick-up is scavenged and burned[10]. Many plants simply dump remnants and scrap from industrial processes over the boundary wall, creating dangerous and unsanitary conditions. The poor solid waste collection and disposal system increases air pollution in the area, clogs drainage channels and encourages the spread of pests and disease. Many industrial units contract out garbage disposal to private companies, but as KMC has no formal agreement to allow for the disposal of this waste at landfill sites, it is likely that it is simply dumped in other areas or along the banks of nallahs and the Lyari River.

Within S.I.T.E. DW, there is a double chamber incinerator that currently operates only to burn solid waste from hospitals that participate in a program of the Sindh Environmental Protection Agengy (SEPA) and the KMC. Currently, up to 31 small hospitals in the Karachi area have their waste collected by KMC and incinerated free of charge. The incinerator does not run at maximum capacity and could be used to incinerate at least a portion of the waste produced by S.I.T.E. DW industrial units.

6.2.2.4 Surrounding Settlements

S.I.T.E. DW provides employment to vast numbers of workers, and at its inception, plots in the area were set aside for development as worker colonies. Industrialists did not develop many of these plots into residential areas, and eventually they were bought up and converted to industrial and commercial land use. The majority of industrial workers, however, do live near their places of work. This study found that industrial workers in S.I.T.E. DW live an average of 6.9 km from their places of work. The lack of planned low-cost housing in and around S.I.T.E. DW has led to unplanned residential settlements. This not only aggravates environmental problems in the area, but it increases human health risks due to the close proximity of workers to sources and streams of industrial pollution.

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[9] Osmani & Company (Pvt.) Ltd., *Feasibility Study for Industrial Waste Collection, Treatment and Disposal System for SITE Karachi*, 1997

[10] S.I.T.E. Ltd., Personal communication with Mir Hussain Ali, Managing Director, 07/12/1999

Today there are two worker colonies within S.I.T.E. DW, one planned and one unplanned. In addition to these colonies, workers also reside in Sher Shah and Gulbai colonies within the boundaries of S.I.T.E. DW. These colonies are entirely Katchi Abadies. Sher Shah colony alone houses approximately 50,000 residents[11]. Other workers and their families live in the low-income areas in close proximity to S.I.T.E.: Orangi Town, Pattan colony, Baldia Colony, Mominabad, Nazimabad, etc. Encroachments along the banks of the Lyari River and the railway tracks in S.I.T.E. house many of the poorest residents. In all, the area had a population of about 300,000 in 1974 and about 650,000 in 1985. It is estimated that the current population is greater than 1.5 million[12].

The Sindh Planning and Development Department understands that Katchi Abadies develop in and around industrial areas because of the lack for low income housing near industrial jobs. A comparison of land use adjacent to S.I.T.E DW and Korangi Industrial Area (KIA) shows that there has been little effective land use planning for residential purposes around the former, whereas the latter has allocated much more land for planned residential us, resulting in a better residential situation.

Even the recent efforts to regularize Katchi Abadies have been difficult in the settlements in S.I.T.E. DW. S.I.T.E. Ltd. owns the land on which the settlements have developed. However, since the land was originally granted to S.I.T.E. Ltd. by the government free of cost, an agreement has recently been forged between the GOP, S.I.T.E. Ltd. and the KAA. S.I.T.E. Ltd. Has agreed to grant the land to the GOP, who will grant it to the KAA, who will then be free to offer land rights to settlers under the terms of the regularization scheme.

6.3 Industrial Profile

The current (1999) estimate of the number of registered industrial units in S.I.T.E DW industrial is approximately 1,600, whereas the total number of registered and unregistered units is estimated to be about 2,200 (Table 6.1).

Table 6.1: S.I.T.E. DW Industrial Units and their Pollutant Potential

Industries		Number of Industrial Units in S.I.T.E. DW	per cent of Total
More Polluting Industries			
341	Paper and products	58	3.6
351	Industrial chemicals	34	2.1
353	Petroleum refineries	--	--
369	Other non-metallic mineral products	33	2.1
371	Iron and Steel	129	7.9
372	Non Ferrous metals	9	0.6
	Subtotal	**263**	**16.3**
Somewhat Polluting Industries			
311	Food products	126	7.8
313	Beverages	3	0.2
321	Textiles	534	32.9
323	Leather Products	10	0.6
342	Printing and publishing	43	2.6
352	Other chemicals	118	7.3
381	Fabricated metals	35	2.2
383	Machinery, electrical	58	3.6
384	Transport equipment	**25**	**1.5**

[11] S.I.T.E. Assn., , personal communcation with Dr. Arshad Vohra, Chairman Sub-Comittee on Environment, 03/02/2000

[12] Institute of Development Studies, Personal communication with Khalid Nadvis, 29/03/2000

Subtotal		952	58.7
Less Polluting industries			
314	Tobacco products	36	2.2
322	Wearing apparel	138	8.5
324	Footwear	6	0.4
331	Wood products	22	1.4
332	Furniture	7	0.4
354	Misc. Petroleum and coal products	4	0.2
355	Rubber products	13	0.8
356	Plastic products	54	3.3
361	Pottery	3	0.2
362	Glass	9	0.6
382	Machinery, except electrical	53	3.3
385	Professional and scientific equipment	1	0.1
390	Other	53	3.3
	Subtotal	**399**	**24.7**
	Total	**1614**	**100**

Source: S.I.T.E. Association of Industry

The study team could not find data to determine the rate of industrial growth in S.I.T.E DW over the last two decades. The lack of a standardized industrial classification system for reporting makes it difficult to compare data from different sources. In addition, historical data were difficult to obtain and are considered unreliable for determining growth rates. No information predating 1991 was available.

A 1991 survey published by the Directorate of Industries reports the total number of industries in S.I.T.E. DW to be 683, of which 44 units were closed. This figure is less than half the number of industrial units commonly held to be operating in S.I.T.E. DW today. Information on the number of industrial establishments that currently exist in the S.I.T.E. area was available from two sources: a) a list of tenants by industry category and percent of total, compiled by S.I.T.E. Ltd.; b) a S.I.T.E. Ltd. Plot allocation list that simply records the business occupying the plot and its telephone number. Because the former source had mistaken entries, which would render the percentages incorrect, the plot allocation list was used for comparison. The difficulty with the latter source is that it was sometimes difficult to categorize an industry based on the information provided (name and trade). Current information was compared with historical information to determine growth rates (Table 6.2). Growth rates based on this data far exceed those reported at the national level, so it must be concluded that this information is at best only an approximation.

Table 6.2: Growth of Industry Sectors 1991-1999

Sector	Directorate of Industries (1991)	S.I.T.E. Ltd. Plot Allocation List (Current)	S.I.T.E. Ltd. Tenant List (Current)	Growth %*
Chemical	7	20	22	186
Leather	6	10	3	67
Plastics	13 (7 closed)	54	29	315
Textile Processing	18	431	274	2294
Other Textile	86	241	303	180
Textile (Total)	104	672	577	546
Iron and Steel	67 (12 Closed)	129	69	93
Paint	8	19	20	138
Pharmaceuticals	27	42	34	56

Source: S.I.T.E. Association of Industry (1999) and Directorate of Industries, "Directors of Industrial Establishments in Sindh" (1991).

For the purposes of this study, seven industrial sectors were selected for investigation based on the following criteria: a) importance to the economy of Karachi; b) potential to pollute; c) the

potential for industrial health and safety hazards to workers and d) not included in the other two case studies.

6.3.1 Industrial Chemicals

There are two textile chemicals and many soap manufacturers in S.I.T.E. DW (S.I.T.E. Assn., 2000). According to the S.I.T.E. Ltd. Plot allocation list, there are 20 establishments producing industrial chemicals (except fertilizer). In this classification however, soap manufacturing is listed under a separate category (soap, cleaning preps, perfumes and toilet preps), which accounts for another 36 establishments. Approximately the same number (22) is recorded in the recent S.I.T.E. Ltd. Tenant list. The Directorate of Industries registered only seven units in 1991, indicating a growth of 186 per cent over the past nine years.

The growth in output is attributed to both market forces and government policies. GOP has reduced taxes for chemical manufacturers, provided approvals for expansion loans and reduced duty on raw materials, which are 60-70 per cent imported. It has also reduced export duties.

One chemical factory, a producer of textile auxiliaries, was visited during this investigation. It employs 50 people and has an average production of 6.7 million kilograms per year. 80 per cent of production is for consumption in the domestic market. The factory visited was ISO 9002 certified and was also working towards implementation of ISO 14001. As part of this effort, it was planning to install a neutralization plant to treat its effluent.

6.3.2 Leather

Only two or three working leather tanneries exist in S.I.T.E. DW. They are large producers and were built several years ago[13]. This small number could be attributed to the fact that KIA was established in the 1970's with the specific intent of relocating existing tanneries and accommodating new ones. The S.I.T.E. Ltd. Plot allocation list identifies 10 tanneries, but the tenant list identifies only three tanneries. The Directorate of Industries registered six units in 1991.

The lack of raw materials in Pakistan has meant that production levels in the country as a whole were dropping rapidly over the past decade, causing a reduction in production from 2.5 million m^2/month to the current level of 1 million m^2/month.

One tannery was visited during this investigation. It employs 250 people and has an average production of 12 million square metres per year and exports all of its output. It has a high level of awareness of the NEQS and is planning to set up its own laboratory for testing, modeled after one which was recently established in KIA. It has also volunteered to be part of the pilot group of plants testing implementation of the NEQS with SMART.

6.3.3 Plastics

The plastics industry represents approximately 8 to 10 per cent of industrial units in S.I.T.E. DW (S.I.T.E. Assn., 2000). According to the S.I.T.E. Ltd. Plot allocation list, there are 54 establishments producing industrial chemicals excluding fertilizers. The recent S.I.T.E. Ltd. Tenant list identifies 29 establishments in the plastics sector. The Directorate of Industries registered only 13 plants in 1991, indicating a growth rate of 315 per cent over the past 9 years.

The price of raw materials in the plastics sector is closely linked to the price of petroleum. These have dramatically increased since the Gulf War and more recently there have been a number of consecutive price hikes. The price of raw materials has jumped 35 per cent in the first half of the year 2000; the duty on the import of those materials is set at 25 per cent. In an effort to encourage the car

[13] S.I.T.E. Assn. 2000, loc. cit.

industry, the GOP issued a State Regulatory Order (SRO) for plastics reducing duty to 10 per cent because the plastics sector is a supplier to Suzuki and Honda.

The GOP deletion policy has also been used to encourage growth in the automobile sector. This had important effects on plastic auto parts manufacturers. "Industries which opt for the deletion programme are provided concessionary import tariffs to import components/parts. The participating enterprises are gradually supposed to increase the use of local parts according to a time-schedule agreed with the Deletion Monitoring cell of GOP. The programme is industry specific and has been most successful in the electrical, electronic, machinery and automotive industries"[14]. The GOP is now eliminating the deletion policy as its objectives run contrary to government agreements signed with the World Trade Organization. This will hurt business for the plastic car parts manufacturers because they will now be forced to compete with Korean, Malaysian, Taiwanese and Chinese producers, who benefit from economies of scale.

One plastics factory producing plastic lawn chairs, foam sporting equipment, and automobile parts such as motorcycle seats was visited during this investigation. It has 110 employees and its production (unknown) is entirely for the domestic market.

6.3.4 Textiles

The textile sector is the most important contributor to Pakistan's economy. It represents 27 per cent of Pakistan's value added in manufacturing, 38 per cent of overall industrial employment and 62 per cent of export earnings. The textile sector is the country's largest foreign exchange earner, bringing $5.5 billion into the country, and representing 62 per cent of the total export of merchandise[15]. The sector is expected to provide increased export earnings of an additional $5 to $14 billion in the next five years[16].

According to the S.I.T.E. Ltd. Plot allocation list, there are 672 plants in the textile sector in S.I.T.E. DW, accounting for 41 per cent of the total. Of these, 431 are classified as textile processors, representing 26 per cent of the total number of industrial units in S.I.T.E. DW. The remaining 231 plants are classified into four other categories (spinning, weaving finishing; made-up textile except apparel; knitting mills; and wearing apparel) which will be discussed together here as "other textile" for purposes of comparison. The recent S.I.T.E. Ltd. Tenant list identifies 577 plants, 274 in the processing class and 303 in the other textile class. The Directorate of Industries registered only 18 units in 1991 under the classification of "textile dying and finishing". These figures would indicate a growth of almost 2000 per cent over the past nine years, which seems unlikely due to insufficient registration by the Directorate of Industries and/or differences in classification.

S.I.T.E. textile manufacturers tell a slightly different story about the sector in S.I.T.E. DW. They believe that the sector accounts for closer to 60 per cent of the establishments, including 250-350 units producing both woven and knitted fabric. They are mainly medium-sized units, producing in the range of one million metres of fabric monthly, with three or four large units producing a minimum of two million metres of fabric per month[17]. Although the number of plants may not have increased over the years, there has been considerable expansion in the output of many units.

Pakistan's textile sector has benefited from a number of policies to encourage its growth. A duty drawback of 10 per cent on the import of new industrial machinery a decade ago encouraged new investment, and many industries took the opportunity to expand or upgrade. An SRO to encourage balancing and modernization has also had some effect by reducing or eliminating duties. Growth in the sector has also been encouraged by a policy to refund sales tax to enterprises contributing to the country's exports. Now, faced with the complete removal of textiles quotas by the year 2005, the GOP

[14] Aftab, Z., Industrial Policy in Pakistan, draft report, 2000

[15] The News International, *Textiles to be Opened to Foreign Competition*, May 1st, 2000

[16] The News International, *Cotton Textile Industry Needs Balancing, Modernization and Replacement*, 2 May 2000

[17] S.I.T.E. Assn. 2000, loc. cit.

is preparing a new textile to encourage investment and growth in the sector. Investment of $6.0 billion is needed in the next four years to prepare for increased competition in international markets.

Proposed incentives being discussed in the new policy are: a) a cash incentive to exporters; b) removal of export re-financing on some items including low-count yarn and grey fabrics, and 3) a subsidy on capital investment. There is also a proposal to reduce or eliminate duty on the import of machinery, particularly processing equipment, in order to encourage the use of high quality machinery in the textile sector. In the weaving sector, there will be a ban on the import of second hand equipment older than 10 years. According to the Chairman of APTMA, one of the most important problems facing the textile sector is the import duty[18]. He has asked that the 15 per cent import duty on raw cotton be removed in order to offset the eroding competitiveness of local industry due to soaring lint and cotton prices in 1998-1999[19].

Simultaneously, regulatory duties on textile products are adversely affecting the textile sector. Duties on raw products (gray cloth) are almost as high as on finished products (35 per cent and 45 per cent respectively). A range of 5-10 per cent for raw product, gradually increasing on intermediary and semi-finished goods, with a maximum of 45 per cent on finished goods, would be more appropriate. Domestic problems, such as the inconsistent supply of electricity and water and high utility and gas pricing, make it difficult for Pakistan's textile manufacturers to compete in the absence of government protection. In the last year alone, manufacturers have faced a 45 per cent jump in electricity rates and a 100 per cent increase in gas prices. The recent imposition of the general sales tax and a ban on gas-powered generation have also hurt manufacturers.

Nine textile mills were visited during this investigation. On average, they have 550 employees and produce almost one and a quarter million kilograms (for those reporting in kilograms) and over twenty-nine million square metres (for those reporting in square metres). They were specifically selected to represent a wide range of products and processes covering dying, printing, finishing of grey fabric, silk, man-made fabrics, knits, etc., for both the local and overseas markets. Four out of nine textile units have been certified to ISO 9002. Although some had been pressured by foreign customers to adopt the standard, many had seen that it was simply good for business. In addition, 10-15 units in S.I.T.E. DW have gained the Oeko-Tex Standard 100 certification, and the S.I.T.E. Assn. Is assisting another 10-15 units in gaining certification because German, Dutch and other European and North American buyers are increasingly demanding these standards (Oeko Tex Standard 100, 2000). These standards limit the use of various chemicals present in textiles, for instance heavy metals, formaldehyde, halogenated carriers, carcinogenic dyes, sensitizing dyes, pesticides and other substances considered hazardous to human health. They also include limits for certain colour fastness properties.

6.3.5 Iron and Steel

There are five or six large iron and steel units in S.I.T.E. DW. According to the S.I.T.E. Ltd. Plot allocation list, there are 129 iron and steel industries. The recent S.I.T.E. Ltd. Tenant list identifies only 69 iron and steel plants. The Directorate of Industries registered 87 steel re-rolling units (including twelve closed units) in 1991, indicating a growth of 93 per cent over the past nine years.

Taxation on electricity is affecting the sector: the tax was said to be greater than the price of the electricity itself. Raw material pricing most affects the re-rolling sector, as Pakistan Steel has a monopoly on the production of steel billets. Although international prices are much lower, a high rate of import duty (30 per cent) restricts import. Demand for billets has fed a high rate of growth for the billet sector; the sector experienced a growth rate of 33 per cent in the 1980s[20].

[18] The News, May 2nd 2000, loc. cit.
[19] The News, 1 May 2000, loc. cit.
[20] Aftab, op. cit.

One steel re-rolling mill was visited during this investigation. It produces 67 thousand anif of iron sheets from billets per year. The factory has 110 employees, and production is entirely for the domestic market.

6.3.6 Paint

According to the S.I.T.E. Ltd. Plot allocation list, there are 19 paint manufacturing plants in S.I.T.E. DW. The recent S.I.T.E. Ltd. Tenant list quotes almost the same number of plants (20) in the paint sector. The Directorate of Industries registered only eight paint and varnish units in 1991, indicating a growth of 138 per cent over the past nine years.

The paint and varnish sector in the country has experienced a growth of 7.9 per cent in the period 1980/1 to 1987/88 and 3.6 per cent in the period 1987/88 to 1990/91. The policy most adversely affecting the sector was the ban on gas generation. Plants in S.IT.E DW want to meet their entire electricity requirement with natural gas-run generators if possible, as the cost difference would be at least 40 per cent less. Unfortunately, the GOP has yet to issue a "No Objection Certificate" to run gas generators.

One paint factory was visited during this investigation. It produces 720 tonnes of paint per year. The factory has 425 employees, and production is entirely for the export market. It is already ISO 9002 certified and is expecting ISO 14001 certification in the year 2000. It is among those volunteering for the pilot study of implementation of SMART.

6.3.7 Pharmaceutical

According to the S.I.T.E. Ltd. Plot allocation list, there are 42 pharmaceutical producers in S.I.T.E. DW. The recent S.I.T.E. Ltd. Tenant list identifies 34 pharmaceutical industries. The Directorate of Industries registered 27 pharmaceutical units in 1991, indicating a growth of 56 per cent over the past nine years.

The pharmaceutical industry, along with chemicals and fertilizers, is responsible for a substantial amount of foreign direct investment[21]. Many multinational pharmaceutical companies have established themselves in the country. Raw materials for the industry are imported, but duties are high – and unpredictable because of constant policy changes. Final product prices are also set by the government and kept deliberately low. The sector has been requesting price increases from the government since 1996 with no response.

One pharmaceutical industry was visited during this investigation. It produces six thousand kilograms and one hundred and forty-four thousand litres of product per year. The factory has 260 employees and produces only for the domestic market.

6.4 Industrial Pollution Profile

6.4.1 Water Use

The majority of S.I.T.E. industrial units are large water consumers. A survey found that the average water use in textile processing units is 1,250,000 litres per day. The leather and iron and steel sectors also use a substantial amount of water daily (400,000 and 272,500 litres a day respectively), while the plastic, paint and pharmaceuticals sectors use relatively less water, mainly for domestic purposes and equipment washing. The survey also found that many units then dispose of most or all of this water as wastewater rather than recycle it. On the other hand, many of the plants which are heavy water users require hundreds of tankers per day and are frustrated by the failure of government to supply a sufficient quantity of water.

[21] Aftab, op. cit.

Annex B: Industrial Survey in District Sheikhupura

Parameters	Chemical	Fertilizer	Tannery	Paper Manufacturing	Pesticide
Year of establishment	1964	1971		1985	1991
Process	DeNora Hg Cells, with metallic Anodes Graphite Furnace for HCl Prod.	Desuphurization of Natural Gas, Reforming, Ammonia Synthesis, U-Tech Process for Urea	soaking, liming, dehairing, deflushing, deliming, bating, pickling, chrome tanning, dying	Pulping, Bleaching 3 stages, Blending	Formulatio packaging of Pesticide
Employees	650	550	350	350	5-6 (60-80
Annual Production MT	NaOH = 52,000 , Cl_2 = 45,000 NaOCl = 16,000 HCl = 57,000 Bleach Earth = 1600	Urea = 445500	40,000 Sq.F/Day	2200	2 Million L
Chemicals Used	NaCl, $BaCO_3$, H_2SO_4 $CaCO_3$ and Flocculent	HCl, H_2SO_4, NaOH, K_2CrO_4, and CO_2 absorption Chemical	Basic Chromium Sulphate Oils and Dyes	Na_2SO_3, Chlorine NaOH, Alum & Rosin Dyes	Different ty Organo-ph pesticides
Chemical Storage	MS Tanks for NaOH Rubber lined Tanks for HCl & NaOCl SS Tanks for dil. NaOH FRP Tanks for Process	Standard storage tanks for acid and alkali	Stored in a ware house	Properly stored indifferent categories. Chlorine cylinders under shed	Stored und protection i warehouse categories.
Health Measures	First Aid Facility at Plant	4-bed Hospital facility at plant	Site dispensary in day shift Social Security covers for labor.	First Aid Box at Plant, health covered by Social Security	Full scale r facilities ar by compan
Safety Measures	Safety Training to Employees Occupational Safety Equipment as required.	Safety Training to Employees, Occupational Safety Equipment as required, Breathing Air network at Plant	Occupational Safety Equipment as required	Occupational Safety Equipment as required.	Strict Safet Environme observed

Estimated water use	2.5 - 3.0 Cusecs	2500GPM	800-1000 M^3/day	9.0 Cusecs	50 - 80 M^3 / Year	No Process water
Wastewater Discharge	0.5 - 1.0 Cusecs	600 GPM and 250 GPM	800-1000 M^3/day	9.0 Cusecs	50 - 80 M^3 / Year	No Plant Effluent
Estimated Energy use	27 Mega Watt	15 Mega Watt		2 Million KWH/ month		
Conservation Measure	Energy conservation Utilization of surplus Cl_2.	Waste heat generation by heating through process gas	Recycling of water Concrete floors to avoid seepage	Recycling of Pulp mill water	Safety, Health & Environment procedures to achieve compliance with standards	
Cleaner Production Efforts	Replacement of graphite anode with DSA ISO-9000 Certified	API separator Neutralization pit, Water treatment by Electrolysis, Settling ponds	Working for waste treatment plant	Wastewater treatment proposal was dropped due to economical consideration, space and technology	Effluent Treatment plant having capacity of 5.0 M^3 per batch Environmental performance will meet contemporary requirements.	ISO 9000 Certification in progress
Pollution Control Equipment	Acid and Cl_2 neutralization	Electrolysis cell to convert Cr VI to Cr III	Machinery installed for desalting and flashing	No	Recycle system for any leakage or wastage is installed.	
Govt. Policies (20 Years) Affecting Production Growth. Recession	During Public sector the CO's production declined due to labor problems After privatization in 1995, Production of the Co increased			Already in private sector.	Being multi-national company, it has its own policies	Already in private sector.
Other Problems / Improvements	Capital Loss due to non-availability of Cl_2 utilization in the country Planning for solid $CaCl_2$ Plant		Primary treatment started but facing problem for solid waste deposal.	Individual industry cannot afford waste treatment plant.	Its operation are conducted in a manner acceptable to the community	Horticulture to improve environmental conditions.

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8. CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions – Industrial Policy

In the broadest sense, there are two categories of policy measures that can influence the effect of industrial activity on the environment. One is industrial policies that indirectly affect the environment and the other is environmental policy which deliberately aims to protect the environment. This section summarizes the findings on the potential effects on the environment of industrial policy. Section 8.2 summarizes the report's findings on the direct impact of environmental policy on mitigating the adverse effects of industrialization.

Governments in developing countries are typically driven by growth, poverty alleviation and employment objectives, as reflected in their macro-economic and sectoral policies. Some of these policies have indirect effects on the environment even though these environment-related effects are not intentional. In the case of Pakistan, for example, the export orientation that defines the new trade policy is likely to shape a different industrial landscape, more focused on the country's comparative advantages. The textile industry, for one, stands to gain from the reforms and expand in the process, while the relative importance of heavy industries in sectoral output will probably decline, thus resulting in environmental benefits altogether.

However, such benefits clearly cannot be credited on the policy action; they merely emerge as positive by-products. In addition, some Government regulations may generate several, possibly conflicting, consequences on the environment: the use of scrap metal in the steel industry, for example, *a priori* deserves public encouragement, as the manufacturing process absorbs considerably less electricity, and reduces the pressure on depletable resources such as iron ore. However, the low-grade scrap metal available in Pakistan is often contaminated with rubber, and releases toxic emissions when melting.

8.1.1 Industrial Growth

The prime objective of industrial policies in general —and Pakistan is no exception to the rule — is to spur manufacturing growth. Value-added in the domestic manufacturing sector has over the period 1970-1999 recorded a compound annual growth of 6 percent, exceeding the comparable figure for GDP growth over the same period (5 percent). As a result, the manufacturing sector accounted, in 1999, for nearly 17 percent of the gross domestic product, against 13 percent some 30 years earlier. These figures, however, remain modest by the standards of the Asian region as a whole.

Manufacturing value-added increased more than five-fold over the thirty years 1970-1999; all things being equal, this would suggest a similar increase in environment variables such as the emission of pollutants, or the depletion of natural resources. But the sectoral composition has changed in the meantime, the SME sector has grown strongly and there has been a strong overall increase in output. This has also had environmental implications. On the other hand, technological progress has raised productivity levels: the same industrial output can today be delivered at lower resource cost then before. Finally, location policies have an effect on the environmental impact of the sector. The next sections briefly review these factors and their role in the case of Pakistan.

8.1.2 Sectoral Composition

As some industries are *a priori* more polluting than others, a change in sectoral composition should modify the overall impact of the sector on the environment. This study grouped industrial branches in terms of pollution intensity, distinguishing three groups: less polluting, somewhat polluting, and more polluting industries.

Stimulated by policy shifts (which have not always have had the desired impact on growth and technological progress), the sectoral composition of Pakistan's industrial sector has changed considerably over the decades: electrical machinery for one (ISIC 383), accounted for 3.4 per cent of

the sector's total value added in 1986. Ten years later, in 1996, its share had more than doubled, to 7.8 per cent. Others, such as petroleum refineries (ISIC 353), have seen their importance shrink over the same period, from 7.1 per cent to 2.1 per cent.

However, the emerging picture in Pakistan is not clear-cut: a surge in the 'more polluting industries' category between 1976 and 1986 was dampened by a similar reduction in the 'somewhat polluting' category. Therefore it is not possible to draw a conclusion whether the industrial sector became more or less polluting during this period.

8.1.3 Technological Change

As newer technologies are a priori more environment-friendly, higher productivity growth and deeper capital intensity means that the same industrial output is produced at lower cost to the environment. But some industries, such as paper and pulp processing, are inherently more polluting than others such as glass manufacturing; thus the environment-conscious analyst would intuitively assign more weight to technological progress in the former, than in the latter

The outcome reveals that productivity growth has been the highest in the traditionally heavily polluting sub-sector, driven by the paper processing and petroleum refining industries (with real annual growth rates of 8.75 and 7.05 percent, respectively). However in the second group of 'somewhat polluting industries', the mediocre performances of the textile industry, which accounts for nearly a quarter of manufacturing value-added, brings down the weighted average to 0.61 percent. In other words, by virtue of differentials in technological progress, the heavily polluting industries have become relatively less harmful to the environment, while the middle category of 'somewhat polluting industries' have in the meanwhile increased their pollution levels in relative terms. An environment-sensitive technology policy must factor in these sectoral patterns of productivity growth.

8.1.4 Scale of Manufacturing Operations

The SME sector often benefits from a distinct, usually more favourable, policy environment. It is often in a unique position to generate employment for low-skilled or rural labour, and today's small firms may be the seeds of tomorrow's industrial giants.

Capital intensity in traditional SMEs is relatively low, and the equipment is often outdated; this is certainly true of Pakistan. Labour productivity in small and medium industries is therefore typically lower than in their larger counterparts (which, incidentally, depresses real wages and leads to perhaps larger employment, but certainly lower incomes). This, in addition to the sectoral composition and the actual size of the SME sector, determines the effects of SMEs on the environment. Unfortunately, there are no hard data on the sectoral composition and the environmental impact of the sector are available in Pakistan. It is however clear that policy incentives designed to encourage the emergence of SMEs should also assess their implications for the environment.

8.1.5 Location Policies

The location of production can affect the environment in two major ways: first, location policies may feature, among other incentives, the establishment of industrial estates fitted with common waste treatment facilities. Economies of scale can be derived from the management, at aggregate level, of waste disposal in whatever form: solid, airborne or waterborne. Effective treatment is possible at lower cost, thus reducing the ultimate release of pollutants for a given output level.

Second, what often matters is not so much the absolute level 'X' of pollutants discharge, but whether or not it exceeds a certain threshold above which it becomes hazardous. If a hundred identical firms are spread across the country side, the local incidence of each one of them will be a mere 'X'/100, probably well within acceptable local limits; if they operate on the contrary in a tiny plot of suburban land, they will jointly emit the full amount 'X' of pollution, in a densely populated area.

This second argument can be used in support of policy incentives aimed at attracting heavily polluting industries from the metropolitan areas to the less economically developed regions of the country. It is no coincidence that the provinces of Punjab and Sindh apply relatively stringent locational rules prior to the issuance of a 'No Objection Certificate', while a lax attitude can be observed, in this respect, in the North West Frontier Province, and in Baluchistan. But these policy initiatives, as has been shown, have not been effective in promoting the dispersal of industrial development and estates were established without waste treatment infrastructure, etc. Hence, location policy will also have contributed little to the solution of environmental problems.

8.2 Conclusions – Environmental Policy

A strong environmental policy, primarily in the form of a traditional regulatory program, is essential for mitigating the potential adverse environmental consequences of industrialization. Unfortunately, only in the past few years are the makings of an effective regulatory program emerging, whereas one has been needed since the beginning of the rapid industrialization in the 1970s.

The first environmental policy that called for a traditional regulatory program to address industrial pollution, PEPO, was not introduced until 1983. Then its provisions for mitigating the potential impacts of new and existing industrial units, the environmental assessment process and national environmental quality standards were not implemented, for a host of reasons which were described in Chapter 4. The fact that a new environmental policy was needed for regulating industrial pollution (PEP-Act of 1997), which had many of the features of PEPO, was a clear indication that the 1983 Ordinance was not effective.

Admittedly, some non-legislative efforts did start in the early 1990s with the NCS for the promotion of sustainable development and the EPRCP for building capacity in provincial environmental regulatory agencies that were established between 1987 and 1990. However, as the review of the NCS in Chapter 4 concluded, it was not possible to determine the implementation status of industrial policies and measures proposed by the NCS seven years after it was finalized. The EPRCP does seem to have contributed to the formulation of revised legislation (1997 PEP-Act) and the new National Environmental Policy for Pakistan (1999) and to have strengthened the technical capacity of some of the provincial EPAs.

All three case studies (Faisalabad, Karachi and Sheikhupura) document the ineffectiveness of the policies addressing industrial pollution over the past 20 years. Only a few industrial establishments in these three areas have taken pollution prevention measures and installed pollution control equipment. These establishments only took these actions in the 1990s because of their connections with transnational corporations. Similarly, none of the industrial estates investigated (S.I.T.E DW in Lahore and the Punjab Small Industrial Corporation estate in Faisalabad) have central treatment plants for collecting and mitigating industrial pollution; the collection and treatment at S.I.T.E DW is primarily for domestic waste.

Environmental policies and regulations that appear adequate have only been put in place recently, and actual implementation of the policies and regulations is now taking place in at least one province (Punjab). However, there is a lingering doubt that the NEQS are not adequate (they need to be sector specific as well as concentration-based), and that there is a commitment to monitoring and enforcement, both in terms of political will and resources.

8.3 Recommendations for Minimizing the Environmental Impact of Manufacturing

The environmental damages due to the industrial sector in Pakistan so far remain moderate, but they are growing steadily. A very large proportion of the sector consists of SMEs, accounting for a major portion of industrial pollution, and most of these lack much of the skills and the resources which would enable them to produce more efficiently and minimize their impact on the environment. The SMEs are difficult to reach and often do not respond to either regulations or assistance programmes. Industrial and environmental policies should therefore pay special attention to this

sector, and government agencies directly associated with the SMEs and affected local government units should work more closely with each other and with the provincial authorities to address this growing problem.

To change the composition of the manufacturing sector progressively toward a less polluting mix and improve the efficiency and quality of processes used, there is a need for a clear national industrial policy which incorporates environmental objectives on a par with the more conventional economic objectives of increased employment, value added, import substitution and export promotion. It is regrettably often overlooked that the "environmental" objectives of sustainability of natural resources and protection of public health are also economic objectives, equally important to the long-term economic viability and competitiveness of a nation.

A step in this direction are the 8th (1993-1998) and 9th (1998-2003) National Development Plans. Among the goals for the industrial sector in the Plans during this ten-year period is the establishment and development of globally competitive industries. While this is a step in the right direction, the basic thrust is to promote exporting industries and those with large employment and high value added and integrate the country into regional free-trade agreements. These specific objectives fall short of a comprehensive industrial policy, and in practice the issue of environmental sustainability as one of the criteria to guide industrial growth has not been addressed. Other governments in the region, such as Taiwan, Korea and Singapore, have effectively addressed environmental objectives in their industrial policies, and their economic and trade growth have benefited from the resulting policies and national programmes.

This document suggests that, to minimize the impact of industrial development on the environment, action is urgently needed in a number of specific areas. In order to maximize the effectiveness of these and the many related efforts, however, they must be viewed and coordinated within a national vision and plan for the achievement of cleaner production. Otherwise there will likely be both duplication of effort and critical gaps and a failure to achieve the critical goal of a significant reduction in pollution by industry.

The key components of a comprehensive national program should include the following:

8.3.1 Information

An important task of the government will be to achieve greater transparency in the actions of industry as they impact the environment. It must improve access to information on environmental conditions, the ecological and health risks from industrial growth, the impact on the economic future of a community or the nation, and the measures and their associated costs that can be taken by the firms, government, the business community and society as a whole to minimize those effects. This will require a strengthening of institutional capacity at the national and local government levels. Public availability of information would serve a number of functions, including educating the general public, making the formal monitoring and enforcement schemes more effective, and indicating compliance with international environmental agreements.

Elements of a comprehensive environmental management program might include:

- Information in the media, community forums and public education on the risk to human health from industrial pollution;
- Public information on cleaner production, including both its environmental and financial advantages;
- Compulsory reporting on the release of toxic and hazardous chemicals by firms; and
- Public rating of the environmental performance of firms, both positive and negative.

Some companies may try to present data that show them to be performing better than they are or to obscure the discharge of dangerous wastes. As the public and local governments become more

sophisticated in understanding pollution issues they will be better able to determine the correctness of data reported by industry.

8.3.2 Standards and Monitoring

The Pakistan system of industrial effluent standards is unfortunately relatively insensitive to actual ambient conditions and to different cost structures due to their use of concentration-based standards. These allow polluters to meet standards by dilution and encourage the over-extraction of ground water in heavily industrialized areas. Air quality standards are also concentration-based.

The Pakistan environmental management effort is unfortunately also deficient in that there are no ambient air and water quality standards, which are the goal of reducing pollution. As a result, industries are sometimes penalized for exceeding emission standards which are well within WHO ambient standards. The formulation and rationalization of these standards would allow firms more flexibility in reaching meaningful pollution reduction targets.

The provincial EPAs' ability to monitor air and water pollution needs to be improved in terms of trained manpower and sampling and testing capability. The private sector should continue to be actively involved, to reduce the pressure on the EPAs' limited monitoring capacity, and private sector accredited laboratory capacity should be expanded.

Monitoring of industry should become a community concern beyond the periodic formal visit of government officials to a facility. As those who will suffer the results of poorly controlled production and the resulting pollution, the members of the surrounding community have the most incentive to assure compliance and promote cleaner production. They need the information and training, however, to recognize industrial pollutants and to understand the extent to which they threaten the health and economic livelihood of the community. Broad-based public information programs and local governments willing to listen and act on community inputs will multiply the monitoring and enforcement capability of EPAs' manifold.

A possible application of this approach would be the development of a cadre of citizen monitors who receive basic training in pollution detection and cleaner production techniques, have access to all polluting facilities under the authority of the local government, and volunteer their time to randomly check on suspected polluters and report back to the official enforcement authority.

A comprehensive environmental management programme might include:

- Formulation of ambient air and water quality standards as a top priority;
- Conversion of concentration-based standards to mass-based standards for specific industrial subsectors top priority;
- More flexible choices for firms in achieving pollutant reduction targets;
- Establishing standards for government-certified private sector compliance auditors;
- Requirements for firms to retain certified auditors and report findings regularly;
- Citizen monitoring programs to assist local government to detect non-compliance;
- Community information programs on recognizing pollution and its threat to health;
- Training for local government staff to recognize and understand industrial pollution;
- Investment incentives and quality controls for private laboratory testing facilities; and
- Training of provincial EPA staff in sampling techniques and other monitoring skills.

8.3.3 Economic Instruments

Efforts are already being made to complement regulations with economic instruments, including market-based instruments, but the programme is too new and too limited for there to be any useful analysis of its impact. There is currently no system in Pakistan for pricing water on the basis of its scarcity and competing uses.

Higher input prices can ultimately help a firm to reduce its production costs by forcing it to find for more efficient ways of using resources, such as water. Fuel pricing policy could be changed to take into account of the adverse environmental impacts of high-sulphur fuels.

Pollution charges basically aim at inducing "behavioural" responses, forcing firms to internalize environmental costs. But they can also have a financial objective of generating funds to support environmental management programs of the government. Unfortunately, there is no legal provision under the present fiscal system of Pakistan for earmarking taxes or revenues for special purposes, though efforts are being made to introduce provisions for earmarking of pollution charges.

The best way to get industry to support the system is if the revenues from the fees collected are cycled back for the use of industry, perhaps as a fund to finance environmental projects. It should be noted that economic instruments are not a replacement for traditional regulation, nor is the use of such instruments necessarily less demanding in terms of monitoring and coordination.

Elements of a comprehensive environmental management program might include:

- Public forums to promote the collaboration of business and government in selecting the most effective economic instruments;
- Financial and operational analysis of the feasibility of selected economic instruments;
- Training of local government to administer pilot programs of economic instruments;
- Legislative changes to earmark revenue from charge systems for environmental uses;
- Establishment of national and regional funds using charge revenues for loans to industry;
- A system of environmentally-based taxes on selected inputs to production;
- A national charge system for the use of ground or surface water based on scarcity and competing uses; and
- A pilot program of traceable discharge permits within a watershed or airshed.

8.3.4 Integrating Environmental Concerns in Economic and Spatial Planning

Previously used solely on a project or site basis, the EIA in Pakistan can now be implemented in a "programmatic mode." An area-based EIA is made for a regional investment center or industrial estate and the planned facilities are evaluated as a whole instead of on their individual component projects. The use of such programmatic EIAs offers advantages for both industries and the EPA. For industry, securing environmental clearances are speeded up for firms locating inside industrial estates so long as they are within the parameters set out for the estate or area.

For EPAs, programmatic EIAs reduce the review process required for individual facilities and, as they are based on analysis of the carrying capacity of the area, enable a more effective assessment of the impacts of industrial activities. The arrangement also enables the EPAs to delegate environmental monitoring and control functions to the industrial estate operator.

Environmental management issues should be integrated into land use planning, which in turn, should be linked to the programmatic EIAs. This would greatly simplify procedures. After local land use plans have been subjected to a programmatic EIA, individual projects would mainly need to demonstrate conformity with the approved land use.

An alternate approach to the programmatic EIA could be to integrate the EIA process into district land use planning and develop incentives for local governments to secure environmental compliance for their land use plans. District governments would prepare spatial environmental management plans based on their land use plans and subject these to requirements. Local governments that pass the EIA review and obtain certification of the environmental soundness of their land use plans could be given incentives by provincial EPAs in the form of devolved authority to review project EIAs and recommend their approval. Or they could receive devolved authority to issue discharge permits to industrial facilities, assuming that their environmental management plan takes into account pollutant carrying capacities of the receiving environment. This approach needs careful study because it would require a significant strengthening of local government capacity for

environmental management, perhaps even to the extent of using an environmental management systems approach involving policy, planning, review and commitment to continual improvement.

Elements of a comprehensive environmental management program might include:

- Executing a systematic programme to construct industrial sewage systems and solid waste collection/treatment.
- Incorporating the economic costs of industrial pollution (e.g., human health, natural resources, trade competitiveness) in national and local economic planning;
- Incentives for the use of the programmatic EIA and its enhancement to integrate economic and social concerns;
- Training programs for industrial estate managers and regional and local planners on the use of the programmatic EIA and other spatial planning tools; and
- Developing procedures, human skills and data resources to base both land use planning and individual pollution discharge permits on the carrying capacity of watersheds and airsheds.

8.3.5 Enforcement

The enforcement of environmental measures should to a large extent devolve to the DECs and local capacities should be built up for this purpose. An important advantage would be the integration of discharge permits with location and business permits issued by the local governments. To prevent abuse, the provincial EPAs could review the situation at regular intervals. At a minimum, a local government should have an environmental management plan built into its land management system.

Formally incorporating environmental considerations in local land use plans and subsequent zoning ordinances could offer local governments the advantage of speeding up processing of environmental clearance for future industrial projects in their jurisdictions, and of making them more competitive in attracting new investment.

Enforcement should be a community concern. The most effective enforcement is the peer pressure placed on the polluter by an enlightened community, which throughout the developing world is much more effective than the existing formal system of fines. The most powerful tool is therefore the public disclosure of verifiable information on the discharges to the environment by industry.

Elements of a comprehensive environmental management program might include:

- Capacity building for local governments in the interpretation and enforcement of environmental regulations to accelerate the devolution of authority;
- Local governments developing environmental performance criteria for business permitting;
- Training for local governments in cleaner production methods so that they can interpret the claimed efforts of industry to reduce pollution; and
- Local government procedures for the collection and use of community-based information in an enforcement and public disclosure process.

9. Recommendations for UNIDO Services

9.1 Industrial Policy Advice

Industrial policy forms a key element of a national framework and program to promote cleaner production. Industrial policy can influence significantly both the mix of industries toward one with a lower pollution potential, and the production efficiency of those industries which are established. More efficient resource use by industrial enterprises will lead not only to cleaner production, but also to increased competitiveness of the Pakistan manufacturing sector in a global market. UNIDO has proposed several projects intended to increase the international competitiveness of Pakistan in its integrated programme (e.g., total qualify management training and promotion of international standards) and other projects have been proposed (e.g., technology management and technology transfer). A project to develop strategies for the crucially important SME sector is in the pipeline.

The present study indicates that recent trade reforms may favor some shift toward industries with a low pollution potential. In order to achieve the full potential of policy measures it would be worthwhile to review the impact of the relevant measures and identify areas where further improvements are possible. Issues which may also be examined in this context are the needs of the Ministry of Industry and Production (MIP) to develop its capacity to design and implement such measures, closer links with MoELG&RD, the Ministry of Science and Technology and the Export Promotion Bureau, and the relationship between policy makers and professional associations of industrialists. Industrial policy advice should also be linked with the assistance in capacity building. UNIDO can provide support in these areas as needed.

A continuous dialogue between the public and the private sectors and among the many concerned parties is essential to the development of realistic and implementable policy instruments. UNIDO would support the establishment of a national roundtable on industrial policy and environmental protection, focused on integrating environmental objectives into industrial policy and on creating an integrated and comprehensive national program to promote and achieve cleaner production.

9.2 Capacity Building for Industrial Environmental Management

UNIDO can provide assistance in all areas discussed in section 8.3, especially in order to ensure that these are implemented as part of a coherent program. It would be worthwhile investigating whether UNIDO's Area Wide Environmental Quality Management (AEQM) approach, which has been applied in India and Vietnam, could provide a useful service. Application of the AEQM approach would build capacity at the provincial level of government to make informed decisions about the real magnitude of industrial pollution in comparison with other sources of pollution, to determine realistic targets for pollution reduction based on benefits and costs, and to implement the more cost effective measures to reduce industrial pollution. Such an approach is clearly needed for Sheikhupura and Faisalabad.

UNIDO can also help to promote industry awareness of the strategic importance of environmental management systems and of certification to the international standard ISO 14001 where appropriate for international competitiveness, and of course the important role of cleaner production in implementing an environmental management system.

9.3 Industrial Self-regulation and Private Sector Initiative

Industrial self-regulation and private sector initiatives can greatly entrance environmental protection efforts by national and local government. A public dialogue about regulatory objectives and ways of meeting these objectives, involving key government organizations (MoELG&RD, MoIP) and the business community (e.g. industry associations and chambers of commerce such as FPCCI), can help to bring about a broad consensus on sustainable development objectives and would help to

ensure that these objectives are met. The dialogue at the national level should be complemented by a greater involvement of the business community in environmental issues at the provincial and local level.

Because of its neutral status, extensive international experience and access to relevant expertise, UNIDO can play an important role as a catalyst in this process. Specific issues addressed in the government-industry dialogue might include ensuring industry compliance with environmental standards and regulations and involving the industrial sector in the provision of environmental infrastructure and services.

9.4 Industrial Estates

Firms benefit through industrial estates from land development, construction and common facilities such as power, security and communications. Industrial estates can also provide centralized environmental services such as sewage systems, effluent treatment, pollution prevention assistance and energy conservation measures. Such infrastructure and services can be particularly-valuable for SMEs, which often cannot afford them on an individual basis. In many countries, advisory services are attached to estates as well, and these can include service points for information on cleaner production and environmental management.

In Pakistan, industrial estates have been proliferating and are becoming increasingly important as locations for industry. The case studies show, however, that on most existing estates environmental infrastructure and services are not provided. UNIDO's wide experience in assistance to industrial estates can be used to:

- Identify additional locations where estates would be an economical solution to the infrastructure needs of industries and where their developmental impact can be maximized and their environmental impact minimized;
- Plan and establish estates, ensuring that environmental services and infrastructure are fully integrated in the design and operation of the estates;
- Design and integrate infrastructure and services on existing estates;
- Develop programs to promote industrial ecology within and among estates, including investment incentives for co-location of complimentary processes and design of processes to facilitate the cross-use of wastes; and
- Develop a national policy to regulate the number of industrial estates to correspond to the demand such that all are financially viable and can provide appropriate services and infrastructure for locating firms.

The first place to start such an effort would be S.I.T.E. DW in Karachi.

9.5 Corporate Responsibility

During the past five years, the perceptions of industry about sustainable development, primarily those of multinational corporations, have shown a remarkable change primarily due to public pressure. They no longer see sustainable development as only a call to be environmentally responsible; they now see it as a call to be socially and environmentally responsible at the same time continuing to be concerned about shareholder value. This changing perception has even acquired a name -- the triple bottom line (TBL).

Rightfully so, most exporters in developing countries fear that they will not be able to respond to social and environmental requirements without losing their competitive edge in international markets. At the same time they are aware that if they do not meet these requirements in a cost effective way, they will not be in a position to access new foreign markets or large international buyers who stipulate their own codes of corporate ethics. Thus non-compliers, primarily the larger exporting enterprises in developing countries, are being forced to reconsider their environmental and social commitments. However, most small and medium size enterprises, some heavily dependent on

export markets, are usually at a loss on how to effect the technical and managerial changes that would enable them to meet emerging environmental and social standards.

In the three case study investigations carried out for this study, the investigators found a few enterprises interested in and willing to response to social and environmental concerns, but usually even they did not know about the relevant environmental and social norms nor how to address these problems in a way that would produce results and not significantly affect them financially.

The UNIDO TBL project is an effort to develop an approach that would build capacity in support institutions for the private sector to provide a comprehensive set of services to manufacturing enterprises on how to comply with TBL standards. The project would consist of formulation of a TBL approach appropriate for manufacturing enterprises in developing countries, application and testing of the TBL approach for Pakistan in the textile and leather sectors and presentation of the results at Rio plus 10 in South Africa in June 2002. The approach would offer manufacturing enterprises a set of global standards against which they could judge their own performance as well as an internally workable method for them to improve their performance in terms of financial, social and environmental parameters.

9.6 Centres for Environmental Management

Because cleaner production has been encouraged by several international assistance projects (the governments of the Netherlands, Norway and Switzerland), there is a need for UNIDO to propose more than just cleaner production. In particular, what is needed are centers for promoting not only cleaner production but also more advanced environmentally sound technologies, pollution control and environmental management practices in individual subsectors, such as UNIDO has already started for the oil refining sector.

Given the dominance of the textile sector in the industrial activities in Pakistan, UNIDO proposes that the first Centre for Environmental Management be established for the textile sector and housed in the National College for Textile Engineering in Faisalabad, which is often called the “Manchester of Pakistan”. The Centre would be a training and technical assistance unit for environmental matters in the College, which would promote integration of environmental matters into all of its technical outreach activities.

Without a national vision, a plan and the strong backing of government and business, the many valuable efforts to promote environmental management and cleaner production will not gain their potential synergy and may thereby fail to achieve their critical common objective.

Appendix I

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Appendix II

Summary of workshops and recommendations

Workshop on "Industrial Policy and the Environment"
Lahore Chamber of Commerce and Industry
22 May 2000

The following items were discussed:

- In response to a question from the audience and subsequent discussion regarding the control of pollution emitted by the industries, Industrial Audit Mass & Energy Balance was recommended.
- Upon a point regarding emission of waste from certain industries, it was agreed by most of the participants that use-ability of by-products of one industry by others should be examined. It was further suggested that the waste and the by-product should be distinguished clearly.
- Upon discussions regarding import of machinery it was recommended by participants that experts should propose indigenous equipment for cleaner practices.
- It was suggested that consideration should be given to National Awards for pollution free industries for their encouragement.
- For technical solutions, it was agreed that less polluting technologies to be explored.
- It was pointed out that on many occasions, due to non availability of standard raw material, inferior quality raw material is used which ultimately results in pollution. It was therefore suggested to look in to support and ensure availability of raw material.
- During discussion regarding information dissemination, it was a general consensus that inventors do not know how much benefit they will get if they invest in pollution control. It was recommended that proper education should be provided to industrialists and investors regarding pay back in case of investment on pollution elimination.
- Due to practical difficulties regarding the measurement of water consumption some audience recommended pollution charge on output basis. There were of the opinion that flat charge on water consumption was not justifiable.
- Some of the participants recommended that sustainability of the project(s) should always be considered.
- To discourage the pollutants and to encourage the clean industry it was recommended to adapt Polluters Pay-Cleaner Award and incentives for pollution free industry.
- Some of the audiences were of the opinion that during implementation of policies disparity between big & small industry should be discouraged.
- Attention was drawn by some audience that there was no rebate or tax reduction on the import of environment friendly equipment. Ministry of Industry indicated their availability for the pursuance of cases with CBR for rebate on the equipment, which helps pollution eradication.
- During discussion, it was said that enforcement of laws is a very good thing but we should give priority to survival of industry on which the laws are to be imposed. Rebates should also be considered for micro economical policies.
- To encourage the industrialist it was suggested to have a mechanism for the technical assistance to the industrialist on implementation of environmental laws.

Workshop on "Industrial Policy and the Environment"
Faisalabad Chamber of Commerce and Industry
5 June 2000

The following items were discussed:

- The majority of industrialists were of the opinion that due to space and financial constraints, introduction of individual treatment plants at this stage is a costlier proposition and possibility of introduction/installation of a common treatment plants should be explored.
- There was a general agreement for establishment of common effluent treatment plant. It was found agreeable to study appropriate location and its identification at the first stage. Participants were of the opinion that this should be done on priority.
- FCCI's representatives were of the opinion that no new industrial estates/zones are being developed. Some times back there was a proposal under study but it seems it has been shelved now. However, representative of the concerned department did not agree with it and it was clarified that this plan is alive and work is being done on it.
- Most of the participants were of the view that public awareness is still below the required level and arrangement of information dissemination is required to be studied.
- The audience also agreed for establishment of the information centre for public awareness as well as introduction of new and environment friendly techniques in the industry so that industrialists may benefit out of it.
- Role of institutions was discussed in detail and it was agreed to strengthen the institutions for implementation of the rules/regulations related to environment.
- Some audiences were of the opinion that some of the institutions personnel were by themselves not aware of the current development in the field of environment. Further, they are unaware of the present rules & law It was therefore suggested that training arrangements should be considered for such personnel to get better results.
- The industrialists contended about non-uniformity of various charges like water supply. It was suggested to have uniform policy.
- It emerged during the discussion that emphasis is being given to bigger industries as far as implementation of environment policy/rules or regulations are concerned.
- It was stressed that smaller units also generate substantial amount of pollution therefore implementation of law on these units should also be examined.
- Some of the audience stressed to examine the possibility of using by product/waste of one industry as raw material for the other industry, which will ultimately result in reduction of waste.
- To get better results, coordination was stressed between various institutions. It was suggested that all the concerned institutions must have meetings at regular internals (eg fortnightly/monthly).
- Some attendees were of the opinion that our current NEQS are very stringent and implementation in one go might not be possible. It was suggested to examine/compare these standards with the neighboring countries.
- Some participants were of the opinion that the noise and air pollution should also be addressed rigorously, and implementation strategy for short term as well as long term achievements should be studied carefully.
- Some participants were of the opinion that Faisalabad should be equipped with one good, reliable and independent environment laboratory.
- It was suggested that awareness program should include schools/collages too.
- Some attendees were of the opinion that list of consultants and contractors experienced in the field of environment should be made available so that the industrialists/investors can benefit from their experience. This list should be easily accessible too.
- It was stressed that if there is any specific proposal for improvement in the Environment Act, it should be accommodated accordingly.

Workshop on "Industrial Policy and the Environment"
Karachi Chamber of Commerce and Industry
13 May 2000

The following items were discussed:

- Some of the audience suggested that the regulatory agencies require institutional reforms. It was stated that implementation of regulation has not exceeded 30% and 70% implementation is still pending.
- Some audience suggested that our laws and standards are stringent and a leniency required in their implementation.
- Upon a query from one of the attendees, it was stated that the procedures for NCS have been developed and they are currently under review and are expected to be finalized soon.
- It was suggested to increase the water tariff so that its wastage is discouraged. Some participants were the opinion that being cheap, people don't try to conserve it.
- Institutional strengthening was required to be studied for better implementation of regulation/acts. It was also recommended to develop mechanism for implementation.
- Requirement of effective municipal lab was foreseen.
- Audiences were of the opinion to have more organized industrial areas/zones. It was stated that more industrial areas/zones should be planned and UNIDO's assistance in this regard may be sought.
- UNIDO was requested to assist the industry on individual basis too. UNIDO agreed to it subject to the condition that procedures are followed. Possible use of export development fund in this regard was highlighted.
- For information dissemination and education with respect to environmental issues, it was suggest in including these courses in the school level syllabus.
- Need of social environmental program was highlighted which may have positive impacts on the environment.
- Some audience suggested to give proper emphasis on to the noise pollution also.
- It was observed that some people use partially treated effluent for agriculture propose in that area. The vegetables grown through this process are hazardous.
- This should be stopped. A policy requirement was foreseen, which can empower the institutions to get such activities stopped.
- Involvement of health department should also be considered for enforcement of policies.
- KCCI was of the opinion that all the areas targeted for improvement in the environment need finds, which is difficult to arrange in present situation.
- It was also stated that our policies contain ambiguities. The policies should be made very clear and target oriented. In such cases when implementation can be foreseen donors may be attracted.
- The idea of cluster councils was floated which might provide ease and assistance to the local industrialists. This may target to rapid solutions to their problems.
- The Government officials were found of the opinion that industrialists/private sector should also contribute for solution to environmental problems.
- Certain attendees were of the opinion that in the past UNIDO was providing assistance through the federal Government. It was suggested that UNIDO now should try the private sector. UNIDO agreed to assist in case of participation by various stakeholders.
- It was also suggested that manufacturers of equipment for treatment plants should be encouraged.
- It was suggested to compare the water usage in Karachi with water usage in similar industries in other areas of the country.

The following main recommendations of the paper were highlighted in the workshop:

- The audience generally demanded that knowledge about policies should be disseminated through various possible means.

- Enforcement of policies should not be done indiscriminately i.e. big or small, private and public sector should not be discriminated.

The same technical paper was presented in Lahore and the following items were discussed:.

- It was suggested that as policy, concessions should be given after proper home work, example of Gadoon was quoted where concessions were given without any prior homework on the part of government officials.
- Effect of variation in Tariff structures should be studied carefully.
- •Indigenous environment friendly equipment should be provided protection like tax umbrella etc.
- ICCI contended that while preparation/development of policies and regulation the chambers must be consulted. Government quarters stated that the laws are always referred to federation of chambers.
- It was suggested that centers for collection of health-related data and its monitoring should be established.
- It was recommended to have information centers on district council levels.
- Role of educational institutions should be enhanced and curricula should include environment as a subject.
- ICCI was of the opinion that NEQS should be developed after consultation with chambers.
- It was suggested by one of the participants that Islamabad industrial area case study should also be done to assess the damage to the environment and to see the possibilities of rectification.
- It was suggested to investigate as to why the female patients are more than the male patients in the case study area.
- Disposal of solid waste generated by the industries should be looked into seriously and proper solution should be recommended in this regard.
- The procedure of obtaining permission from the government for establish of particular industry in an area should be reviewed. At present, market force is the decisive force.
- Use of cleaner practices should be examined in the industrial area.
- It was suggested not to allow extension of environment non-friendly industries. Use of liberalization, as a tool should be discouraged.
- Possibilities of establishment of common treatment plant should be examined on urgent basis.
- Sewage plant is also required in the area.
- Noise pollution control should also be studied in the case study area.
- It was suggested by some participant that a proper land use plan should be developed.
- It was recommended that dialogue should continue between the ministries and the industries because this could provide a solution acceptable to both parties.
- The contents and conclusion of case study have already been stated in KCCI workshop report.
- The general features of his presentation were same as stated in LCCI workshop.
- However, following was discussed after his presentation.
- It was stated that the CPC proposed in Islamabad will be taking care of oil sector and it will be benefited from international experts whereas it will be administrated by local staff. Need of multi sectional CPC was stressed.
- It was suggested to spend a particular percentage of tax collected for the environment of the tax payer's respective area.
- Networking with various universities of world to be considered.
- Match making for technologies to be studied.
- Data base to be formed for the technology & facilities available here.

Workshop on “Industrial Policy and the Environment”
Islamabad Chamber of Commerce and Industry
15 June 2000

The following items were discussed:

- It was observed by some of the participants that the Act and NEQS are given in contractual/legal language and cannot be easily understood by common people. Act/NEQ’s should be in National Language or simple so that it shall be understood by user. The representative of the ministry however did not agree and stated that legal matters have to be in legal language.
- Some of the participants contended that implementation of rules, regulations is limited only to the private sector. Public sector must set example for private sector in implementation of environmental laws.
- It was observed that SME do not have data available with them in respect of standards etc. Data bank should be prepared for the use of SME.
- Strengthening of Ministry of Environment for effective implementation was requested so that enforcement of regulations could be ensured.
- Some of the audience pointed out that the existing Small Industrial Estates are not fully occupied. Steps should be taken in this direction too.
- It was stated that general public is not aware of the dangers of pollution and its after effects. Community should be made aware so that they can stand against the polluters.
- Need for more environmental tribunals was stressed as it was observed that at this stage only two tribunals are operative. One for NWFP and Punjab and the other for Sindh and Balouchistan, which are not sufficient.
- Some of the participants pointed out that there are certain NEQS for some areas which have not been prepared yet. NEQS not prepared as yet should be prepared soon.
- To enhance awareness with respect to environmental education to be introduced involved in practical besides the theoretical environment, it was suggested that on school levels and the students be education.
- Some of the participants were of the opinion that since UNIDO has done quite substantial work in the field of environment, UNIDO's assistance/experience should be utilized in Pakistan too.
- Some participants stated that in the Environment Act, Safety & Health should also be included.
- In response to a question, the representative of Ministry of Industries & Production stated that the government has principally decided to setup CPC's in Pakistan.
- Dissemination of information should be through web page & the web page address to be advertised as some of the participants were of the view that more and more information should be provided to public as well as let the others know about our achievements in the environment field.
- It was generally agreed that the environment in the area has deteriorated. We should protect and preserve environment from further deterioration.
- Some participants had the opinion that private sector should not always look for Government's assistance. Individual treatment plants should be installed by the industrialists.
- There was a general consensus that the current situation demands establishment of at least two wastewater common treatment plants as recommended.
- Some participants were of the opinion that Environmental and Industrial policies are formulated in isolation from each other. It was therefore suggested to co-relate the implementation of industrial and environmental policies to stop further deterioration of the health of human beings
- To make it convenient and economical for the industrialist, indigenous solutions/equipment should be encouraged.

- Pollution impacts on health and livelihoods are serious. Need of data collection on uniform formats from various hospitals of the area on sickness in various classes of people on a permanent basis was stressed.
- Based on the indiscriminate discharge of the solid waste in the area, need of Solid Waste Disposal Site was foreseen.
- One suggestion was that health related data should be compared with other areas on permanent basis to assess the effect of industrial pollution of various sectors and to take/propose remedial action in this regard.
- See page of injurious chemicals to the ground water to be studied prior to its ultimate disposal. It was also proposed to look into the possibility of certain steps which should be taken to stop it as the effluent travels a long distance before its arrival at proposed wastewater treatment plant.

Appendix III

Workshop on "Industrial Policy and the Environment"
Lahore Chamber of Commerce and Industry
22 May 2000
List of participants

	Name	Company
1	Asim Mahmood	Global Environmertal Lab
2	Muhammad Safique Director	The leads of NGO
3	Huma Fakhar	Advocate
4	Jawad Hassan	Hassan & Hassan
5	Rabia Javaid	LCCI
6	Mr. Sajid Rasid	Dawood Hercules Chemicals Ltd.
7	Dr Aftab Ahmad	AFTEC (Pvt.) Ltd.
8	Mr. Ather Ayyub Khan	Packages Ltd.
9	Engr. Mumtaz Hussain	Environment Media Forum
10	Mr. Maqsood Toor	DDFC (Pvt.) Ltd.
11	Mr. Ahmad Raza Khan	MMP (Pvt.) Ltd.
12	Mr. Geoffrey Richards	ACCC-SEMIOTICS Consultants
13	Moinuddin Ghauri	ACCC-SEMIOTICS Consultants
14	Mr. Tariq Bashir	ACCC-SEMIOTICS Consultants
15	Mr. M. Nawaz Janjua	Pak-kuwait Textile Mills Ltd.
16	Syed Mansoor Ah Shah	Afridi Shah & Minallah
17	Dr. A. R. Siddiqi	Kasure Tannery Pollution Control Project
18	Mr. Mehboob Elahi	Ministry of Environment
19	Mr. Jawad Ah Khan	Ministry of Environment
20	Mr. Muhammad Anwar Khan	Ministry of Industries & Production
21	Dr. Chaudry Inayatullah	UNDP
22	Dr. Robert G. Gumen	LINIDO
23	Dr. Javid Aziz	UET
24	Dr. Mushtaq Ahmad	
25	Dr. A. Sami-uz-zama	FPCCI
26	M. Naveed	Deacon
27	Hamid Aslam	Kinnarid College
28	Sadia Pervez	Kinnarid College
29	Rabia Majeed	Kinnarid College
30	Sadia Rashid	Kinnarid College
31	Dr. Saleem Bashir	Kinnarid College
32	Ch. Laiq Ah	UNIDO
33	Ibrahirn Saeed	UNIDO
34	Zehra Aftab	UNIDO
35	Muhammad B. Habib	UNIDO
36	Abdul Matin Khan	UNIDO
37	Dr. Irshad Ahmed	UNIDO
38	Dr. Naeem-uz-Zama	IN Consult (Pvt.) Ltd.
39	Mr. Naeem Javed	IN Consult (Pvt.) Ltd.
40	Mr. Nasir Akbar	IN Consult (Pvt.) Ltd.
41	Mr. Ilyas Chaudry	President LCCI
42	Saeed Akthar	Director LCCI

Workshop on "Industrial Policy and the Environment"
Faisalabad Chamber of Commerce and Industry
5 June 2000
List of participants

	Name	Company
1	Sh. Nisar Ahmed	APTPMA
2	Haji Bashir Ahmed	Sitara Group of Industries
3	Haji Muhammad Ishaq Mushtaq	Textile industries Ltd.
4	Muhammad Sirtulad	Silate Chemical Industry Ltd.
5	Usman Saleem Sitara	Chemical Industry Ltd.
6	Ah Hussain	Dawood Textile (Pvt.) Ltd.
7	Imran Aslam	Dawood Textile (Pvt.) Ltd.
8	Anjum Sharif	Sitara Chemical Industry Ltd.
9	M. Imran Yousaf	Sitara Energy Ltd.
10	M. Farooq	FDA Environment
11	Muhammad Hamza	Chaudry Association
12	Rana Nadeem Fayaz	G.M Adam Fabrics
13	Mazhar Ahmad	M/s Ihsan Yousaf Textiles (Pvt.) Ltd.
14	Muhammad Saeed	Kasure Processing Khurarianwala
15	Nadeem Hussain	Sitara Textile Industry Ltd.
16	M. Manzoor	Sitara Textile Industry Ltd.
17	Majeed Ah Saluenir	Sitara Textile Industry Ltd.
18	Nisar Ahmad	Hi lal Textile
19	M. Naeem	Sitara Chemical Industry Ltd.
20	Ch. Abdul Ghafoor	Abdul Ghafoor Weaving Factory
21	Haji Ghulam Rasool	Farooq Weaving Factory
22	Ch. Muhammad Saleem Akhtar	Awami Goods Transport Company
23	Muhammah Sharif Khan	Iqbal Sons Paper Mart
24	Capt. (R) Rana Khalid Javed	Naz Fabrics (Pvt.) Ltd.
25	Sheikh Muhammad Amjad	Saeed Fabrics (Pvt.) Ltd.
26	Muhammad Subho Sadiq Butt	Subho Sadiq Silk Mills
27	Mr. Zafar Ahrncd	Rana Weaving Factory
28	Mr. Muhammad Saleem	Shafi Silk Factory
29	Seth Mehmood Akbar	Seth Muhammad Tufail Foundry
30	Haji Shaukat Ah	Adam Fabrics (Pvt.) Ltd.
31	Mr. Sartaj M. A. Siddiqui	FCCI
32	Mr. Muzammil Sultan	FCCI
33	Ch. Anwar-ul-Haq	Industries Deptt.
34	Shahid Pervaiz Butt	Dy. Director Industries Faisalabad
35	Ajmal Farooq	Director NFT
36	Liaqat Ah Randhawa	Director (TP) FDA
37	Dr. Khalid-ur-Rehman	Assisstcnt Proffesor
38	Mr. Abdul Hamid	Encomic Affect Division
39	Shaharyar Qureshi	UNIDO
40	M. Anwar Khan	Ministry of Industries and Production
41	Naeem Javed	IN Consult (Pvt.) Ltd.
42	Dr. Irshad Ahmad	UNIDO
43	Nasir Akbar	IN Consult (Pvt.) Ltd.
44	Sh. M. Khalid Habib	President FCCI

Workshop on “Industrial Policy and the Environment”
Karachi Chamber of Commerce and Industry
13 May 2000
List of participants

	Name	Company
1	Raja Bashir Ahmad	Habib Mills Ltd.
2	Usman Ahmad Qureshi	Berger Paints Pakistan Ltd.
3	L.F. Poonawala	Liberty Mills Ltd.
4	Iqbal Ahmad	Iqbal Trading Corporation
5	Mir Hussain Ah	M.D. Site Ltd.
6	Syed M. Shakil	KMC
7	Abdul Ghani Vohra	I. G. Traders
8	Shehzad A. Khan	Al-Abid Silk Mills
9	5. A. Javed	Din leather
10	M. Nasim Sheikh	Rafique Ahsan
11	M. Shafiq Sindho	New Pump
12	Mr. Nadeem	Pak - Danim
13	Hanif Saddiqui	Inbolliceunlt ISite Ltd.
14	Mahboob Haq	Al-Abbas Fabrics (Pvt.) Ltd.
15	S.M.Nasi	MIs. S. M. Nasi
16	Iqbal Mirza	KDH
17	Asif Ah	Daing Express
18	S.M.Yahya	SEPA
19	M.Nawaz	SEPA
20	Azar ud din Khan	ETPI - FPCCET
21	Dr. A. Sami uz zama	FPCCI
22	Numan Ahmad	FPCCI
23	Dr. Mubina Agbcatuwalla	HOPE
24	Ah Hussain	SSGS
25	Syed Nadeem Arif	Environmental Management
26	Hussain Bux	KWSB
27	Amjad Habib	KWSB
28	Mr. Sohail	Arnreh Sucit
29	Prime International	Prime International
30	Mr. Ishaq Subhani	Director Riginal ICCCI
31	Mian M. Tasiq	Moon Light Industry
32	Tanveer Ahmad	Moon Light Industry
33	Feroz Ansari	Feroz International
34	Mr. Ahmad Saeed	Enviroment Assessment Service
35	Khazib Farooq	KCCI
36	Ibrahim Saeed	UNIDO
37	Ch. Laiq Ah	UNIDO
38	Dr. Irshad Ahmad	UNIDO
39	Naeem Javed	In Consult Pvt. Ltd.

Workshop on "Industrial Policy and the Environment"
Islamabad Chamber of Commerce and Industry
15 June 2000
List of participants

	Name	Company
1	Dr. M. Ilyas Faridi	Attock Refinry RWP
2	Ejaz Rawahawa	Attock Refinry RWP
3	Sirfraz A. Khan	FIREX SOLAR
4	Muhammad Irfan	Pakistan Engineering
5	Abid Ah Khan	Pakistan Engineering
6	Mr. Ehsan Ahmad	Pak Steel Islamabad
7	Imtiaz Rastgar	Rastgar Engineer Co. Ltd.
8	Dr. M. Irfan	Private Consultant
9	Khalid Irfan Ghowri	PPI
10	Shahid Ah Butt	APP
11	Zia-ul-Islam	Pak- EPA
12	Asif Hameed Khan	Pak- EPA
13	Iran Saeed Alrai	Pak- EPA
14	Ahuja-ud-din Siddiqi	DG. EPB
15	Asif S. Khan	D.G Environment
16	Mrs. Maheer Zehra	IUCN
17	Sikandar Murtaza	Sohail Centre
18	Mr. Amir	Amir Construction Company
19	Mr. Sajjad Shah	S. A. S
20	Mr. Shahid Zaman	Shahid Zaman & Company
21	Sh. Baser Daud	Sheikh & Sons
22	Shahid Munir	Tarjuman Islamabad
23	Mrs. Shsgufta	
24	Dr. Muhammad A. Khwaja	SDDI
25	Hafiz Ehsan ul Haq	LJDA
26	M. Javed Syed	EPB Islamabad
27	Irfan Maqbool	Radio Pakistan
28	Qazi Muzafar	Radio Pakistan
29	Hassan Saeed	PTV Centre
30	Ibrahim Saced	UNIDO
31	Ms. Erum Wahab Siddique	UNIDO
32	Ch. Laiq Ah	UNIDO
33	Dr. Irshad Ahmad	UNIDO
34	Imran Khalid	UNIDO
35	Abdul Matin Khan	UNIDO
36	M. Zahid Ah Shah	ICCI
37	Anayat ullah Niazi	ICCI
38	Mr. Omer Shahid	ICCI
39	Mr. Munawar Mughal	Ex-President ICCI
40	Mr. Shahid Rashid Butt	Chairman Faunder Group ICCI
41	Mr. Muhammad Sohail	ICCI Member
42	Syed Numan Shah	ICCI Member
43	Agha Iftikhar Ali Shah	
44	Nasir Akbar	In Consult (Pvt.) Ltd

Appendix IV

UNIDO'S PROGRAMME ON CLEANER PRODUCTION CENTRES

A. What is Cleaner production

Cleaner Production requires a shift in thinking away from end of pipe treatment towards pollution prevention. The techniques and technologies for prevention go beyond those for pollution abatement and waste disposal; they embrace the changes in management attitudes, shop floor operations, industrial processes, equipment and even product design.

Cleaner Production (CP) is the continuous application of an integrated preventive environmental strategy applied to *processes*, *products* and *services* to increase eco-efficiency and reduce the risks to humans and the environment. For *processes*, CP includes conserving raw materials and energy, eliminating toxic raw materials and reducing the quantity and toxicity of all emissions and wastes. For *product*s, CP involves reducing the negative impacts along the life cycle of a product, from raw materials extraction to its ultimate disposal. For *services*, the strategy focuses on incorporating environmental concerns into designing and delivering services. Experience with CP shows that many improvements can be made into the production processes at minimal or no costs, improving both the profitability and the environmental performance.

B. UNIDO's National Cleaner Production Centres

The National Cleaner Production Centres (NCPC) programme is a joint initiative by the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme Industry and Environment Programme Activity Center in Paris (UNEP IEPAC, hereafter referred to as UNEP). UNIDO is the executing agency, with UNEP assisting in the provision of strategic environmental guidance and professional support.

The ultimate goal of the NCPC programme is to increase the application of CP in industry and to incorporate the concept into national environmental policy. To realize this goal, the programme establishes NCPCs to facilitate the transfer of CP information and CP technology to industrial enterprises and environmental management agencies. The transfer of technology is not only from developed to developing countries but also from developing to developed countries.

Phase I of the NCPC programme started in 1994 with the start of 8 national cleaner production centres. These 8 centres are located in Brazil, China, Czech Republic, India, Mexico, Slovak Republic, Tanzania and Zimbabwe. The 8 centres were selected from solicitations received from 39 institutions in 25 countries. In 1996 Tunisia was included in the programme and in 1997 a centre was established in Hungary. Cleaner production programmes have, since then, also started in Uzbekistan, Croatia and Vietnam.

The programme is funded from a number of sources. The Government of Netherlands funds the centres in China, India, Zimbabwe, Tanzania and Mexico. The Government of Austria funds the centres in Czech Republic, Hungary and Slovakia. UNEP also provided substantial funding for the programme in Phase I. The centre in Brazil is funded through a self financed trust fund. The centre in Tunisia, initially established with assistance from US AID is supported by Norway. The cleaner production Programmes in Croatia, Uzbekistan and Vietnam are funded by the Czech Republic, Japan and Sweden respectively.

Based on lessons from Phase I, Phase II of the programme has begun. It encompasses increased regional expansions in India and China and the establishment of at least 10 additional NCPCs.

C. The core services of NCPCs

The centres provide four services: in-plant assessments, training, information dissemination, and policy dialogue. The four activities are interrelated and strongly support one another, as described below.

1. In-plant assessments

The organization of in-plant assessments is an important service that generates CP success stories. In-plant assessments can show how the CP concept works in the given country and also provide opportunities for hands-on training for plant personnel. The NCPC demonstration follows a method based on the PRISMA project, which has been successfully implemented in the Netherlands. The method proved to be suitable for small and medium-sized companies during the UNIDO implemented DESIRE project (Demonstration in Small Industries for Reducing waste) in India. The results of in-plant assessments are profitable CP options that have been implemented and sustained.

2. Training

The training service is linked to the in-plant assessments, as training of company staff and consultants takes place during these assessments. Training is also conducted outside plants through workshops, seminars and in-depth technical training. These training activities are conducted to raise the CP capacity and awareness of branch organizations, government agencies, educational and research institutes, and consultants.

3. Information Dissemination

The information dissemination service is crucial in creating a CP network within a country and among countries. Within each country, the NCPC can provide technical information such as available technologies for solving environmental problems, share experience with interested partners through the submission of case-studies, and promote the centre's activities. All centres are being connected to the Internet, which provides access to a wide variety of environmental information, including the UNIDO and UNEP home pages with information on CP (case studies, sectoral reviews and technologies), the NCPC Programme home page and to e-mail. The centres have also been equipped with numerous UNEP and UNIDO technical manuals and policy guides on CP and environmental management, UNEP's diskette database on CP (International Cleaner Production Information Clearinghouse (ICPIC)), and periodicals enable them to access and provide the most current information on CP. The NCPCs and support institutions are also connected by the e-mail conferencing network (NCPC-NET), which provides a platform for discussions and exchange of information.

4. Policy Dialogue

Policy dialogue promotes effective policy frameworks which accommodate preventive environmental management. This not only involves administrative measures like licensing, but also economic instruments such as duty and fee systems for waste disposal and pricing of raw materials and energy. The NCPCs assess the existing policies and provide recommendations on how to better incorporate CP considerations. The centres have access to policy studies conducted in various countries and are supported by international institutions which have experience in conducting policy reviews.

D. Pakistan's National Cleaner Production Programme

The Government of Pakistan (GoP) has requested the establishment of a National Cleaner Production Center (NCPC) as well as a number of industry-specific cleaner production centres. The

"multi-sectoral" NCPC will play a coordinating and catalytic role for cleaner production by providing policy advice on environmental management, supporting demonstrations of cleaner production techniques/ technologies, training industry and government professionals in this new area of industrial environmental management, and by being a source of information on cleaner production. It will eventually become the core of a network of public and private institutions and individuals involved in pollution prevention, which will include the industry-specific cleaner production centres expected to be established under this programme. The latter are initially expected to cover the oil refining, textiles and leather industries, although the programme may be widened during the implementation phase to include other industries such as sugar processing and steel production provided that the necessary funding can be mobilized.

Oil Sector has been nominated by the GoP for the development of the first Sectoral Cleaner Production Center (CPC) in Pakistan for the following reasons:

1) the Oil Sector's importance to the country;
2) the vast environmental impacts associated with the sector;
3) the potential to significantly improve the environment of Pakistan's large cities which are experiencing severe degradation in their living environment as a result of population growth and the associated increase in urban traffic;

A CPC is being established at Attock Refinery (pvt) Ltd (ARL), Morgah, Rawalpindi. After its establishment this oil-sector CPC will be able to undertake projects such as:

1) upgrading of refineries to phase out lead and eventually produce unleaded petrol;
2) development of other environmently fuels, e.g. low sulfur fuel;
3) effluent treatment
4) vapour loss minimization.

United Nations Industrial development Organization (UNIDO) is planning to create a network of cleaner production centres (CPC) in Pakistan, which after achieving sustainablity will become an entry point for the environmental activities of UNIDO and other agencies in the country. The centres will introduce the cleaner production approach, and thus will help industry to make a shift to ecologically sustainable production practices and achieve the environmental targets set by the Government with optimum investment.

On the international level the network of CPCs in Pakistan will become an integral part of the international network of the 15 NCPCs which are successfully operated by UNIDO in co-operation with UNEP.

F. SOURCE / REFERENCES

1. UNIDO Site on the Internet : www.UNIDO.org/doc/34.html

2. Draft UNIDO Integrated Programme to support, Capacity Building For Sustainable Industrial Development in Pakistan. Un-edited, May 2000

Appendix V

Selected Websites on Cleaner Production

1. UNIDO National Cleaner Production Centres Programme
http://www.UNIDO.org/doc/what.htmls

This site, produced by United Nations Industrial Development Organization (UNIDO), includes information about UNIDO's Cleaner Production Centres Programme and its implementation in different countries.

2. Government Strategies and Policies for Cleaner Production
http://es.epa.gov/new/contacts/newswires/UNEP/UNEP-gov.html

This site, produced by United Nations Environment Programme (UNEP), is an information and guidance document that governments can use to stimulate Cleaner Production. Information about other Cleaner Production documents is provided.

3. Environment International Cooperative for Cleaner production
http://es.epa.gov/cooperative/international

This site is part of a United States (U.S) Environmental Protection Agency sponsored web site. It is a collection of in formation on international Cleaner Production activities. It includes activity descriptions, list to other relevant pages and listings of experts.

4. China-Canada Cooperation Project in Cleaner Production
http://www.chinacp.com

This site provides information on issues of cleaner production and ISO 14000. Information on other Cleaner Production activities in China is also provided. Links are provided to relevant cleaner production, pollution prevention and ISO 14000 web sites in Canada and internationally.

5. International Round Tables
http://c2p2.sarnia.com/roundtables/international.html

This site, produced by Canadian centre for pollution prevention, provides information on and links to International Round Tables on Cleaner Production.

6. Cleaner Production in Central and Eastern European Countries (CEE)
http://www.rec.org/REC/Programs/Business/CleanerProd.shtml

This site outlines the functions and goals of Cleaner Production Centres in CEE. Also provided are links to international organizations working in Cleaner Production

7. Project on Promotion of Cleaner Production in Thai industry
http://www.tei.or.th/ctic/danced.cfm

This site provides information on an on going project to promote cleaner production methods within Thai Industry. Back ground project information as well as project activities and accomplishments are provided.

8. Cleaner Production in the Food Industry
http://www.rfisk.is/verkefni/1077

Cleaner Production in the Food Industry is a combined project, in Iceland, Norway, Denmark and Sweden, which works closely with companies in the food industry with respect to waste minimization and health standards. This page provides information on the project and contacts for those involved.

9. Center for Clean Products and Clean Technologies
http://www.eerc.ra.utk.edu/clean

The Center for Clean products and Clean Technologies (CCPCT), located at University of Tennessee, USA, works to develop, evaluate, and promote cleaner products and cleaner technologies that minimize pollution at the source and contribute to long term sustainable development. This site offers information on the organization, their publications, projects and a directory of suggested links.

10. Australian Cleaner Production Activities
http://www.epa.vic.gov.au/cleanprod/default.htm

This site, produced by Australian Environmental Protection Agency (EPA), explains cleaner production practices in different industries. Case studies are included and environmental and economic benefits are identified.

Appendix VI

ISO STANDARDS AND CERTIFICATION

A. INTRODUCTION

Global interdependence has increased the demand for, and interest in international standards. The main function of most international standardizing organizations is to produce international standards. In addition, they promote the voluntary adoption of these standards worldwide; their use in conformity assessment and accreditation; the health, safety and environmental benefits resulting from them; and the use of these standards in regulatory and procurement activities by government authorities and in the market place.

The international Organization for Standardization (ISO) is a private (non-governmental) world wide federation, founded in 1946 to promote the creation and implementation of uniform standards facilitating the international exchange of goods an services. The policy making body of ISO is its Council, consisting of representatives of 18 members (national standardizing bodies). It meets three times a year. The overall governing body of ISO is the General Assembly of ISO members, and it meets once a year.

The ISO covers all fields involving the promotion of goods, services, or products with the exception of electrical and electronic engineering. Those fields are covered by the International Electrotechnical Commission (IEC). The Central Secretariat of ISO is located in Geneva, Switzerland. Between 1951 (when the first standard was published) and 1999, ISO issued over 12,000 standards. Standards are documents containing technical specifications, rules, guidelines, and definitions to ensure that equipment, products, and services conform to their specifications. The ISO standards are drafted by Technical Committees (TC), each of which are charged with development of standards in a defined area. Each TC solicits the input of producers, customers, governmental bodies and scientists during the drafting of standards.

B. ISO 9000

The best known set of standards published by the ISO is the ISO 9000 series, which was developed by the TC on Quality Assurance and Quality Management (TC 176). The ISO 9000 series is a set of standards for quality management and quality assurance. The standards apply to processes and systems used to produce products; they do not apply to the product themselves. Since they are not industry-specific, the standards provide a general framework for any industry.

The ISO 9000 series provides a set of generic quality assurance standards applicable to any enterprise large, medium or small. With or without modification, it can be used in conjunction with any existing quality assurance or industry-specific standard. Many see the implementation of these standards as an opportunity for an enterprise to reduce its internal costs, and increase product quality, efficiency and productivity. It is also regarded as a stepping stone to total quality and continuous quality improvement.

The five most crucial standards in the ISO series are ISO 9000, ISO 9001, ISO 9002, ISO 9003 and ISO 9004. ISO 9000 and ISO 9004 provide guidelines. A company developing a quality management and assurance program may choose to become certified to one of three standards: ISO 9001, ISO 9002, or ISO 9003.

<u>ISO 9001: Quality Systems-Model for Quality Assurance in Design/ Development, Production, Installation, and Sevicing</u>

This standard includes twenty required elements for a quality management and assurance program. It is the most comprehensive of the five major ISO 9000 series standards. It is designed to apply to all industries, but it is particularly useful in manufacturing and in industries, but it is particularly useful in manufacturing and in industries in which a company designs, produces, installs, and services its own products.

ISO 9002: Quality Systems-Model for Quality Assurance in Production and Installation

This standard includes eighteen required elements for a quality management and assurance program. It is primarily used by companies that do not design their own products although they produce and install them. These provisions are used by suppliers and subcontractors for ISO 9001 certified companies.

ISO 9003: Quality Systems-Model for Quality Assurance in Final Inspection and Test.

This standard includes twelve required elements for a quality management and assurance program. Its primary users are companies that perform tests on and do final inspections of products. Such companies include calibration and test laboratories. In general a company that does not add value to the manufacturing process uses ISO 9003.

As of mid 1999, more than 260,000 companies around the world had been "certified to" one of the ISO 9000 series standards, and nearly 1,000 additional businesses per month were seeking registration. Competitive pressure is considered the primary reason for adopting ISO 9000, and in some markets adoption is obligatory. For example, in the European Union, ISO 9000 certification is a legal requirement for medical devices, for high pressure valves, and in the public transportation market.

C. ISO 14000

The ISO 14000 series, issued in 1996, is the next major set of ISO standards following ISO 9000. ISO 14000 is a series of voluntary international standards for implementing an affective Environmental Management System (EMS). The standards are designed to help manufacturing and service companies of any size develop a uniform set of EMS elements that will help them achieve their own environmental goals.

Companies that choose to adopt the standards make a clear management commitment to an environmental policy, formulate a plan to carry out that policy, identify activities that significantly impact the environment, and train personnel in environmental practices. Finally these standards create an audit and senior management review system to ensure that the program is implemented and maintained. As of mid-1999 over 10,000 ISO 14001 certifications had been completed. ISO 14000 includes twenty standards, the first five of which were released in 1996.

The foundation document in the series ISO 14001, presents core specifications for developing an EMS and, unlike ISO 9000, is the only standard open to audit for the purposes of certification. All other standards either support ISO 14001 or tell how to analyze product characteristics. The ISO 14004 standard complements 14001, providing descriptions, examples, and practical advice for implementing an EMS. ISO 14010, 14011, and 14012 contain guidelines for audit procedure and lay out qualification for auditors. ISO 14040, which came out in 1997, presents a framework for the application of life cycle assessment principles.

ISO 14001: Environmental Management System- Specification with Guidance for Use

Implementation of ISO 14001 requires the organization to specify its policy, identify the environmental aspects, set objectives and targets, and comply with appropriate legislation.

This standard also requires an organization to review its system and continually improve the performance of its products, services and operations as measured by their environmental impact. The standard encourages Best Available Technology (BAT) and Occupational Safety and Health Management into the EMS but does not require their integration.

Although the adoption of the standard does not guarantee environmental compliance, it is believed that companies that implement these commitments will improve their environmental performance. This is a graduating approach to conform to regulatory requirements and to set a path for continual improvement.

D. CERTIFICATION

The ISO standards have attracted widespread recognition and have made businesses all over the world quality and environmentally conscious. Certification to an ISO standard sends a clear message about a company's quality and/or environmental management system. ISO standards are primarily market driven. However, where no customer has specifically requested compliance with ISO standards, then the decision to implement, and to obtain certification on compliance, with these standards will be an internal (voluntary) one. Compliance will provide customers with an assurance of quality of one's products and services, giving them tremendous 'added value' and improving their competitiveness. However, a voluntary standard will have the effect of a mandatory standard if compliance is demanded by a customer, the terms of contract or the purchase order.

The acceptance of ISO standards by enterprises in developing and developed countries stems directly from the market need to obtain greater assurance that products and services conform to customer and environmental requirements.

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