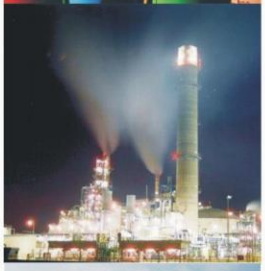
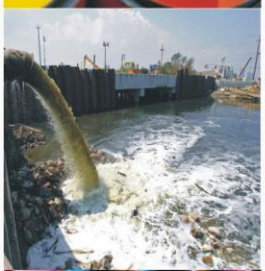
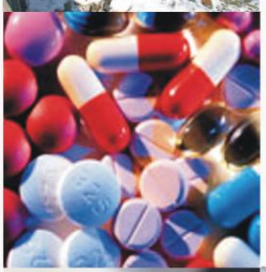





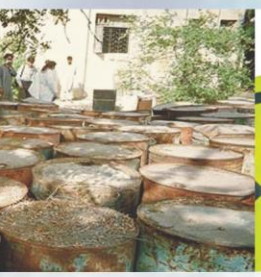



National Profile for Chemical Management in Pakistan

2009

Muhammad Zafar Iqbal

International Cooperation Wing
Ministry of Environment, Government of Pakistan
Islamabad

Acknowledgements

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EXECUTIVE SUMMARY

Chemical sector plays a vital role in the economic development of any country. Pakistan has not yet utilized potential of chemical sector. At the time of independence, chemical industry in Pakistan was practically non-existent. Over the years, some traditional sectors have developed, however the Chemical Industry in Pakistan is still at a very nascent stage. The chemical industry in Pakistan has by and large developed on a fragmented and ad hoc basis motivated by a combination of the existence of small local market and attracted by traditionally high tariffs. As a result it suffers from the lack of scales, national integration and consequent non-competitiveness. However, there are sectors where some scale and integration has been achieved on the basis of growing local market. These include fertilizers, pesticides and to some extent dyestuffs and other inputs for the textile industries. Even in the domains of pesticides and dyestuffs, the production is primarily based on imported base materials and the domestic value addition is confined to formulations and packaging. Pakistan is an agricultural economy; therefore, major part of the chemical industry provides agricultural inputs, i.e. fertilizer and pesticides.

Chemicals including pesticides, fertilizers, industrial chemicals and consumer chemicals have become indispensable in many economic activities and are increasingly used in the industrial, agricultural and consumer sectors of Pakistan. But, increasing evidence suggests that these chemicals can cause health and environment problems at various stages during their life cycle from production or import through disposal. Moreover, most of the industries in the country are situated in urban center near the population without treatment and pollution control facilities. Unfortunately there is no centralized treatment facility anywhere in the country.

The Intergovernmental Forum on Chemical Safety (IFCS), whose primary goal is to complete the tasks and programmes defined in Chapter XIX of Agenda 21, has emphasized the need to prepare national profiles on the sound management of chemicals. The National Profile is the first document in Pakistan that summarizes the efforts of governmental bodies and non-governmental organizations (of the industrial sector, the scientific community, special interest groups, environmental groups, public interest groups) to promote chemical safety and the sound management of chemicals. The National Profile provides an overview of the life-cycles (import, production, use, disposal, etc.) of the most significant chemicals in Pakistan, analyses the national infrastructure meant to ensure the sound management of chemicals, the human resources devoted to making this function, and the regulatory aspects of all this; it also analyses the strong and weak points of these factors, and discusses the possible social and economic advantages, the risks associated with making mistakes, and the need to participate in international co-operation. Furthermore, it contains recommendations on ways to improve chemical safety in Pakistan.

Primarily, in 2000 a National Profile on Chemical Management in Pakistan was prepared for providing information on registered hazardous chemicals being imported or produced locally. Now

the present National Profile is being prepared, with the aim that it can be used to inform both members of the professional community and the general public, and that implementation of its recommendations will go a long way towards improving the coordination of relevant tasks, and the level of chemical safety in Pakistan.

National Background Information

Pakistan is located in the southeast of Asia and bordered by India, China, Iran and Afghanistan. Pakistan covers about 796,095 sq km with a population of some 163.67 million in mid 2008-09. The overall literacy rate (age 10 years and above) is 56%. The population of working age (15-65 years) is about 115.64 million while the unemployment rate stood at 5.2% in 2007-08. Pakistan has extreme variations of temperature as well as great topographical variety. The administration is federal parliamentary system with a president as head of state and an elected prime minister as head of government. There are 4 provinces, and each province is divided into districts, sub-districts and villages consecutively. The national language is Urdu, while Urdu and English, both are recognized as the official languages.

Economic structure of Pakistan is composed of two major sectors, i.e. agriculture sector (mostly in rural area) and industrial sector (mostly in urban centres and industrial states). Major Export oriented industries are textile, leather, carpet, supports and surgical instruments, that accounts an 80% of total exports. Among the agricultural raw products, the major export items are rice, cotton, citrus fruit, dates, mangoes and cane melons.

In 2008-09, the major economic activity, based on the non-agricultural contribution to GDP, was industrial / manufacturing (18.2%), while the agricultural sector having contribution of 21.8% to the GDP. About 60-70% of industrial establishments in Pakistan are based on agricultural commodities such as food manufacturing, tobacco, textile, leather, footwear, cotton yarn, wood work, chemical, fertilizers, pesticides and agricultural machinery, etc.

Chemical Production, Import, Export and Use

Pakistan's total imports have exceeded US$ 10 billion out of which chemicals imports constitute approximately US$ 2 billion. Pakistan imports various chemicals in order for use in both agricultural and industrial area. According to the statistics in 2008, the importation of petroleum products was 9.03 million tons, ranked as the most abundant chemicals imported, followed by industrial chemicals, fertilizers, pesticides (agricultural, public health and consumer use) and consumer chemicals (pharmaceuticals, cosmetics and disinfectants) respectively. With respect to commercial energy used in Pakistan during 2007-08, petroleum products were still the most dominant, followed by natural gases, coal, and hydroelectric power.

The major chemical wastes generated per year are industrial hazardous wastes, wastes from commerce & service, medical practice & laboratory, port & shipping, community and agriculture,

respectively. The unattended chemical waste dumping sites scattered all over the country are a big health risk. Unfortunately, there are very few waste disposal/ treatment/recycling facilities in the country.

The unchecked illegal traffic of banned chemicals especially pesticides through border movement especially in Balochistan is another issue of major concern

The capacity for data gathering is inadequate. Absence of data related to different aspects of chemical life cycle. Centralized database is not present. The scope of data processed is too narrow. The quality of statistical data is very poor.

Priority Concerns Related to Chemical Production, Import, Export and Use

The priority areas of concern related to chemical production, import, export and use include the followings: - air pollution, pollution of inland waterways, marine pollution, groundwater pollution, soil contamination, shallow – well water pollution, hazardous waste treatment / disposal, occupational health (agricultural and industrial), chemical accidents (industrial and transport), storage / disposal of obsolete chemicals, persistent organic pollutants, chemical residues in food, drinking water contamination, public health and chemical poisoning / suicides.

The scale of problems ranges from local, regional to national. Five of the problems are identified as high rank, six as medium rank and six as low rank in priority. Specific chemicals creating concerns are CO2, Smoke, heavy metals, BOD, COD, Pesticides, Acids, Alkalis, and Organic solvents. Commonly, the problems are addressed by the responsible agencies and relevant regulatory bodies, for instance, the Ministries of Health, Agriculture, Industry, Labour, Social Welfare, Science & Technology and Environment. However, an improved coordinating mechanism is needed in order to gain more accurate and reliable data on problems related to chemical production, import, export and use. This will, in turn, result in increased national capacity and capability for achieving sound management of chemicals.

Legal Instruments and Non-Regulatory Mechanisms for Managing Chemicals

The different life-cycle phases of the various groups of chemicals in different sectors of the national economy are regulated by a number of laws, governmental and ministerial decrees, while technical specifications are governed by standards, technical guidelines, and safety regulations. The National Profile summarizes the relevant legal instruments in tables and lists 55 regulations. These regulations primarily deal with the various groups of chemicals—their use/handling. The rest deal with food safety, the safety of various elements of the natural (the air, water, soil) and urban (residential areas, workplaces) environment, and aim to promote chemical safety either by direct regulation, through international agreements, or indirectly, through associated laws and regulations.

There are numerous chemicals considered as severely restricted or banned for agricultural and public health use, as well as use in foods, cosmetics and household products.

Legislation related to different aspects of life cycle of chemicals, especially with reference to import, export, production, use and disposal is very comprehensive. The legislation dealing with disposal, transportation and storage of chemicals is insufficient. These areas are required to be addressed urgently. All institutions, in charge with enforcing these acts, should be sufficiently supported in terms of increasing manpower and improving the infrastructure and equipment. Some of these acts do not address problems of chemical management adequately, hence they need to be revised and updated.

Ministries, Agencies and Other Institutions Managing Chemicals

In order to protect the environment and human beings from adverse effects of poor chemical management, there are at least seventeen ministries (Environment, Health, Food & Agriculture, Labour & Manpower, Commerce, Industry & Production, Finance, Petroleum & Natural Resources, Interior, Science & Technology, Communication, Railways, Textile Industry, Law & Justice, Ports & Shipping, Defence Production, Foreign Affairs, and Local Governments & Rural Development) entrusted with the responsibilities of ensuring related laws, regulations and other operational guidelines.

Mandates of various ministries and institutions related to chemical management are well defined. No new ministry is required exclusively for chemicals management. But there is a need for capacity building of existing institutions with reference to implementation of policies, rules, regulations and acts; as well as in terms of improved availability of information, filling gaps in the understanding of chemicals related health issues, risk assessment methods, protection of vulnerable groups including children, workers and population in general, promotion of safe alternatives and needs for prevention. The lack of human resource, awareness of existing regulatory framework within implementing agencies and meagre funds available are main bottlenecks to be removed. There should be a national monitoring and surveillance system. There is also a need for close and effective collaboration among concerned authorities.

Relevant Activities of Industry, Public Interest Groups and the Research Sector

There is considerable expertise available outside the government in respective fields. A number of organizations indirectly take part in the management of chemicals. They are considered as the government counterparts. These organizations are identified as professional organizations, research institutes, universities, industrial associations, environmental / consumer groups, labour unions and non-governmental organizations. They can share information, and provide ideas and suggestions to the government, but they have no capacity to make official decisions. In Pakistan all these stakeholders are contributing well and taking effective measures.

In order to strengthen the role of all counterparts, there is a need for a stronger coordinating and consultative mechanism among the NGOs and community at grass root level. NGOs require capacity building in chemical management exclusively. NGOs have the capacities for policy analysis, legislation, research on alternatives, trainings, education, data collection/dissemination and raising awareness. The cross cutting capacities are very important to deal with the chemical management in the country. There is also a need to create some mechanism of standardizing these organizations so that they can play some vital role in monitoring and inspections.

Inter-ministerial Commissions and Coordinating Mechanisms

Three inter-ministerial commissions are available for co-ordinating mechanisms among concern institutions. All of them are centralized at the national level. These include National Technical Advisory Committee on Chemicals (NTACC), Agricultural Pesticides Technical Advisory Sub – Committee and Steering committee for elimination of adulteration in pesticides.

The existing coordinating mechanisms are working effectively, how ever there is a dire need of centralised database related to chemicals life cycle. The presence of some of very important sectors/ ministries/organizations have been neglected in the NTACC, e.g. representation of ministry for Petroleum & Natural Resources, Labour, Railway, Communication, Ports & Shipping, National Disaster Management Cell, Rescue 115 Service, is not there. To deal with issues related with the all segments of chemical life cycle there representation in this committee is very important. To enhance participation of academia, heads of departments of chemical technology, chemistry and environmental sciences of the major universities of the country may also be included in the committee. After the addition of above mentioned ministries/departments, the existing mechanism will covers nearly all important aspects of chemical life cycle which require inter-ministerial cooperation and coordination.

Data Access and Use

It is generally accepted that the availability and reliability of information are the key factors in facilitating systemic development. In Pakistan, the national data is maintained by the relevant departments and agencies. There is no harmonization in available data for analytical purpose. There are many gaps in the data management for chemicals in Pakistan. The availability in many areas and quality of available data is not satisfactory. Without reliable data the chemical management is not possible and in this regard a serious effort is required. Data related to chemical accidents, deaths caused due to industrial accidents, injuries, mitigation measures taken is nearly absent. Industries neither maintain such records nor do they report to authorities due to fear of reprisal. Public access to available data is not easy. Due to behavioural problems and lengthy procedures often it takes too much time to acquire data from government agencies.

Literature from international organizations such as, UNDP, WHO, UNITAR, FAO, UNEP, UNIDO, UNICEF, World Bank, Asian Development Bank, USAID etc. are readily available on internet unless it is classified.

Technical Infrastructure

A broad range of laboratory infrastructure has been set up at national level. These laboratories have been designed to meet the requirements of the country. They conduct laboratory operations in order for quality control, regulation, chemical residue monitoring, certification, diagnosis, monitoring & surveillance for consumer protection, research & development, academic and training. Many laboratories have been accredited through National Accreditation Council of Pakistan, but still there are other laboratories which still require certification.

These laboratories also provide training and courses related to chemical management. Although education in chemistry, chemical engineering, environmental management and environmental studies is available but there are no specific course available for chemical management. The additional modules are required in the curricula of the universities with reference to the chemical management, waste management, waste treatment etc

With the e-government initiative the ministries and government departments are interlinked through internet thus providing main source of Information Exchange System. Public has also access to information through the same system. Ministries can interact with the relevant international institutions/organizations through internet. They have access to databases, general information and international literature.

Chemical Emergency Preparedness, Response, and Follow-up

Every country needs emergency response infrastructures to prepare for the tragic chemical accidents, to avoid human, environmental and financial loss. In Pakistan, there is a need for development of emergency response infrastructures for chemical disaster management. The National Disaster Management Plan though include chemical accidents response and management plan, but it is still not implemented. Most of the industries do not have a chemical hazard identification system and they do not even maintain a record of chemical accidents. There is lack of information regarding hazard identification, risk assessment & management, and linkages between livelihoods and disaster preparedness. The emergency services in the country are also lacking except in few big cities. The emergency services personnel are not properly trained and provided with necessary equipment required in case of emergency. Moreover, disaster management, development planning and environmental management institutions operate in isolation and integrated planning between these sectors is almost lacking.

Awareness / Understanding of Workers and the Public

Workers are considered as an important component for sound management of chemicals because they directly handle chemicals in occupational settings. Moreover, the general public, especially who are in the vicinity of chemical industry area, have the right to gain access to appropriate information that can be applied to their situations. A number of measures have been conducted by both government and non-government agencies to provide relevant and comprehensive information about chemical risks in order to raise awareness and understanding of workers and the public. These measures include operations according to regulations, publications, television & radio programs, education, exhibitions and seminars.

In general these efforts seem to be inadequate. Normally the factory workers are not fully aware of risks to the environment, health, and safety from chemicals, and measures which should be taken in order to protect themselves from chronic or acute exposure to hazardous chemicals in everyday life, as well as at the time of a chemical emergency. There is a need to Raise the awareness of decision-makers and legislatures concerning chemical safety and encourage them to take timely action to implement sound management measures. Also the understanding of communicators and media concerning chemical safety issues should be improved in order to improve understanding and chemical safety actions by the public and civil society in general.

International Linkages

Pakistan is a member of numerous international organizations, and has participated in various programmes. It has become a signatory to many international Conventions/Protocols/Agreements like Agenda-21, UN Framework Convention on Climate Change (UNFCCC), Montreal Protocol on Ozone Depleting Substances, Global Environment Facility (GEF), Commission on sustainable Development (CSD), Basel Convention on the Control of Trans boundary Movement of Hazardous Waste and their Disposal, Rotterdam Convention on Prior Informed Consent (PIC) For Certain Hazardous Chemicals and Pesticides, Stockholm Convention on Persistent Organic Pollutants (Pops), Strategic Approach to International Chemicals Management (SAICM) and GATT / WTO agreements. The focal point for each international cooperation is usually located at the institution which is considered to be the prime responsible agency. Through the international linkages, Pakistan is trying to implement these international agreements, and have accepted funding and technical assistance from UNITAR.

Resources available and needed for chemicals management

This chapter attempts to provide a nation-wide overview of the resources utilized for the purposes of chemicals management. It notes that the tasks of governmental bodies – ministries, agencies, authorities and background institutes – in connection with the management of different groups of chemicals are governed by regulations. Their expenses are generally financed by the state budget.

In certain cases the costs of an administrative procedure are borne by the requesting party (applicant).

The number of staffs and experts present at each institution is basically dependent on the related ministry and budget available. In this regard, specific trainings are required to enhance the capability and capacity of the existing human resources.

Background on National Chemical Profile

International Context Concerning the Chemicals Management

Sound chemicals management means that chemicals are produced and used in such a way to minimize the adverse effects to human health and the environment, as emphasized at the Earth Summit in Rio de Janeiro in 1992 in the Chapter 19, Agenda 211. One of the six program areas for sound chemicals management was strengthening of national capabilities and capacities for management of chemicals. Two years later, in 1994, at the meeting of the Intergovernmental Forum on Chemical Safety (IFCS) aimed at monitoring implementation of activities referred to in Agenda 21, a recommendation was adopted to obtain insight in local possibilities and capacities concerning the chemicals management as well as to identify particular national needs through preparation of the National Profile.

Sound chemicals management represents also one of the objectives of the Implementation Plan of the World Summit on Sustainable Development held in Johannesburg in 2002, where 2020 was indicated as a deadline for fulfillment of the set objective. Aimed at supporting countries to achieve the set objective, a Strategic Approach for International Chemicals Management (SAICM) was adopted in the occasion of the International Conference on Chemicals Management held in Dubai in 2006.

SAICM is a global policy framework with an aim to coordinate and support a process leading to achievement of the set objective at the Earth Summit in 2002. SAICM was developed at the international level with the goal to support sound chemicals management as a basis for sustainable development, to contribute to the reduction of differences between the developed countries and developing countries i.e. countries with transition economies through increase of capacities for sound chemicals management. One of the SAICM's recommendations is preparation of National Profile for Chemical Management.

Pakistan Context

National Chemical Profile of Pakistan is a comprehensive and systematic assessment of a country's existing infrastructure and capabilities that are in place for the sound management of chemicals.
The profile has been prepared to highlight the national priorities, identify existing gaps and weaknesses in the chemicals infrastructure.

The information in the National Profile will assist the Government to develop a national action programme with an integrated approach for chemicals management. Execution of this national action programme will contribute to the sound management of chemicals in Pakistan.

The major achievements of National Chemical Profile will:

- Provide an understanding of chemicals produced, imported, exported, used, handled or disposed of in the country, and the people and environmental resources that are potentially affected by these chemicals.
- Give information on ongoing and planned activities at a national level (activities related to the implementation of the Agenda 21 programme).

- Document the existing national infrastructure both for general aspects of chemicals (e.g. information on existing legislation, ministerial responsibilities) and for specific aspects of chemical management such as pesticides registration, occupational health, transport of dangerous substances.
- Initiate a process by which the Government will be able to identify gaps and weaknesses in the existing legal, institutional, administrative and technical infrastructure related to chemicals management and safety.
- Provide a basis for cost-effective allocation of resources by including information on the resources available for management of chemicals, including financial resources and human skills /capabilities, as well as an indication of resources needed for undertaking priority actions. The process of compiling the National Profile report will involve the participation of all concerned stakeholders (national and provincial State departments, NGO, labour, business, interested and affected parties) who are directly involved with the various aspects of chemicals management and safety. National action plans that will be developed from the National Profile will assist the Government to address the following:
- Adequate chemicals management legislation.
- Information generation, gathering, use and dissemination.
- Capacity for hazard and risk assessment, interpretation and communication.
- Establishment of risk management policy, including evaluation of safer chemical alternatives and non-chemical options.
- Effective education programmes.
- Capacity to respond to emergencies.

The national Profile is also relevant to other global projects linked to the Johannesburg Plan of Implementation (JPOI) which was adopted at the World Summit on Sustainable Development (WSSD) held in Johannesburg, in 2002. These projects include the Globally Harmonized System of Classification and Labeling of Chemicals (GHS), projects that seek to reduce the negative effects of chemicals on humans and the environment

The National Profile will form a basis for the development of national priority actions in line with the concrete measures articulated in the Strategic Approach to Chemicals

Abbreviations

AAS	Atomic Absorption Spectroscopy
AATCC	American Association of Textile Chemists and Colourists
APFL	All Pakistan Federation of Labour
APFTU	All Pakistan Federation of Trade Unions
APFUTU	All Pakistan Federation of United Trade Unions
APTUC	All Pakistan Trade Union Congress
APTUF	All Pakistan Trade Union Federation
ARL	Attock Refinery Limited
ASTM	American Society for Testing and Materials
ASTM	American Society for Testing and Materials
BHC	Benzene Hexa Chloride
BOC	British Oxygen Company Limited
BOD	Biochemical Oxygen Demand
BTX	Benzene, Toluene, Xylene
BSE	Bovine Spongiform Encephalopathy
BSI	British Standards Institute
BVCPS	Bureau Veritas Consumer Product Services
CAN	Calcium Ammonium Nitrate
CBOs	Community Based Organizations
CBR	Crude Birth Rate
CDM	Clean Development Mechanism
CDR	Crude Death Rate
CERs	Certified Emission Reductions
CETP	Combined Effluent Treatment Plant
CLEAN	Central Labs for Environmental Analysis and Networking
CNG	Compressed Natural Gas
COD	Chemical Oxygen Demand
CSD	Carbonated soft drinks
CWC	Chemical Weapon Convention
DAP	Di Ammonium Phosphate
DEEPP	Development for Education, Environment, Population Welfare and Poverty Alleviation Organization
DNA	Designated National Authority
ECC	Economic Coordination Committee
EFB	Environment Foundation Balochistan
EIA	Environmental Impact Assessment
EPS	Environmental Protection Society
EPA	Environmental Protection Agency
EPO	Environment Protection Order
ETAD	Ecological and Toxicological Association of the Dyestuff
ETPI	Environmental Technology Programme for Industry
FATA	Federally Administered Tribal Areas

FBS	Federal Bureau of Statistics
FBS	Federal Bureau of Statistics
FFBL	Fauji Fertilizer Bin Qasim Limited
FJFC	Fauji Jordan Fertilizer Company
FO	Foreign Office
FPCCI	Federation of Pakistan Chambers of Commerce and Industry
FRC	Fuel Research Centre
GEL	Global Environmental Lab (Private) Limited
GDP	Gross Domestic Product
GHG	Green House Gases
GQCTL	Grain Quality Control and testing Labs
HANDS	Health and Nutrition Development Society
HCl	Hydrochloric
HCWM	Health Care Waste Management
HDIP	Hydrocarbon Development Institute of Pakistan
H&O	Home and Office
HIES	Household Integrated Economic Survey
HOPE	Health Oriented Preventive Education
HSD	High Speed Diesel
IAC	Institute for Applied Chromatography
IAC	Industrial Analytical Centre
ICM	Integrated Chemical Management
IEE	Initial Environmental Examination
ILO	International Labour Organisation
ISO	International Organization for Standardization
KATI	Korangi association of Trade and Industry
LDO	Light Diesel Oil
LFS	Labour Force Survey
LPG	Liquefied petroleum gas
LRC	Leather Research Centre
MEAS	Multilateral Environmental Agreements Secretariat
MDF	Management for Development Foundation Training & Consultancy
MEG	Mono Ethylene Glycol
MINFAL	Ministry of Food, Agriculture & Livestock
NA	Northern Areas
NARC	National Agricultural Research Centre
NCS	National Conservation Strategy
NEC	National Environmental Consulting (Pvt.) Ltd
NEQS	National Environmental Quality Standards
NIAB	Nuclear Institute for Agriculture and Biology
NRDF	National Research and Development Foundation
NRL	National Refinery Limited
NP	Nitro-Phosphate

NPK	Nitrogen, Phosphorous, Potassium
NTACC	National Technical Advisory Committee on Chemicals
NWQL	National Water Quality Laboratory
NWFP	North West Frontier Province
OHSAS	Occupational Health and Safety Assessment Series
OHSMS	Occupational Health and Safety Management System
OH&S	Occupational Health & Safety
OPP-RTI	Orangi Pilot Project Research and training Institute
PARC	Pakistan Agricultural Research Council
PAEA	Pakistan Atomic Energy Agency
PCRWR	Pakistan Council of Research in Water Resources
PCSIR	Pakistan Council for Scientific & Industrial Research
PCRWR	Pakistan Council of Research in Water Resources
PDS	Pakistan Demographic Survey
PE	Polyethylene
PEPA	Pakistan Environmental Protection Act
PIC	Prior Informed Consent
PIDC	Pakistan Industrial Development Corp
PILER	Pakistan Institute of Labour Education and Research
PIDS	Participatory Integrated Development Society
PINSTECH	Pakistan Institute of Science and Technology
PIEDAR	Pakistan Institute for environmental Development Action Research
PFW	Pakistan Workers Federation
PIHS	Pakistan Integrated Household Survey
PNFTU	Pakistan National Federation of Trade Unions
PNAC	Pakistan National Accreditation Council
POPs	Persistent Organic Pollutants
PP	Polypropylene
PPD	Plant Protection Department
PPC	Pakistan Penal Code
PSQCA	Pakistan Standards and Quality Control Authority
PSQC	Pakistan Standards and Quality Control
PSLM	Pakistan Social and Living Measurement
PSMA	Pakistan Sugar Mills Association
PSST	Pakistan Society of Sugar Technologies
PS	Polystyrene
PTA	Purified Terephthalic Acid
PVA	Poly Vinyl Acetate
PVC	Polyvinyl Chloride
PX	Paraxylene
QCL	Quality Control Laboratory
QHSE	Quality, Health, Safety, Environment
QMS	Quality Management System
RBD	Refined, Bleached & Deodorized

R & D	Research and Development
REACH	Registration, Evaluation, and Authorization of Chemicals
RENPAP	Regional Network on Pesticides in Asia and Pacific
SA	Social Accountability
SARC	Southern zone Agriculture research Centre
SAFWCO	Sindh agricultural and Forestry Workers Coordinating Organization
SCOPE	Society for Conservation and Protection of Environment
SHERI	Shehri-Citizen for Better Environment
SLGO	Sindh Local Government Ordinance
SMART	Self-Monitoring and Reporting System
SMD	Surface-Mounted Device
SMEs	Small and Medium Enterprises
SSP	Single Super Phosphate
TDS	Total Dissolved Solids
TiO2	Titanium Di-Oxide
TFR	Total Fertility Rate
TNT	Tri Nitro Toluene
TRS	Total Reduced Sulfur
TSS	Total Suspended Solid
USD	US Dollar
VCM	Vinyl Chloride
VSF	Viscose Staple Fiber
WTO	World Trade Organization
WESS	Water environment and Sanitation Society

Acknowledgements

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EXECUTIVE SUMMARY

Chemical sector plays a vital role in the economic development of any country. Pakistan has not yet utilized potential of chemical sector. At the time of independence, chemical industry in Pakistan was practically non-existent. Over the years, some traditional sectors have developed, however the Chemical Industry in Pakistan is still at a very nascent stage. The chemical industry in Pakistan has by and large developed on a fragmented and ad hoc basis motivated by a combination of the existence of small local market and attracted by traditionally high tariffs. As a result it suffers from the lack of scales, national integration and consequent non-competitiveness. However, there are sectors where some scale and integration has been achieved on the basis of growing local market. These include fertilizers, pesticides and to some extent dyestuffs and other inputs for the textile industries. Even in the domains of pesticides and dyestuffs, the production is primarily based on imported base materials and the domestic value addition is confined to formulations and packaging. Pakistan is an agricultural economy; therefore, major part of the chemical industry provides agricultural inputs, i.e. fertilizer and pesticides.

Chemicals including pesticides, fertilizers, industrial chemicals and consumer chemicals have become indispensable in many economic activities and are increasingly used in the industrial, agricultural and consumer sectors of Pakistan. But, increasing evidence suggests that these chemicals can cause health and environment problems at various stages during their life cycle from production or import through disposal. Moreover, most of the industries in the country are situated in urban center near the population without treatment and pollution control facilities. Unfortunately there is no centralized treatment facility anywhere in the country.

The Intergovernmental Forum on Chemical Safety (IFCS), whose primary goal is to complete the tasks and programmes defined in Chapter XIX of Agenda 21, has emphasized the need to prepare national profiles on the sound management of chemicals. The National Profile is the first document in Pakistan that summarizes the efforts of governmental bodies and non-governmental organizations (of the industrial sector, the scientific community, special interest groups, environmental groups, public interest groups) to promote chemical safety and the sound management of chemicals. The National Profile provides an overview of the life-cycles (import, production, use, disposal, etc.) of the most significant chemicals in Pakistan, analyses the national infrastructure meant to ensure the sound management of chemicals, the human resources devoted to making this function, and the regulatory aspects of all this; it also analyses the strong and weak points of these factors, and discusses the possible social and economic advantages, the risks associated with making mistakes, and the need to participate in international co-operation. Furthermore, it contains recommendations on ways to improve chemical safety in Pakistan.

Primarily, in 2000 a National Profile on Chemical Management in Pakistan was prepared for providing information on registered hazardous chemicals being imported or produced locally. Now

the present National Profile is being prepared, with the aim that it can be used to inform both members of the professional community and the general public, and that implementation of its recommendations will go a long way towards improving the coordination of relevant tasks, and the level of chemical safety in Pakistan.

National Background Information

Pakistan is located in the southeast of Asia and bordered by India, China, Iran and Afghanistan. Pakistan covers about 796,095 sq km with a population of some 163.67 million in mid 2008-09. The overall literacy rate (age 10 years and above) is 56%. The population of working age (15-65 years) is about 115.64 million while the unemployment rate stood at 5.2% in 2007-08. Pakistan has extreme variations of temperature as well as great topographical variety. The administration is federal parliamentary system with a president as head of state and an elected prime minister as head of government. There are 4 provinces, and each province is divided into districts, sub-districts and villages consecutively. The national language is Urdu, while Urdu and English, both are recognized as the official languages.

Economic structure of Pakistan is composed of two major sectors, i.e. agriculture sector (mostly in rural area) and industrial sector (mostly in urban centres and industrial states). Major Export oriented industries are textile, leather, carpet, supports and surgical instruments, that accounts an 80% of total exports. Among the agricultural raw products, the major export items are rice, cotton, citrus fruit, dates, mangoes and cane melons.

In 2008-09, the major economic activity, based on the non-agricultural contribution to GDP, was industrial / manufacturing (18.2%), while the agricultural sector having contribution of 21.8% to the GDP. About 60-70% of industrial establishments in Pakistan are based on agricultural commodities such as food manufacturing, tobacco, textile, leather, footwear, cotton yarn, wood work, chemical, fertilizers, pesticides and agricultural machinery, etc.

Chemical Production, Import, Export and Use

Pakistan's total imports have exceeded US$ 10 billion out of which chemicals imports constitute approximately US$ 2 billion. Pakistan imports various chemicals in order for use in both agricultural and industrial area. According to the statistics in 2008, the importation of petroleum products was 9.03 million tons, ranked as the most abundant chemicals imported, followed by industrial chemicals, fertilizers, pesticides (agricultural, public health and consumer use) and consumer chemicals (pharmaceuticals, cosmetics and disinfectants) respectively. With respect to commercial energy used in Pakistan during 2007-08, petroleum products were still the most dominant, followed by natural gases, coal, and hydroelectric power.

The major chemical wastes generated per year are industrial hazardous wastes, wastes from commerce & service, medical practice & laboratory, port & shipping, community and agriculture,

respectively. The unattended chemical waste dumping sites scattered all over the country are a big health risk. Unfortunately, there are very few waste disposal/ treatment/recycling facilities in the country.

The unchecked illegal traffic of banned chemicals especially pesticides through border movement especially in Balochistan is another issue of major concern

The capacity for data gathering is inadequate. Absence of data related to different aspects of chemical life cycle. Centralized database is not present. The scope of data processed is too narrow. The quality of statistical data is very poor.

Priority Concerns Related to Chemical Production, Import, Export and Use

The priority areas of concern related to chemical production, import, export and use include the followings: - air pollution, pollution of inland waterways, marine pollution, groundwater pollution, soil contamination, shallow – well water pollution, hazardous waste treatment / disposal, occupational health (agricultural and industrial), chemical accidents (industrial and transport), storage / disposal of obsolete chemicals, persistent organic pollutants, chemical residues in food, drinking water contamination, public health and chemical poisoning / suicides.

The scale of problems ranges from local, regional to national. Five of the problems are identified as high rank, six as medium rank and six as low rank in priority. Specific chemicals creating concerns are CO2, Smoke, heavy metals, BOD, COD, Pesticides, Acids, Alkalis, and Organic solvents. Commonly, the problems are addressed by the responsible agencies and relevant regulatory bodies, for instance, the Ministries of Health, Agriculture, Industry, Labour, Social Welfare, Science & Technology and Environment. However, an improved coordinating mechanism is needed in order to gain more accurate and reliable data on problems related to chemical production, import, export and use. This will, in turn, result in increased national capacity and capability for achieving sound management of chemicals.

Legal Instruments and Non-Regulatory Mechanisms for Managing Chemicals

The different life-cycle phases of the various groups of chemicals in different sectors of the national economy are regulated by a number of laws, governmental and ministerial decrees, while technical specifications are governed by standards, technical guidelines, and safety regulations. The National Profile summarizes the relevant legal instruments in tables and lists 55 regulations. These regulations primarily deal with the various groups of chemicals—their use/handling. The rest deal with food safety, the safety of various elements of the natural (the air, water, soil) and urban (residential areas, workplaces) environment, and aim to promote chemical safety either by direct regulation, through international agreements, or indirectly, through associated laws and regulations.

There are numerous chemicals considered as severely restricted or banned for agricultural and public health use, as well as use in foods, cosmetics and household products.

Legislation related to different aspects of life cycle of chemicals, especially with reference to import, export, production, use and disposal is very comprehensive. The legislation dealing with disposal, transportation and storage of chemicals is insufficient. These areas are required to be addressed urgently. All institutions, in charge with enforcing these acts, should be sufficiently supported in terms of increasing manpower and improving the infrastructure and equipment. Some of these acts do not address problems of chemical management adequately, hence they need to be revised and updated.

Ministries, Agencies and Other Institutions Managing Chemicals

In order to protect the environment and human beings from adverse effects of poor chemical management, there are at least seventeen ministries (Environment, Health, Food & Agriculture, Labour & Manpower, Commerce, Industry & Production, Finance, Petroleum & Natural Resources, Interior, Science & Technology, Communication, Railways, Textile Industry, Law & Justice, Ports & Shipping, Defence Production, Foreign Affairs, and Local Governments & Rural Development) entrusted with the responsibilities of ensuring related laws, regulations and other operational guidelines.

Mandates of various ministries and institutions related to chemical management are well defined. No new ministry is required exclusively for chemicals management. But there is a need for capacity building of existing institutions with reference to implementation of policies, rules, regulations and acts; as well as in terms of improved availability of information, filling gaps in the understanding of chemicals related health issues, risk assessment methods, protection of vulnerable groups including children, workers and population in general, promotion of safe alternatives and needs for prevention. The lack of human resource, awareness of existing regulatory framework within implementing agencies and meagre funds available are main bottlenecks to be removed. There should be a national monitoring and surveillance system. There is also a need for close and effective collaboration among concerned authorities.

Relevant Activities of Industry, Public Interest Groups and the Research Sector

There is considerable expertise available outside the government in respective fields. A number of organizations indirectly take part in the management of chemicals. They are considered as the government counterparts. These organizations are identified as professional organizations, research institutes, universities, industrial associations, environmental / consumer groups, labour unions and non-governmental organizations. They can share information, and provide ideas and suggestions to the government, but they have no capacity to make official decisions. In Pakistan all these stakeholders are contributing well and taking effective measures.

In order to strengthen the role of all counterparts, there is a need for a stronger coordinating and consultative mechanism among the NGOs and community at grass root level. NGOs require capacity building in chemical management exclusively. NGOs have the capacities for policy analysis, legislation, research on alternatives, trainings, education, data collection/dissemination and raising awareness. The cross cutting capacities are very important to deal with the chemical management in the country. There is also a need to create some mechanism of standardizing these organizations so that they can play some vital role in monitoring and inspections.

Inter-ministerial Commissions and Coordinating Mechanisms

Three inter-ministerial commissions are available for co-ordinating mechanisms among concern institutions. All of them are centralized at the national level. These include National Technical Advisory Committee on Chemicals (NTACC), Agricultural Pesticides Technical Advisory Sub – Committee and Steering committee for elimination of adulteration in pesticides.

The existing coordinating mechanisms are working effectively, how ever there is a dire need of centralised database related to chemicals life cycle. The presence of some of very important sectors/ ministries/organizations have been neglected in the NTACC, e.g. representation of ministry for Petroleum & Natural Resources, Labour, Railway, Communication, Ports & Shipping, National Disaster Management Cell, Rescue 115 Service, is not there. To deal with issues related with the all segments of chemical life cycle there representation in this committee is very important. To enhance participation of academia, heads of departments of chemical technology, chemistry and environmental sciences of the major universities of the country may also be included in the committee. After the addition of above mentioned ministries/departments, the existing mechanism will covers nearly all important aspects of chemical life cycle which require inter-ministerial cooperation and coordination.

Data Access and Use

It is generally accepted that the availability and reliability of information are the key factors in facilitating systemic development. In Pakistan, the national data is maintained by the relevant departments and agencies. There is no harmonization in available data for analytical purpose. There are many gaps in the data management for chemicals in Pakistan. The availability in many areas and quality of available data is not satisfactory. Without reliable data the chemical management is not possible and in this regard a serious effort is required. Data related to chemical accidents, deaths caused due to industrial accidents, injuries, mitigation measures taken is nearly absent. Industries neither maintain such records nor do they report to authorities due to fear of reprisal. Public access to available data is not easy. Due to behavioural problems and lengthy procedures often it takes too much time to acquire data from government agencies.

Literature from international organizations such as, UNDP, WHO, UNITAR, FAO, UNEP, UNIDO, UNICEF, World Bank, Asian Development Bank, USAID etc. are readily available on internet unless it is classified.

Technical Infrastructure

A broad range of laboratory infrastructure has been set up at national level. These laboratories have been designed to meet the requirements of the country. They conduct laboratory operations in order for quality control, regulation, chemical residue monitoring, certification, diagnosis, monitoring & surveillance for consumer protection, research & development, academic and training. Many laboratories have been accredited through National Accreditation Council of Pakistan, but still there are other laboratories which still require certification.

These laboratories also provide training and courses related to chemical management. Although education in chemistry, chemical engineering, environmental management and environmental studies is available but there are no specific course available for chemical management. The additional modules are required in the curricula of the universities with reference to the chemical management, waste management, waste treatment etc

With the e-government initiative the ministries and government departments are interlinked through internet thus providing main source of Information Exchange System. Public has also access to information through the same system. Ministries can interact with the relevant international institutions/organizations through internet. They have access to databases, general information and international literature.

Chemical Emergency Preparedness, Response, and Follow-up

Every country needs emergency response infrastructures to prepare for the tragic chemical accidents, to avoid human, environmental and financial loss. In Pakistan, there is a need for development of emergency response infrastructures for chemical disaster management. The National Disaster Management Plan though include chemical accidents response and management plan, but it is still not implemented. Most of the industries do not have a chemical hazard identification system and they do not even maintain a record of chemical accidents. There is lack of information regarding hazard identification, risk assessment & management, and linkages between livelihoods and disaster preparedness. The emergency services in the country are also lacking except in few big cities. The emergency services personnel are not properly trained and provided with necessary equipment required in case of emergency. Moreover, disaster management, development planning and environmental management institutions operate in isolation and integrated planning between these sectors is almost lacking.

Awareness / Understanding of Workers and the Public

Workers are considered as an important component for sound management of chemicals because they directly handle chemicals in occupational settings. Moreover, the general public, especially who are in the vicinity of chemical industry area, have the right to gain access to appropriate information that can be applied to their situations. A number of measures have been conducted by both government and non-government agencies to provide relevant and comprehensive information about chemical risks in order to raise awareness and understanding of workers and the public. These measures include operations according to regulations, publications, television & radio programs, education, exhibitions and seminars.

In general these efforts seem to be inadequate. Normally the factory workers are not fully aware of risks to the environment, health, and safety from chemicals, and measures which should be taken in order to protect themselves from chronic or acute exposure to hazardous chemicals in everyday life, as well as at the time of a chemical emergency. There is a need to Raise the awareness of decision-makers and legislatures concerning chemical safety and encourage them to take timely action to implement sound management measures. Also the understanding of communicators and media concerning chemical safety issues should be improved in order to improve understanding and chemical safety actions by the public and civil society in general.

International Linkages

Pakistan is a member of numerous international organizations, and has participated in various programmes. It has become a signatory to many international Conventions/Protocols/Agreements like Agenda-21, UN Framework Convention on Climate Change (UNFCCC), Montreal Protocol on Ozone Depleting Substances, Global Environment Facility (GEF), Commission on sustainable Development (CSD), Basel Convention on the Control of Trans boundary Movement of Hazardous Waste and their Disposal, Rotterdam Convention on Prior Informed Consent (PIC) For Certain Hazardous Chemicals and Pesticides, Stockholm Convention on Persistent Organic Pollutants (Pops), Strategic Approach to International Chemicals Management (SAICM) and GATT / WTO agreements. The focal point for each international cooperation is usually located at the institution which is considered to be the prime responsible agency. Through the international linkages, Pakistan is trying to implement these international agreements, and have accepted funding and technical assistance from UNITAR.

Resources available and needed for chemicals management

This chapter attempts to provide a nation-wide overview of the resources utilized for the purposes of chemicals management. It notes that the tasks of governmental bodies – ministries, agencies, authorities and background institutes – in connection with the management of different groups of chemicals are governed by regulations. Their expenses are generally financed by the state budget.

In certain cases the costs of an administrative procedure are borne by the requesting party (applicant).

The number of staffs and experts present at each institution is basically dependent on the related ministry and budget available. In this regard, specific trainings are required to enhance the capability and capacity of the existing human resources.

Background on National Chemical Profile

International Context Concerning the Chemicals Management

Sound chemicals management means that chemicals are produced and used in such a way to minimize the adverse effects to human health and the environment, as emphasized at the Earth Summit in Rio de Janeiro in 1992 in the Chapter 19, Agenda 211. One of the six program areas for sound chemicals management was strengthening of national capabilities and capacities for management of chemicals. Two years later, in 1994, at the meeting of the Intergovernmental Forum on Chemical Safety (IFCS) aimed at monitoring implementation of activities referred to in Agenda 21, a recommendation was adopted to obtain insight in local possibilities and capacities concerning the chemicals management as well as to identify particular national needs through preparation of the National Profile.

Sound chemicals management represents also one of the objectives of the Implementation Plan of the World Summit on Sustainable Development held in Johannesburg in 2002, where 2020 was indicated as a deadline for fulfillment of the set objective. Aimed at supporting countries to achieve the set objective, a Strategic Approach for International Chemicals Management (SAICM) was adopted in the occasion of the International Conference on Chemicals Management held in Dubai in 2006.

SAICM is a global policy framework with an aim to coordinate and support a process leading to achievement of the set objective at the Earth Summit in 2002. SAICM was developed at the international level with the goal to support sound chemicals management as a basis for sustainable development, to contribute to the reduction of differences between the developed countries and developing countries i.e. countries with transition economies through increase of capacities for sound chemicals management. One of the SAICM's recommendations is preparation of National Profile for Chemical Management.

Pakistan Context

National Chemical Profile of Pakistan is a comprehensive and systematic assessment of a country's existing infrastructure and capabilities that are in place for the sound management of chemicals.
The profile has been prepared to highlight the national priorities, identify existing gaps and weaknesses in the chemicals infrastructure.

The information in the National Profile will assist the Government to develop a national action programme with an integrated approach for chemicals management. Execution of this national action programme will contribute to the sound management of chemicals in Pakistan.

The major achievements of National Chemical Profile will:

- Provide an understanding of chemicals produced, imported, exported, used, handled or disposed of in the country, and the people and environmental resources that are potentially affected by these chemicals.
- Give information on ongoing and planned activities at a national level (activities related to the implementation of the Agenda 21 programme).

- Document the existing national infrastructure both for general aspects of chemicals (e.g. information on existing legislation, ministerial responsibilities) and for specific aspects of chemical management such as pesticides registration, occupational health, transport of dangerous substances.
- Initiate a process by which the Government will be able to identify gaps and weaknesses in the existing legal, institutional, administrative and technical infrastructure related to chemicals management and safety.
- Provide a basis for cost-effective allocation of resources by including information on the resources available for management of chemicals, including financial resources and human skills /capabilities, as well as an indication of resources needed for undertaking priority actions. The process of compiling the National Profile report will involve the participation of all concerned stakeholders (national and provincial State departments, NGO, labour, business, interested and affected parties) who are directly involved with the various aspects of chemicals management and safety. National action plans that will be developed from the National Profile will assist the Government to address the following:
- Adequate chemicals management legislation.
- Information generation, gathering, use and dissemination.
- Capacity for hazard and risk assessment, interpretation and communication.
- Establishment of risk management policy, including evaluation of safer chemical alternatives and non-chemical options.
- Effective education programmes.
- Capacity to respond to emergencies.

The national Profile is also relevant to other global projects linked to the Johannesburg Plan of Implementation (JPOI) which was adopted at the World Summit on Sustainable Development (WSSD) held in Johannesburg, in 2002. These projects include the Globally Harmonized System of Classification and Labeling of Chemicals (GHS), projects that seek to reduce the negative effects of chemicals on humans and the environment

The National Profile will form a basis for the development of national priority actions in line with the concrete measures articulated in the Strategic Approach to Chemicals

Abbreviations

AAS	Atomic Absorption Spectroscopy
AATCC	American Association of Textile Chemists and Colourists
APFL	All Pakistan Federation of Labour
APFTU	All Pakistan Federation of Trade Unions
APFUTU	All Pakistan Federation of United Trade Unions
APTUC	All Pakistan Trade Union Congress
APTUF	All Pakistan Trade Union Federation
ARL	Attock Refinery Limited
ASTM	American Society for Testing and Materials
ASTM	American Society for Testing and Materials
BHC	Benzene Hexa Chloride
BOC	British Oxygen Company Limited
BOD	Biochemical Oxygen Demand
BTX	Benzene, Toluene, Xylene
BSE	Bovine Spongiform Encephalopathy
BSI	British Standards Institute
BVCPS	Bureau Veritas Consumer Product Services
CAN	Calcium Ammonium Nitrate
CBOs	Community Based Organizations
CBR	Crude Birth Rate
CDM	Clean Development Mechanism
CDR	Crude Death Rate
CERs	Certified Emission Reductions
CETP	Combined Effluent Treatment Plant
CLEAN	Central Labs for Environmental Analysis and Networking
CNG	Compressed Natural Gas
COD	Chemical Oxygen Demand
CSD	Carbonated soft drinks
CWC	Chemical Weapon Convention
DAP	Di Ammonium Phosphate
DEEPP	Development for Education, Environment, Population Welfare and Poverty Alleviation Organization
DNA	Designated National Authority
ECC	Economic Coordination Committee
EFB	Environment Foundation Balochistan
EIA	Environmental Impact Assessment
EPS	Environmental Protection Society
EPA	Environmental Protection Agency
EPO	Environment Protection Order
ETAD	Ecological and Toxicological Association of the Dyestuff
ETPI	Environmental Technology Programme for Industry
FATA	Federally Administered Tribal Areas

FBS	Federal Bureau of Statistics
FBS	Federal Bureau of Statistics
FFBL	Fauji Fertilizer Bin Qasim Limited
FJFC	Fauji Jordan Fertilizer Company
FO	Foreign Office
FPCCI	Federation of Pakistan Chambers of Commerce and Industry
FRC	Fuel Research Centre
GEL	Global Environmental Lab (Private) Limited
GDP	Gross Domestic Product
GHG	Green House Gases
GQCTL	Grain Quality Control and testing Labs
HANDS	Health and Nutrition Development Society
HCl	Hydrochloric
HCWM	Health Care Waste Management
HDIP	Hydrocarbon Development Institute of Pakistan
H&O	Home and Office
HIES	Household Integrated Economic Survey
HOPE	Health Oriented Preventive Education
HSD	High Speed Diesel
IAC	Institute for Applied Chromatography
IAC	Industrial Analytical Centre
ICM	Integrated Chemical Management
IEE	Initial Environmental Examination
ILO	International Labour Organisation
ISO	International Organization for Standardization
KATI	Korangi association of Trade and Industry
LDO	Light Diesel Oil
LFS	Labour Force Survey
LPG	Liquefied petroleum gas
LRC	Leather Research Centre
MEAS	Multilateral Environmental Agreements Secretariat
MDF	Management for Development Foundation Training & Consultancy
MEG	Mono Ethylene Glycol
MINFAL	Ministry of Food, Agriculture & Livestock
NA	Northern Areas
NARC	National Agricultural Research Centre
NCS	National Conservation Strategy
NEC	National Environmental Consulting (Pvt.) Ltd
NEQS	National Environmental Quality Standards
NIAB	Nuclear Institute for Agriculture and Biology
NRDF	National Research and Development Foundation
NRL	National Refinery Limited
NP	Nitro-Phosphate

NPK	Nitrogen, Phosphorous, Potassium
NTACC	National Technical Advisory Committee on Chemicals
NWQL	National Water Quality Laboratory
NWFP	North West Frontier Province
OHSAS	Occupational Health and Safety Assessment Series
OHSMS	Occupational Health and Safety Management System
OH&S	Occupational Health & Safety
OPP-RTI	Orangi Pilot Project Research and training Institute
PARC	Pakistan Agricultural Research Council
PAEA	Pakistan Atomic Energy Agency
PCRWR	Pakistan Council of Research in Water Resources
PCSIR	Pakistan Council for Scientific & Industrial Research
PCRWR	Pakistan Council of Research in Water Resources
PDS	Pakistan Demographic Survey
PE	Polyethylene
PEPA	Pakistan Environmental Protection Act
PIC	Prior Informed Consent
PIDC	Pakistan Industrial Development Corp
PILER	Pakistan Institute of Labour Education and Research
PIDS	Participatory Integrated Development Society
PINSTECH	Pakistan Institute of Science and Technology
PIEDAR	Pakistan Institute for environmental Development Action Research
PFW	Pakistan Workers Federation
PIHS	Pakistan Integrated Household Survey
PNFTU	Pakistan National Federation of Trade Unions
PNAC	Pakistan National Accreditation Council
POPs	Persistent Organic Pollutants
PP	Polypropylene
PPD	Plant Protection Department
PPC	Pakistan Penal Code
PSQCA	Pakistan Standards and Quality Control Authority
PSQC	Pakistan Standards and Quality Control
PSLM	Pakistan Social and Living Measurement
PSMA	Pakistan Sugar Mills Association
PSST	Pakistan Society of Sugar Technologies
PS	Polystyrene
PTA	Purified Terephthalic Acid
PVA	Poly Vinyl Acetate
PVC	Polyvinyl Chloride
PX	Paraxylene
QCL	Quality Control Laboratory
QHSE	Quality, Health, Safety, Environment
QMS	Quality Management System
RBD	Refined, Bleached & Deodorized

R & D	Research and Development
REACH	Registration, Evaluation, and Authorization of Chemicals
RENPAP	Regional Network on Pesticides in Asia and Pacific
SA	Social Accountability
SARC	Southern zone Agriculture research Centre
SAFWCO	Sindh agricultural and Forestry Workers Coordinating Organization
SCOPE	Society for Conservation and Protection of Environment
SHERI	Shehri-Citizen for Better Environment
SLGO	Sindh Local Government Ordinance
SMART	Self-Monitoring and Reporting System
SMD	Surface-Mounted Device
SMEs	Small and Medium Enterprises
SSP	Single Super Phosphate
TDS	Total Dissolved Solids
TiO2	Titanium Di-Oxide
TFR	Total Fertility Rate
TNT	Tri Nitro Toluene
TRS	Total Reduced Sulfur
TSS	Total Suspended Solid
USD	US Dollar
VCM	Vinyl Chloride
VSF	Viscose Staple Fiber
WTO	World Trade Organization
WESS	Water environment and Sanitation Society

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Chapter 1

1. National Background Information

1.1. Physical and Demographic Context

1.1.1. Location and Size of the Country

Situated in western part of Indian subcontinent, Pakistan shares it's eastern border with India and a north-eastern border with China. Iran makes up the country's south west border and Afghanistan runs along its western and northern edge. The Arabian Sea is Pakistan's southern boundary with 1,064 km of coastline.

The country has a total area of 796,095 sq km (310,409 mi), extending 1,875 km (1,165 mi) NE – SW from ranges of Hindu Kush and Himalaya to the Arabian Sea and 1,006 km (625 mi) SE – NW. Pakistan is divided into four provinces viz. North West Frontier Province (NWFP), Punjab, Sindh and Balochistan. The tribal belt adjoining NWFP is managed by the Federal Government and is named FATA i.e., Federally Administrated Tribal Area. Azad Kashmir and Northern Areas have their own respective political and administrative machinery, yet certain of their subjects are taken care of by the Federal Government through the Ministry of Kashmir Affairs and Northern Areas. Provinces of Pakistan are further divided into districts.

1.1.2. Topography

Pakistan has great topographical variety. The high mountain region of the north includes part of the Himalayas, Karakoram and Hindukush. There are 35 peaks over 7,320 m high, including K-2, the world's second highest mountain. This region abounds in glaciers, lakes and green valleys. Southwards the ranges gradually loose height. The western low mountain region covers much of the North-West Frontier Province, with mountains cut by valleys and passes, including the Khyber Pass, 56 km. long, connecting Kabul in Afghanistan with Peshawar. The third region is Balochistan plateau to the west. West of the Balochistan plateau is an area of desert with dry lakes.

The Potohar upland lies between the Indus and Jhelum rivers in the Islamabad/Rawalpindi area. This is an arid region, with cultivation along the valleys. The fifth region is the Punjab plain watered by the river Indus and its eastern tributaries (Jhelum, Chenab, Ravi, Sutlej and Beass) and additionally irrigated by canals.

The Sindh plain stretches between the Punjab plain and the Arabian Sea on both sides of the Indus River. The plain comprises a vast fertile tract with many lakes, and a desert spreading eastward into India.

1.1.3. Climate

Extreme variations of temperature are found in Pakistan. The northern mountains are cold with long and severe winters. Temperatures on the Balochistan plateau are high. Along the coastal strip, the climate is the climate is modified by sea breezes. In the rest of the country, the temperature

rises steeply in summer. Rainfall varies from 760 – 1,270 mm in the Himalayan foothills to 210 mm in Balochistan.

1.1.4. Form of government

The constitution of Islamic Republic of Pakistan, 1973 provides for a federal parliamentary system with a president as head of state and an elected prime minister as head of government. It has a three branch system of governance consisting of the legislature, executive and judiciary. The president, who must be a Muslim, is elected for a five-year term by an electoral college consisting of members of the Senate and National Assembly and members of the provincial assemblies. The president generally acts on the advice of the prime minister but has important residual powers.

The bicameral federal legislature is the Majlis-i-Shoora (Council of Advisors), consisting of the Senate (upper house) and National Assembly (lower house). Members of the National Assembly are elected general elections. All citizens above the age of 18 are eligible to vote. Seats are allocated to each o the four provinces, the federally administered tribal areas and Islamabad capital territory on the basis of population. The National Assembly has a total membership of 342 elected through adult suffrage (272 general seats, 60 women seats and 10 non-Muslim seats. About 5% of the seats are reserved for minorities. Elections for the minority seats are held on the basis of joint electorates. National Assembly members serve for the parliamentary term which is for five years.

The prime minister is appointed by the president from among the members of the National Assembly. The prime minister is assisted by the Federal Cabinet, a council of ministers whose members are appointed by the president on the advice of the prime minister and comprises the ministers, ministers of state and advisors.

The Senate is permanent legislative body with equal representation from each of the four provinces elected by the members of their respective provincial assemblies. There are representatives from the Federally Administered Tribal Areas and from Islamabad Capital Territory. The Chairman of the Senate, under the constitution is next in line to act as president, should the office become vacant and until such time as a new president can be formally elected. Both the Senate and the National Assembly can initiate and pass legislation except for finance bills.

Other offices and bodies having important roles in the federal structure include the attorney general, the Auditor General, Federal Land Commission, the Federal Public Services Commission, Election Commission of Pakistan and Wafaqi Mohtasib (Ombudsman).

Pakistan's four provinces enjoy considerable autonomy. Each province has a governor, a Cabinet of Ministers headed by a chief minister appointed by the governor and a provincial assembly.

The Judiciary includes the Supreme Court, provincial high courts, and other lesser courts exercising civil and criminal jurisdiction. The Supreme Court is headed by the chief justice, appointed by the president. The Supreme Court has original, appellate and advisory jurisdiction.

There is also a Federal Shariat Court consisting of eight Muslim judges, headed by a chief justice appointed by the president. The Federal Shariat Court has original and appellate jurisdiction. The court decides if any law is repugnant to the injunctions of Islam.
A further feature of the judicial system is the office of the Wafaqi Mohtasib (Ombudsman) appointed by the president. The office of the Ombudsman institutionalize a system for enforcing administrative accountability, through investigating and rectifying any injustice done to a person through maladministration by a federal agency or a federal government official.

1.1.5. Official Language

Urdu and English are both recognized as the official languages of Pakistan. English being widely used within the government, by the civil service, the judiciary, the legislature, the officer ranks of the military and corporate business and by the educated urban elite. Private as well as public universities including most of the colleges use English as the medium of instruction for degree courses.

1.1.6. National Language

Urdu is the national language, the lingua franca of the people. It is widely used, both formally and informally, for personal letters as well as public literature, in the literary sphere and in the popular media. It is a required subject of study in all primary and secondary schools. Urdu is Pakistan's national language and has been promoted as a token of national unity, though less than 8% of Pakistanis speak it as their first language but it is spoken more or less, fluently as a second language by all Pakistanis. Urdu by origin is an "Islamic version" of Hindi language which was spoken for centuries in the neighborhood of Delhi and it was known as Western Hindi, Hindvi, Dehlvi, Reekhta and Hindustani. It is written in a modified form of the Arabic alphabet and its basically Indic vocabulary has been enriched by borrowings from Arabic, Persian, English and other Indian languages.

1.1.7. Local Languages (province wise)

Punjabi

Punjabi is spoken as a first language by almost 44% of Pakistanis, mostly in and is spoken by almost 60% of the population in Pakistan.

Pashto

Pashto is spoken as a first language by 15% of Pakistanis, mostly in the North-West Frontier Province, Federally Administered Tribal Areas and in Balochistan as well as by immigrants to the eastern provinces.

Sindhi

Sindhi is spoken as a first language by 14% of Pakistanis, in Sindh and parts of Balochistan. Sindhi language contains Arabic words and is affected by Arabic language to a great extent.

Balochi

Balochi is spoken as a first language by 4% of Pakistanis, mostly in Balochistan, Sindh and southern Punjab. Baluchi language is very close to the Persian language.

Seraiki

Seraiki is related to Punjabi and Sindhi. This language is spoken as a first language by 11% of Pakistanis, mostly in southern districts of Punjab. Normally Seraiki is considered part of Punjabi.

Other languages

Numerous other languages are spoken by relatively small numbers of people, especially in some of the more remote and isolated places in, for example, the Northern Areas of Pakistan. These inlude: Burshaski - Spoken in Hunza, Shina - spoken in Baltistan, Khowar - Spoken is Chitral, Kalash - spoken in the Kalash Valley and Gujarati spoken by 100,000 Pakistanis who reside in Lower Punjab and Sindh. All Parsi (5,000), many Ismaili Muslims, and many Hindus (10,000 to 100,000) speak Gujarati. Many Parsi and Ismaili Muslims are literate in Gujarati.

1.1.8. Total Population

With the population of 163.67 million in mid 2008-09 and a land mass of 796,096 sq. km, Pakistan is sixth most populous country of the world. If the existing trend remains unchanged it will reach 167 million by the end of 2010 and 194 million by 2020 (NIPS). The density of population per person is 185 (2003) which varies dramatically, ranging from scarcely populated arid areas, especially in Balochistan, to some of the highest urban densities in the world in Karachi and Lahore.

According to 2008 province wise demographic estimates of the planning and development division, Punjab has 55.46 % of the total population of Pakistan. Sindh has 22.92 % of entire population. NWFP has 13.73 % population. Balochistan is the least populous with 5.15 % of population while Islamabad has 0.7 % population and federally administered Tribal Areas have 2.37% percent of entire population. The current annual population growth rate is 1.8 % (2008 est.) and is ranked on 66 globally. In terms of land area it is 34th and shares 0.6 % of the world area only and in terms of human development index it has 136th position in the world.

Table 1.1: Distributions of Area, Population by Provinces and Annual Growth

Province	Area				Population Density (per sq., km,)
	Sq. Km.	%	1998	%	1998
Pakistan	796095	100.0	132352	100.0	166
Punjab	205344	25.8	73621	55.6	359
Sindh	140914	17.7	30440	23.0	216
NWFP	74521	9.4	17744	13.4	238
Balochistan	347190	43.6	6566	5	19
Islamabad	906	0.1	805	0.6	889
FATA	27220	3.4	3176	2.4	117

Source: Federal Bureau of Statistics, 2008

Pakistan is still amongst the high-fertility countries with a large proportion of young adults and children. The Crude Birth Rate (CBR) in Pakistan is estimated at 25 while 10 years ago it was 31.7. Similarly Crude Death Rate (CDR) is 7.7 which was 9, about a decade ago. (Pakistan Economic Survey 2008-09). Both of these indicate that an improvement on the population front is evident.

1.1.9. Urban Population

The urban population is 35.35 % of the total population of the country. Fore delineation between urban and rural areas, all places where civic affairs are run by an urban local body, like a Municipality, Corporation, Cantonment Board, or any notified area committee are treated as urban areas.

Table 1.2: Population by Sex and Rural/Urban Areas (millions)

Gender	Rural	Urban	Total Population
Male	34.00	17.40	51.40
Female	32.43	16.16	48.60

Source: Pakistan Labor Force Survey 2007-08

1.1.10. Rural Population

The rural population is 64.65 % of the total population

1.1.11. Average Age of Population

The median age of the population has increased over the years from about 18 years in 1998 to 22 years in 2008.

1.1.12. Population of Working Age

According to Pakistan Labor Force Survey (2007-08) the population of working age (15-65 years) is about 115.64 million.

Table 1.3: Population by Selective Age Groups

Administrative Unit	Less than 5 Years	Less than 10 Years	Less than 15 Years	18 Years and above	65 Years and above	15 to 64 Years	Age dependency ratio
Pakistan	13.52	15.27	13.41	51.25	3.13	54.67	88.34
Rural	7.51	10.81	9.08		2.20	34.81	95.46
Urban	4.00	4.45	4.33	53.66	0.93	19.86	75.5
N.W.F.P	15.1	17.21	14.10	47.25	3.09	50.49	100.83
Rural	12.89	14.75	11.90	46.39	2.63	41.33	104.67
Urban	2.21	2.47	2.20	50.76	0.46	9.16	83.46
Punjab	13.11	14.27	12.76	52.00	3.92	55.93	87.07

Rural	9.3	10.32	8.8	51.33	2.89	36.71	92.24
Urban	3.81	3.95	3.97	53.5	1.03	19.22	76.62
Sindh	13.18	15.80	13.96	52.21	1.77	55.27	83.58
Rural	7.54	8.96	7.39	49.95	0.69	26.11	96.13
Urban	5.64	6.85	6.57	54.59	1.08	29.16	72.01
Baluchistan	15.05	18.31	16.12	48.69	1.01	49.52	96.79
Rural	11.76	14.01	12.38	47.79	0.61	37.18	101.5
Urban	3.29	4.21	3.73	51.58	0.40	12.34	83.17
Islamabad	11.93	25.04	37.90	55.43	2.73	59.38	68.42
Rural	13.38	27.73	41.23	52.06	2.98	55.79	79.26
Urban	11.17	23.63	36.16	57.19	2.60	61.25	63.27

Age Dependency Ratio: It is the ratio of the persons in the "dependent" ages (under 15 and over 64 years) to those in the "economically productive" ages (15-64 years).
Source: Pakistan Labor Force Survey (2007-08)

1.1.13. Birth Rate

The Crude Birth Rate (CBR) in Pakistan is estimated at 25 while 10 years ago it was 31.7. (Economic Survey of Pakistan 2009)

1.1.14. Life Expectancy

Table 1.4: Assumption of Total Fertility Rate (TFR) Life Expectancy

Assumptions for Total Fertility Rate				Assumptions of Life Expectancy at Birth		
Year	**High Variant**	**Medium Variant**	**Low Variant**	**High Variant**	**Medium Variant**	**Low Variant**
1988	5.0	5.0	5.0	61.7	61.9	61.4
1988	5.0	5.0	5.0	61.7	61.9	61.4
2003	4.2	4.0	3.7	64.0	64.1	63.9
2008	3.6	3.4	3.2	66.4	66.4	66.3
2013	3.2	3.0	2.8	68.5	68.5	68.6
2018	2.8	2.7	2.4	70.6	70.5	70.8

Source: Population Census Organization

Table 1.5: Projected Population Estimates

***Total Population (Million)**	**Annual Growth**	***Total Population (Million)**	**Annual Growth**	***Total Population (Million)**	**Annual Growth**	***Total Population (Million)**
Year	High	Year	High	Year	High	Year
1988	133.2	1988	133.2	1988	133.2	1988
2003	149.3	2003	149.3	2003	149.3	2003

2008	166.0	2008	166.0	2008	166.0	2008
2013	183.4	2013	183.4	2013	183.4	2013
2018	100.5	2018	100.5	2018	100.5	2018
2023	217.1	2023	217.1	2023	217.1	2023

Source: Population Census Organization
Source: National Institute of Population Studies, 1998
**Mid Year Population*

1.1.15. Literacy Rate

According to Pakistan Social and Living Measurement (PSLM) Survey (2007-2008), the overall literacy rate (age 10 years and above) is 56% (69% for male and 44% for female) in 2007-2008. Literacy is higher in urban areas (71%) than in rural areas (49%) and more in men (69%) compared to women (44%). Provincially literacy rate in Punjab is 59%, followed by Sindh (56%), NWFP (49%) and Balochistan (46%).

1.1.16. Average Education Level

No data available yet

1.1.17. Unemployment Rate

Table 1.6: Unemployment Rates

(Percent Share)

Administrative Unit	**2007-08 (10 years and over)**		
	Both Sexes	Male	Female
Pakistan	5.2	4.31	8.52
Rural	4.71	3.94	6.92
Urban	6.34	5.02	17.70
N.W.F.P	8.62	6.85	15.49
Rural	8.40	6.74	14.10
Urban	9.77	7.36	33.02
Punjab	5.54	4.85	7.69
Rural	4.91	4.41	6.13
Urban	7.14	5.76	16.43
Sindh	3.10	2.41	6.88
Rural	2.04	1.32	4.62
Urban	4.52	3.63	16.81
Baluchistan	2.78	1.86	10.09
Rural	2.21	1.51	7.31
Urban	4.94	3.15	27.33
Islamabad	15.70	16.80	1.70
Rural	28.70	29.40	8.20
Urban	10.10	11.00	0.80

Un-employment Rate: It is the percentage of persons unemployed

(those looking for work and temporary laid off) to the total economically active population (10 years and above);
Source: Pakistan Labor Force Survey 2007-08

1.1.18. Percentage of Women Employed Outside the Home

The percentage of Women Employed outside the home is 19.59 (Source: Pakistan Labor Force Survey 2007-08)

1.2. Political Geographic Structure of the Country

Under the Constitution of Pakistan, Federal Legislature has been empowered to make laws in respect of any matter given in the federal legislative list while it can also make laws with respect to any matter contained in the concurrent legislative list. Provincial assemblies are empowered to make laws in respect of matters contained in the concurrent legislative list as also have powers to make laws in respect to any matter not contained in the federal legislative list or the concurrent legislature list. Federal legislative also has powers to make laws with respect to matters not enumerated in either of the lists for such areas in the federation (NA,FATA, etc) as are not included in any of the four provinces.

Table 1.7: Political Geographic Structure of the Country

Province/ Region	Division	District	Tehsil/ Taluka	Mauza/ Deh/ Village	Urban Localities				
					Total	Metro./ M. Corp.	Municipal Committee	Town Committee	Cantonment
N.W.F.P.	7	24	59	7326	55	1	30	13	11
PUNJAB	8	34	118	25872	245	8	78	141	18
SINDH	5	21	87	5871	163	9	31	116	8
BALOCHISTAN	6	26	113[@]	6584	46	1	14	28	3
ISLAMABAD	-	1	1	132	1	-	-	-	-
F.A.T.A.	-	7(Agencies)	42	2559[#]	5	-	-	5	-
Total:-	**26**	**113**	**420**	**48344**	**515**	**19**	**153**	**303**	**40**

@: Include 61 sub-tehsils.
#: Number of Villages have been shown in place of Mauzas.
Source: Federal Bureau of Statistics, 2008

1.2.1. Number of provinces, municipalities

1.2.1.1. Provinces

Punjab

Neighbouring to Sindh to the south, Balochistan and Federally Administered Tribal Areas, Pakistan to the west, North-West Frontier, Pakistan, Kashmir, India and Islamabad to the north and Punjab, India and other Indian states to the east, Punjab is the second largest province at 205,344 km² (79,284 square miles) and has the largest population: approximately 81 million (55.46 % estimated) in 2009. The major language spoken in the Punjab is Punjabi and Punjabis comprise the largest ethnic group.

The Indus River and its many tributaries traverse the Punjab from north to south. The name Punjab is composition of "Panj" and "Ab", which means "five waters," referring to the Beas, Ravi, Sutlej, Chenab and Jhelum rivers. Part of Indus river also lies in Punjab, but it is not considered one of the "five" rivers. Despite its dry climate, extensive irrigation makes it a rich agricultural region. Its canal-irrigation system established by the British is the largest in the world. Wheat and cotton are the largest crops. Other crops include rice, sugarcane, millet, corn, oilseeds, pulses, fruits, and vegetables. Livestock and poultry production are also important.

Punjab is one of the most industrialized provinces of Pakistan; its manufacturing industries produce textiles, sports goods, machinery, electrical appliances, surgical instruments, metals, bicycles and rickshaws, floor coverings, and processed foods.

North-West Frontier Province (NWFP)

North-West Frontier Province (NWFP) is geographically the smallest of the four provinces of Pakistan. Neighboring regions are Afghanistan to the west and north, and Northern Areas and Azad Kashmir to the east. The Federally Administered Tribal Areas stand as a buffer between the NWFP and parts of Afghanistan. Punjab and Islamabad Capital Territory are to the south.
Its area is 74,521 km² with the 13.73 % of total population and the capital and main city Peshawar. The major language spoken in the NWFP is Pashto, and most of its residents are Pashtuns, especially in the lowlands and the southern areas of NWFP. The mountainous northern regions of the province are mostly non-Pashtuns, being home to diverse ethnic groups and languages.

Sindh

Sindh is the third largest province geographically. Its size is about 579 km north-south and 442 km (extreme) or 281 km (average) east-west, with an area of 140,915 km² The estimated population is about 23% of the total. About half of the population is urban. Its capital is Karachi. Other towns and cities include Hyderabad, Sukkur, Mirpurkhas, Tando Adam, Tando Allahyar, Nawabshah, Larkana, Shikarpur, Khairpur, Badin. Languages spoken include Sindhi, Urdu and Rajasthani.
Neighbouring regions are Balochistan to the west and north, Punjab in the north and Rajasthan (India) to the east. To the south are the Arabian Sea and the Rann of Kutch. Karachi is the industrial hub of Pakistan and hundreds of small, medium and large industries are established in the city.

The province contains the southern part of the Indus River valley. In the east is the Thar Desert of India. The main crops are cotton, rice, wheat and sugar cane, with rice the most important. Other crops include banana and mango.

Balochistan

Balochistan, the largest of the four provinces of Pakistan, spreads over an area of 347,190 Sq, Kms., forming 43.6 per cent of the total area of Pakistan. It has clustered population and is smallest in proportion as compared to that of other provinces. Its population, according to estimates of 2008, is about 30 million, having a low density per square kilometer. Physically,

Balochistan is an extensive plateau of rough terrain divided into basins by ranges of sufficient heights and ruggedness. Broadly, Balochistan geographic area can be divided in to four distinct zones: Upper high lands, lower high lands, plains, and deserts.
The upper highlands, known locally as Khorasan, rise as high as 3,700 meters, with valley floors about 1,500 meters above sea levels.

The Lower High Lands have an altitude ranging from 1970 to 3940 ft (600 to 1200 M). They are located in the south-eastern Balochistan, except eastern part of Kachi, the southern end of Dera Bugti and Nasirabad districts. Some are extension of lower high lands that exist at boundaries of Gwadar, Turbat, Panjgur, Kharan and Chaghi districts.

Balochistan has relatively small area of plains as compared to its total land area. Mountains dominate the terrain, and valley floors, and piedmont plain make up only 15% of the landscape.

The coastal-line is about 760 Kilometers long, with a number of peninsulas and promontories. The coastal area is not effectively connected with the interior; the steep hills rise abruptly beyond the narrow coastal plain. Ports, such as Somiani, Pasni and Gwadar are unsheltered. Federal and provincial governments have comprehensive development plans that feature a deep sea port at Gwadar and a coastal highway.

1.2.1.2. Overview of Districts

The Districts of Pakistan form the third tier of government in Pakistan, ranking as subdivisions of the provinces of Pakistan. Prior to August 2000, the provinces contained administrative units called divisions which contained districts as the fourth level of government. In August 2000, the divisions were abolished as an administrative tier, and the provinces are now directly divided into districts.

Table 1.8: Overview of Provinces and District

Subdivision	Number of Districts
Balochistan Province	27
North-West Frontier Province	24
Punjab Province	35
Sindh Province	20
Islamabad Capital Territory	1
Federally Administered Tribal Area	7 Tribal Agencies plus 6 Frontier Regions
Azad Kashmir	7
Northern Areas	6
Pakistan	120 Districts plus 7 Tribal Agencies

Source: Federal Bureau of Statistics, 2008

Districts are further subdivided into tehsils which may contain villages or municipalities. There are over five thousand local governments in Pakistan. Since 2001, these have been led by

democratically elected local councils, each headed by a Nazim (the word means "supervisor" in Urdu, but is sometimes translated as "mayor"). Women have been allotted a minimum of 33% seats in these councils; there is no upper limit to the number of women in these councils.
Prior to 2001, there were 106 districts but with the reorganization, these were reduced to 102 by the merger of the five districts of Karachi Central, Karachi East, Karachi South, Karachi West and Malir to form Karachi District. The five districts had formed the division of Karachi which was abolished. The number of districts rose to 106 again in December 2004, when four new districts[1] were created in the province of Sindh of which one (Umerkot) had existed until 2000 and three districts (Kashmore, Qambar and Jamshoro) were newly created.

In May 2005, the Punjab provincial government created a new district[2] by raising the status of the Nankana Sahib from a tehsil of Sheikhpura District to a district in its own right.
In Azad Kashmir, the second tier of government is formed by two administrative divisions with a third tier of seven districts. In the Northern Areas, there are six districts divided between two informal regions. The Azad Kashmir and Northern Area districts are not included in the lists below.

1.2.2. Descriptions of Local Government Entities

The provincial governments promulgated the Local Government Ordinance, 2001 in their respective provinces to install a new integrated Local Government System with effect from 14th August 2001 to function within the provincial framework and adhere to the Federal and Provincial laws. The new system, which may be best described through the 5Ds Local Government System 2001, reorients administrative system to allow public participation in decision-making. The essence of this system is that the local governments are accountable to citizens for all their decisions. It enables the proactive elements of society to participate in community work and development related activities. It has also removed rural-urban divide.

The new system provides three-tier local government structure in which there is only one line of authority in the district and district bureaucracy is responsible to the elected representatives. More operational autonomy is ensured to the district level offices. Administrative and financial powers of the defunct divisional offices have been, by & large, delegated to the District level.

At the top tier, the District, there is a single integrated local government called District Government. The district government consists of Zila Nazim and District Administration. The District Administration, which comprises district offices including sub-offices at Tehsil level. The Provincial Government departments decentralized to the District Government are responsible to the Zila Nazim. The administration is now responsible to serve the people. Adequate checks and balances have been introduced in the System. The new System effectively addresses the specific needs and problems of large cities. In addition to declaration of four provincial headquarters as City Districts, the System has provisions to declare a city/Tehsil as City District and Towns when it becomes urbanized and fulfills the criteria of a City District. Government of the Punjab has declared Rawalpindi, Multan, Gujranwala and Faisalabad as City Districts in June 2005.

The middle tier, the Tehsil, has Tehsil Municipal Administration headed by the Tehsil Nazim. The Tehsil Municipal Administration includes the offices and sub-offices of the Urban Local Councils established under the repealed Local Government Ordinance 1979, offices and sub-offices of Local Government & Rural Development, Public Health Engineering and Housing & Physical Planning Departments of Provincial Government entrusted to it for administrative and financial management. The organizational structure of a Tehsil Municipal Administration is shown in. In a City District, a Town Municipal Administration is organized more or less on the same pattern as Tehsil Municipal Administration in a common District.

At the lower tier, the Union Administration, which is a body corporate, covers the rural as well as urban areas across the whole district. It consists of Union Nazim, Naib Union Nazim and three Union Secretaries and other ancillary staff.

The coordination between the three tiers is ensured through the following arrangements:
The Zila Council in a common district or in a city district, apart from reserved seats for women, peasants & workers and minorities, consists of Union Nazims of all the unions in the district or the city district. Similarly the Tehsil/Town Council, apart from reserved seats for women, peasants & workers and minorities, consists of Naib Union Nazims of all the unions in the Tehsil in a common district or in the town in a city district. This provides vertical linkages between the three tiers of the local governments i.e. the Union, Tehsil, and District. Union Nazim and Naib Union Nazim are elected as joint candidates to the Union Council, which consists of thirteen elected members against general and reserved seats including the Union Nazim and Naib Union Nazim.

The new Local Government System envisages formula-based fiscal transfers to the districts through Provincial Finance Awards. In addition, local governments are allowed to levy local taxes/fees from a specified list. To promote trade and commerce in the country there will be no import/export tax or tax on movement of goods through a district. According to the new Local Government System, local governments are not allowed to incur any debt to finance their expenditures.

1.2.3. Division of Responsibilities between National, Provincial and Local Governments

Under the Constitution of Pakistan, Federal Legislature has been empowered to make laws in respect of any matter given in the federal legislative list while it can also make laws with respect to any matter contained in the concurrent legislative list. Provincial assemblies are empowered to make laws in respect of matters contained in the concurrent legislative list as also have powers to make laws in respect to any matter not contained in the federal legislative list or the concurrent legislature list. Federal legislative also has powers to make laws with respect to matters not enumerated in either of the lists for such areas in the federation (NA,FATA, etc) as are not included in any of the four provinces.

Environmental pollution and ecology, population planning and social welfare, narcotics control, drugs and medicines, poisons and dangerous drugs, and mental illness, etc are the subjects included in the concurrent list of legislation. It implies that both the Federal and Provincial Legislatures can make laws with respect to these health and environmental problems. Accordingly, the Federal Ministry of Environment and the Pakistan Environment Protection Agency exist and

operates in the Federal Government as also the Ministries of Health, Populations, Planning and Social Welfare along with numerous subsidiary departments and research institutes are in existence at the federal level. Similarly, the provincial governments also support environment protection agencies provincial health departments and related institutions. AJ&K government too has identical set-up of sizeable magnitude within its territory as far as the health and environmental control is concerned. The magnitude may be smaller but an identical set-up prevails for health and environment control in the NA and FATA.

1.2.4. Location of various ethnic groups

The population of Pakistan comprises several main ethnic groups:

1. Punjabis (44.15%)
2. Pashtuns (15.42%)
3. Sindhis (14.1%)
4. Seraikis (10.53%)
5. Muhajirs (7.57%)
6. Balochis (3.57%)
7. Others (4.66%) including dispersed Kashmiris from Indian-held Kashmir.

Smaller ethnic groups, such as Turwalis, Kalash, Burusho, Hindkowans, Brahui, Kashmiris, Khowar, and Shina, are mainly found in the northern parts of the country. The people of the Potohar Plateau in Northern Punjab, (Potoharis) are called potoharis.

Pakistan's census does not include the 1.8 million Afghan refugees (registered in Pakistan as *Afghan Citizens*) from neighbouring Afghanistan, who are mainly found in the NWFP, Balochistan and Sindh provinces. A number of refugees from other countries may also be found in Pakistan.

Punjabis

Punjabis in Pakistan are multi-ethnical group of people, and can be divided into sub-groups. They are natives of Greater Punjab. The region of Pakistani Punjab has been invaded in the past by Arabs, Turks, Persians, Afghans, thus giving a number of Punjabis diverse origin. One uniting factor among Punjabis is their Punjabi language. Punjabis have many different dialects and that depends in what region of Punjab they are from.

Pashtuns

Pashtuns or Pakhtuns (sometimes *Pathans*) Ethnic Afghans are Pakistan's second largest ethnic groups that are native to the land principally west of the **Indus River**. However, they can be found in cities all throughout Pakistan. The largest urban population of Pashtuns is interestingly found in the city of **Karachi** with a total estimated population of about 4 million this is then followed by Peshawar, **Quetta**, **and Lahore** in descending order. There are more than double the numbers of Pashtuns in Pakistan than they are in Afghanistan, where they are the major ethnic group in that country.

Sindhis

Sindhis are ancient people principally inhabiting the province of Sindh, Pakistan from where the river Indus (in ancient times revered to as *Sindhus*) runs and subsequently, from which they derive the name Sindh from. Believed to be the inheritors of the ancient Indus Valley Civilization, Sindhis are heavily influenced by the adjacent Balochis in Pakistan. Sindh also has considerable Arabic and Persian influence. Sindhis can be also found in the southern part of Punjab, and there is significant Punjabi influence in the Sindhi population.

Balochis

The Baloch, as an Ethnic Group, are principally, scattered almost all over Pakistan's Areawise largest: about 44%, and Population wise, the smallest, about 6%, of Pakistan's National Population; Province: Baluchistan. The Balochis sparsely inhabit the south-western and the Central north-eastern parts, of Baluchistan Province.

Balochis speak many ethnic languages, Balochi, Brahui, Pushto, Sindhi, Mekrani, Farsi, and Turkoman Dialects. Besides these, the Tajiks, speak Central Asian versions of Persian Dialet, the Punjabis, who settled in Baluchistan, well over a century ago, and the Urdu speaking Mohajirs, who migrated to Baluchistan, over half a century ago and settled in Baluchistan, as the Seraiki speaking people of Jacobabad and Sibbi etc. All these Balochistanis speak their Native and the Local Tribal Languages.

Among other smaller groups inhabiting Baluchistan, are the Kurds, who still use the Kurd suffix to their names, and the Parsis, and Muslim Iranians, such as the Bakhtiaris, who still speak pure Persian. According, to some recent studies, the Balochs are supposed to hail from Iranic people, and are also closely related to the Kurdish, spread all over the Middle-East (Northern Iraq, Syria, Iran and Turkey).

The Larger of Baloch and Brahvi Tribes are the Marris, Bugtis, and Mengals. There are also a large number of other; smaller, area-specific and local, sub-branches of the Larger Tribes. The Total Population of purely Baluch and Brahvi Tribals, remains under 2.2 million (2009), and the rest of Baluchistan's total Population, of 11.6 million]; around 10 million, are of the above mentioned Ethnic Groups, Inhabiting Pakistan's Province of Baluchistan.

Muhajirs

Muhajirs are a multi-ethnical group of people who claim descent from Arabs**, Persians, Afghans and Central Asians. One uniting factor in Muhajirs is Urdu, which is the na**tional language of Pakistan. Muhajirs emigrated from India after the independence of Pakistan.

Saraikis

The Saraiki people or Multani people are an ethnic group from the south-eastern areas of Pakistan. The Seraikis maintain that they have a separate language and culture, but their language is often viewed as a dialect of Sindhi or Punjabi depending on what area of Saraikis they are.

Hindkowans

Hindkowans are believed to be the transitional group of people between Punjabis and Pashtuns. They are also known as Punjabi Pathans. Their traditional homeland are areas around Abbottabad

in Hazara,and Mianwali, Dera Ismail Khan and Dera Ghazi Khan, in Punjab and Kohat, in the Frontier Province. Peshawar's "City" population is composed of Qissa Khwani Traders, and daily wage workers, speaks a local dialect of Punjabi.

Hazara
The Hazara are a Persian-speaking people residing in Quetta and as refugees in the Islamabad area. Genetically, the Hazara are primarily a mixture of eastern Eurasian and western Eurasian peoples. The genetic research suggests that they are closely related to the Mongols and the Uygurs. The Pakistani Hazaras estimate population believed to be more than 200,000.

Makranis
Makrani are the inhabitants of Makran coast of Balochistan in Iran and Pakistan. They are the Negroid people of Pakistan. They are the descendants of slaves first brought to Pakistan by Arab merchants in medieval times from the Bantu-speaking parts of eastern Africa.

Tajiks
Tajiks are a Persian-speaking people, with traditional homelands in present-day Afghanistan, Tajikistan, southern Uzbekistan, northern Pakistan and western China. The Pakistani Tajiks are estimated to be over 1 million. Tajiks of Pakistan are often considered similar group of people as Dardic/Chitrali people of Pakistan

1.3. Industrial and Agriculture Sector

1.3.1. Overview of Industrial Sector

In Pakistan the industrial sector comprises small, medium and large units with blend of new and old technology. Most of the industries are situated in urban center near the population without treatment and pollution control facilities. The major cities where industries are located are Karachi, Lahore Faisalabad, Multan, Hyderabad, Peshawar, Gujranwala, Sialkot, and Gujrat. The industrial states are Hatar, Gadoon, in the country. Unfortunately there is no centralized treatment facility anywhere. Pakistan Industrial Sector is comprises in following major sub-industrial sectors.

Textile
Sugar
Leather
Fertilizer/Agrochemical
Cement
Dairy
Food Processing
Pharmaceutical
Oil/Ghee
Paper & Pulp
Dyes and Pigments
Polyester Fiber
Industrial Cement
Supports/Goods

Garments

Major Export oriented industries are textile, leather, carpet, supports and surgical instruments That accounts an 80% of total exports.

Industrial States

In order to strengthen Pakistan's low industrial base, it was crucial to begin the formative phase soon after independence. Pakistan's policy makers banked upon small industrial estates to groom an entrepreneurial class, which was not existent at the time of Pakistan's creation. Pakistan's first industrial estate "Sindh Industrial Trading Estate Ltd., Karachi" was established in 1947. Resources were augmented to develop numerous industrial estates in all corners of the country and today the number of industrial estates has increased to 72. The industrial estates are distributed in all provinces. Sindh contains the largest number of industrial estates (24), due to the strategic location of the Province, which encompasses the only port of the country. Punjab has established 20 industrial estates followed by 15 in NWFP, 10 in Baluchistan and 3 in Federal Capital Area, Islamabad. The following small medium size industries have been established in the country, industrial estates:

- Light Engineering
- Wood & Steel Furniture
- Arms & Ammunition
- Steel Re-rolling Mills
- Aluminum
- Plastic Products
- Shoes and chapples making
- Electric bulbs manufacturing
- Textiles
- Pharmaceutical
- Soap
- Chemical
- Flour Mills
- Ghee Mills
- Food products
- Ceramics & marble units

1.3.1.1. Livestock & Fisheries

Livestock

Livestock is one of the main sub-sectors of the agriculture. It plays an important role in the economy of the country through making available the most essential items of human diet like milk, meat, eggs and poultry and providing the principle sources of power for land cultivation and rural transport. The role of livestock in rural economy may be realized from the fact that 30-35 million rural populations is engaged in livestock raising, having household holdings of 2-3 cattle/buffalo and 5-6 sheep/goats per family deriving 30-40% of their income from it. The livestock includes cattle, buffaloes, sheep, goats, camels, horses, asses and mules.

Livestock

Value addition	51.8% of Agriculture
GDP contribution	11.3% (Chapter no: 2 Agriculture)
Forex earnings (2001-02)	51.5 billion rupees
(11.4% of overall export earnings).	
Population engaged	30 – 35 million

Milk

Annual Production	(2008-09) 43562 million tons
Human consumption	35160 million tons

Meat

Production (2008-09)	2515 million tons
Beef	1601 million tons
Mutton	590 million tons
Chicken	652 million tons

Source: Ministry of Livestock and Dairy Development

Fisheries

It is an important and relatively well looked after sub-sector. Its main importance has been as a foreign exchange earner. There has been a rapid increase in fish production since early seventies. Most of this increase has been utilized for exports and as a component of feed for expanding poultry industry. A fair amount of infrastructure development has taken place. This includes the commissioning of Fish harbour at Karachi in 1959, its expansion and improvement in mid eighties, the construction of a deep sea fish harbour at Korangi and increased facilities along the Balochistan Coast line.

People engaged	400,000 (fisherman), 600,000 ancillary industry
Marine	167,000M. Tons, July-March (2008-09)
Inland	323,000M. Tons, July-March (2008-09)
Employment contribution	1% (of country's labour force)
GDP Contribution	1%

Source: Pakistan Economic Survey 2008-09

1.3.1.2. Forestry

Forestry is one of the most neglected components of the agriculture sector. Pakistan is a forest deficit country with 4.2 million Hectare **(5.3%)** of forest area out of 87.98 million hectares of total land mass. Though the forest source is meager it plays an important role in Pakistan's economy by employing half a million people, providing 3.5 million cubic meters of wood and one third of nation's energy needs. Forest and rangelands supports about 30 million herds of livestock. During the year 2008-09 forests have contributed 83 thousand cubic meters of timbers, 205 thousand cubic meters of fire wood. *(Pakistan Economic Survey 2008-09)* The Federal and Provincial Governments are implementing a number of forestry projects at a total cost of Rs 6.9 billion under the umbrella of Forestry Master Plan.

Forest Area	4.2 million Hectare
Total landmass	87.98 million hectare
Punjab	3.7 million Hectare
NWFP	1.3 million Hectare
Balochistan	1.1 million Hectare
Azad Kashmir	0.567 million Hectare
Northern Area	3.616 million Hectare
Sindh	1.16 million Hectare
Employment contribution	0.5 million people
Wood	3.5 million m3
Livestock support	30 million m3
Timber	83 thousand m3
Firewood	205 thousand m3 *
(State Forest contribution)	
Wood Product export	1.5 billion US dollars
Low wood and wood products	7.5 billion US dollars Share of Forestry in Value Addition by Agriculture

Source: Industrial Digest of Pakistan 2005
** Pakistan Economic Survey 2008-09*

Table 1.9: Major Forest Products of Pakistan

Qty in '000' Cub. Meters
Value in Million Rupees

Year	Timber		Firewood		Total	
	Quantity	Value	Quantity	Vakue	Quantity	Value
1998-99	184	11191.1	199	86.24	383	1277.34
1999-00	425	666.2	443	337.1	868	1003.3
2000-01	380	648.7	425	394.6	805	1043.3
2001-02	363	1188.1	465	387.1	828	1575.2
2002-03	384	961.6	444	484.7	828	146.3

Net figures are for all Pakistan including Northern Area and Azad Kashmir.
Pakistan agricultural statistical book 2002-03

Table 1.10: Revenue Earned By Forest Department

Value in Million Rupees

Year	Punjab	Sindh	NWFP	Balochistan	Northern Area	Azad Kashmir	Total
1998-99	402.76	43.38	285.0	7	16.17	246.10	995.43
1999-00	344.5	52.7	258.2	31.2	18.6	242.7	947.9
2000-01	413.55	58.93	247.92	25.22	16.30	232.10	976.02
2001-02	535.07	65.26	318.31	33.25	180.19	6.23	1138.31

2002-03	450.5	0.589	384.5	8.98	7.00	303.025	1118.45

Pakistan agricultural statistical book 2002-03

Table 1.11: Out Turn of Minor Forest Products

(Tons)

	1998-99	1999-2000	2000-01	2001-02	2002-03
RESIN					
Punjab	-				
NWFP	-				
Baluchistan	-				
AJK	238	447	398	417(P)	
Total	238	447	398	417(P)	
MAZRI					
NWFP	1613	1590	1710	1787(P)	1493
Baluchistan	36496	1840	2671	3100(P)	2838
Total	38109	3430	4381	4887(P)	4331
EPHEDRA					
Baluchistan	-	0.022	1.101	0.919(P)	494.6 Cu. m.
Total	-	0.022	1.101	0.919(P)	494.6 Cu. m.

Source: Agricultural Statistics of Pakistan 2002-03

1.3.1.3. Bottled Water Industry

Pakistan's bottled water market comprises of two main segments i.e. the retail market and the bulk market. The retail market supplies water in 0.5, 1.5, 3.0 and 5.0 litres capacity PET bottles whereas the bulk market makes Home and Office (H&O) deliveries in 3 and 5 gallons made of Polycarbonate. There are around 26 players operating in the bottled water sector. However, according to industry's sources, this number reaches well above 70 when small unknown operators crop up during summer owing largely to the relax regulation and ineffective monitoring of the sector.

The bacterial and chemical contamination associated with bottled water is a major global concern and has sparked many controversies in Pakistan. The issue of contaminated bottled water came to the fore when Pakistan Council of Research in Water Resources (PCRWR) claimed in its report that all the major brands available on the market were contaminated and 10 of them not fit for human consumption after conducting a survey in the Rawalpindi- Islamabad region where it randomly collected 41 water samples of 26 brands from public utility stores and shops2. The relax regulation and weak monitoring infrastructure in countries like Pakistan makes the bottled water sector extremely susceptible to the unscrupulous bottlers.

The quality standards for bottled water have been formulated by the PSQCA. Water standards PSS No 2102 for natural mineral water and PSS No 4639 for bottled drinking water have been declared mandatory for mineral and bottled water manufacturers under the authority of PSQCA

Act IV of 1996 of the Government vide SRO: 638 (1)/2000,dated September 12, 2001. The water quality standards are mandatory, and have become legally enforceable from December 1. After December 1, all brands of bottled water have to comply with the stipulated standards, failing which legal action could be initiated against the non- complying bottled water manufacturers. The PSQC has now made it obligatory for the companies to obtain license from the authority before commencing operation. A total of 18 companies have so far been registered by the PSQCA.

1.3.1.4. Ceramics Industry

Pakistan ceramic manufacturing sector plays a significant role in the economy of Pakistan. The sector employs over 36000 people and contributes 0.1 % to total GDP of the country and 0.5% to the manufacturing GDP annually. Its contribution to exports of the country is about $ 12.30 million per annum.

Pakistan ceramic industry can be broadly categorized in three segments product-wise as given in table 1.12.

Table 1.12: Spot analysis of Ceramic Industry

Organized Units

	No. Units	Employment
Ceramics Tiles	8	4000
Sanitary Wares	68	7200
Pottery/Crockery	132	7900

Table 1.13: Contribution of Ceramic Industry in Economy

(Production in Rs. millions)

Products	1999-00	2000-01	2001-02	2002-03
Tiles	2427	2482	2784	3072
Tableware	1775	1792	1826	1896
Sanitary ware	1212	1380	1706	2194
Refractory's	754	802	880	972
Insulators	476	570	734	916
Total	6644	7026	7930	9050

Source: Industrial Digest of Pakistan 2005

1.3.1.5. Edible Oil Sector

Edible oil industry is involved in manufacturing of compound oils i.e. edible oil (table or salad oil) & vegetable ghee. Edible oils are further classified into Soft Oils i.e. Sunflower, Soyabeans, Rapeseed, Corns & Canola and Hard Oils i.e. RBD Palm Oil, Crude Palm Oil etc. Major macroeconomic indicators of this industry are tabulated below:

Table 1.14: Spot Analysis of Edible Oil Industry

Number of industries/units operating in the sector	155
Total capacity (Million Metric Tones)	2.7
Production (Million Metric Tones)	1.964
Export growth/trend	NIL
Contribution to total exports of the country	NIL
Contribution to GDP	2.8 %
Capital output ratio	1:2
Employment on sectoral basis (Nos.)	37,700
Skilled and unskilled labour ratio	N. A..
Total sector-wise investment (Million PKR)	7.2
Value addition	20-30%

Source: Industrial Digest of Pakistan 2004

Total demand of Edible Oil/Ghee in the country during 2002-2003 was 1.938 million M.tons. Out of this, 33% edible oil was produced from locally available oil seeds (Cottonseed, Rapeseed & Sunflower etc) while 67% was imported. The imports have increased by 10% against last year due to lower level of local oil production. The bar chart in fig. 1 shows a comparison of imports and local oil production for the last ten years.

Imports of Edible oil

Pakistan was self sufficient in edible oil production till the 1960s. Since then, we have relied heavily on imports to meet the consumption demand. This is mainly due to steep increase in population, paucity of local raw materials and low yields of locally available oil seeds. The share of edible oil imports have more or less ranged between 5-7% in total imports. During 2002-03, its share was 4.8% against 3.8% in 2001-02.

1.3.1.6. Glass Sector

The glass industry comprises of about 37 units which are producing sheet glass, glass containers, electric glass tubes/bulbs, neutral glass tubings and glass wares. Out of these 37 units, around 12 major glass manufacturers are producing sheet glass, containers and tubings. A unit namely Ka' Asul Musaf' Fa (Pvt) Ltd has the facility to produce both sheet glass and containers. The production capacity of the units ranges between 10 tons/day to 200 tons/day. Most of the units are located near the sources of raw materials. Around 73% are situated in Punjab, 19% in NWFP, 5% in Sind and 3% in Balochistan. In addition to these, there are 29 units manufacturing pharmaceutical ampoules & vials from neutral glass tubings. Eight units are producing auto glass products, art glass products, furniture etc. through further processing of local & imported glass.

Table 1.15: Spot Analysis of Glass Sector

Number Of Industries/Units:		
A. Formal Sector		
Units in operation	37	
Units under completion	1	
A. Informal Sector	More than 100 units	
Total Installed Capacity of The Sector		
Units in operation:	Sheet Glass	122400 (tons)
	Containers(Bottles, etc)	248265 (tons)
	Neutral Glass Tubing	5625 (tons)
	Neutral Glass Ampoules and Vials	1109(pec in million)
	Glass Bulb and Tube	246.5 (pec in million)
	Table ware and other Glass ware	23755 (tons)
Units under completion	Float Glass	50000-60000 Tons
Production	Sheet Glass	85667 (tons)
	Containers(Bottles, etc)	123116 (tons)
	Neutral Glass Tubing	1812 (tons)
	Neutral Glass Ampoules and Vials	*665 (pec in million)
	Glass Bulb and Tube	144 (pec in million)
	Table ware and other Glass ware	12673 (tons)
Contribution To Total Exports of The Country	negligible	
Contribution to GDP (Mp)	0.14%	
Capital Output Ratios	1:0.51	
Employment	10000	
Skilled And Unskilled Labor Ratio	30:70	
Capital Labor Ratio	Approx. one employees (0.9523) per one million of investment	
Total Sector-Wise Investment	Rs. 10.50 billion	

**Estimated*

Source: Industrial Digest of Pakistan, 2005

There are also more than 100 units in the informal sector engaged in production of various glass products. These units are located in Karachi, Hyderabad, Multan and Lahore. 60% of these units produce small glass containers & table ware and the remaining units are involved in the production of bangles, beads, tiny glasses for dresses, furniture, crystal glass products, etc.

Total investment made in the glass sector is approximately Rs 10.5 billion. The sector produced glass products worth of about Rs 5.5 billion and contributed 1% to the total manufacturing sector value. The sector is directly providing job opportunities to approximately 10,000 persons including skilled, semi-skilled and un-skilled employees. In addition, more than one hundred thousand jobs are provided by the converter units and the informal sector. (Industrial Digest of Pakistan 2005)

Minerals like silica sand of low value (approximately Rs 552/- per ton) is converted into high valued products in the range of Rs 15,000 to Rs 26,000 per ton. The sector is also contributing toward import substitution through saving millions of dollars by producing high & low quality glass products.

Table 1.16: Production Statistics of Glass Industry in Pakistan

	1997-98	1998-99	1999-2000	2000-2001	2001-02	2002-03
Sheet Glass						
Physical Production (Tons)	75742	78085	80500	63264	64045	85667
Installed Capacity (Tons)	98000	98000	98000	97900	113900	122400
Capacity Utilization (%)	77	80	85	65	56	70
Glass Containers						
Glass Bottles etc						
Physical Production (Tons)	102504	115418	142277	94790	95084	123116
Installed Capacity (Tons)	214000	210000	211000	198202	213242	248265
Capacity Utilization (%)	48	55	67	60	55	50
Neutral Glass Tubing						
Physical Production (Tons)	2000	2000	2000	1500	2100	1812
Installed Capacity (Tons)	5625	5625	5625	5625	5625	5625
Capacity Utilization (%)	36	36	36	27	37	32
Neutral Glass Ampoules and Vials						

Physical Production (Tons)	517	518	528	548	570	665*
Installed Capacity (Tons)	765	886	886	914	938	1109
Capacity Utilization (%)	68	58	60	60	61	60
Glass Bulb and Tube for electric						
Physical Production (Tons)	100	110	120	104	160	144
Installed Capacity (Tons)	195	195	195	195	255	246.5 !
Capacity Utilization (%)	51	56	62	53	63	58
Table ware and other Glass ware						
Physical Production (Tons)	14710	18464	23632	19634	21341	12673@
Installed Capacity (Tons)	21831	29364	28455	28455	28455	23755@
Capacity Utilization (%)	64	63	72	69	75	53
Average Capacity Utilization	57	58	64	56	58	54

Data on annual rated capacity and production obtained from stakeholders
** Estimated base on increase in capacity.*
@Tariq Glass Industries and Omar Glass only.
! Operational units only
Source: Industrial Digest of Pakistan, 2005

Raw materials used in sheet glass manufacturing are similar irrespective of types of processes and technology. Almost 100% of the raw materials are indigenous and abundantly available in the country. Raw materials used in glass manufacturing are silica sand, soda ash, dolomite, feldspar, salt cake, lime stone and cullet. Other than silica sand and soda ash, the remaining is used in smaller quantities.

1.3.1.7. Leather Industry

Leather and Leather products manufactured in Pakistan have a sizable market both in Pakistan and around the world. Being an agrarian economy, Pakistan has a natural advantage in the area of Live Stock population, which is the major input (Hides & Skins) in the leather sector. At present, the country produces 8.4 million Hides and 41.4 million Skins with an average annual growth of 2.54% and 2.71% respectively.

Table 1.17: Spot Analysis of Leather Sector

Number of Industrial Units Operating in the Sector

Tanneries	725
Leather Garments/Apparels	461
Footwear	524
Leather Gloves	348
Leather Goods	142
Leather Sports	160
Total Capacities	
Tanned Leather	90 million Sq. m
Leather Garments/Apparels	7 million pcs.
Leather Gloves	10 million pcs.
Leather Footwear	200 million pcs.
Export Growth (1991 to 2001)	1.11 %
Contribution to Total Exports of the Country	7 %
Contribution to GDP	
In Total GDP	1 %
In Manufacturing GDP	6 %
Total Employment in the sector (estimated)	250,000
Employment ratio to total country's employment	0.70 %
Value Addition	
Finished Leather	20 %
Leather garments/apparels	26 %
Footwear	50 %
Technology	Intermediate

Source: Industrial Difest of Pakistan 2004

More than 80 percent of the units are located at Karachi and Lahore. There are numerous tannery units in the unorganized sector producing leather on cottage basis, with negligible use of machinery. The main reason for heavy concentration of tanneries in Karachi and Lahore is the availability of skilled and semi-skilled labour and technicians and a well developed market for hides and skins. Other towns, where this industry is flourishing are Hyderabad, Multan, Shahiwal, Kasur, Sheikhupura, Gujranwala, Sialkot and Peshawar. The growing capacity for tanning in the country has given a fillip to the development of footwear and leather goods manufacturing industries, which produce gloves, garments, bags and other products.

Table 1.18: Installed Capacities and Estimated Production (Million Nos.)

Products	Estimated Production Capacities	Capacity Utilization
Tanned Leather	*90 sq. meter	67%
Leather Garments	7Pcs.	71%
Leather Gloves	10Prs.	50%

Leather Footwear	200Prs.	50%

Based upon LIDO Survey of 595 units

1.3.1.8. Mining and Quarrying Industry

Nature of Industry

Mineral Occurrences

Sedimentary**:** includes coal, gypsum, barite, clays, silica sands, limestone, building stones, rock salt, iron ores, etc.

Igneous: includes Sulphur, Beryl, Chromites, Magnesite, Porphyry, Copper, Iron and Granite.

Metamorphic: includes Marble, Fluorites, Radioactive minerals, precious and semi precious stones, etc.

Table 1.19: Spot Analysis of Mining and Quarrying Sector

	2001-02	2002-03
Total GDP (Billion Rs)	3628.731	4018.112
Total GDP (Billion USD)	60.791	58.46
Contribution to GDP (%)	0.5	2.4 (2008-09) (Pakistan Economic Survey 2008-09)
Minerals Contribution in GDP (Billion Rs)	21.203.274.8	2.574
Foreign Direct Investment (Million USD)	3.992	137.2 (JUL-MARCH)
Employment (in million)	560.947	652.294
Total Exports (Billion Rs)	634.630	714.372
Total Imports (Billion Rs)	0.971	0.827
Export of Minerals (Billion Rs)	7.228	7.194
Import of Minerals (Billion Rs)	2.18	1.53
Contribution to Total Exports (%)%age of Total Imports	1.354	1.147
Mineral Wealth (estimated figures of some minerals)		
Crude oil	296 Million US Barrels	
Iron Ore	Million Tons	
Natural Gas	Billion CU. Meter	
Copper	Million Tons	
Coal	Billion Tons	
Bauxite	Million Tons	
Gypsum Anhydrite	Million Tons	
Lead and Zinc	Million Tons	
Fire Clay	Million Tons	
Rock Salt	Million Tons	

Growth Rate of Mining and Quarrying	1.31% (July –March 2008-09, Economic Survey of Pakistan

Table 1.20: Major Products by Mineral Sector

Minerals	Reserves	Unit of Measurement	Year-wise Extraction				
			2005-06	2006-07	2007-08	2007-08 (Jul-Mar)	2008-09 (Jul-Mar) P
Antimony		Tons	91	119	245	165	60
Aragonite/Marble	Very Large Deposits	000 Tons	1835	1980	1537	1122	980
China Clay	4.9 million tons	000 Tons	53	31	32	25	23
Celestite	Not Estimated	Tons	3160	1530	1310	1010	670
Chromite	Fairly Large Deposits	000 Tons	52	104	115	69	81
Coal	185 billion tons	000 Tons	3854	3702	4066	2948	2960
Dolomite	Very Large Deposits	Tons	183952	342463	359994	258496	246489
Fire Clay	Over 100 million tons	000 Tons	333	347	330	24	259
Fullers Earth	Fairly Large Deposits	000 Tons	16	11	11	9	8
Gypsum Anhydrite	350 million tons	000 Tons	601	624	660	495	532
Lime Stone	Very Large Deposits	000 Tons	18427	25512	31789	24135	24540
Magnesite	12 million tons	Tons	2446	3445	3940	3665	1864
Rock Salt	Over 100 million tons	000 Tons	1859	1873	1849	1377	1380
Silica Sand	Very Large Deposits	000 Tons	411	402	403	304	280
Ochre	.....	Tons	34320	61665	46215	29782	44566
Sulphur	0.8 million tons	Tons	24730	27710	29485	22205	19907
Soap Stone	0.6 million tons	000 Tons	21	45	38	33	26
Baryte	30 million tons	000 Tons	52	47	50	37	46
Bauxite/Laterite	Over 74 million tons	Tons	60370	150796	174223	144296	135745
Iron Ore	430 million tons	Tons	130259	12589	286255	220233	240920
Crude oil	296 million US barrels	m. barrels	23.94	24.62	25.60	19.16	19.26

Natural Gas	492 billion cu. Meter	000 m.co.mtr.	39.65	40.03	41.18	30.86	30.96

P Provisional

Source: Federal Bureau of Statistics

1.3.1.9. Paper and Paper Board Industry

The Majority of the Paper and Paper Board mills are of low production capacities with only 7 mills having a capacity of more than 100 tons per day in Pakistan. The designed capacities of the units range from 1500 tpy to 88,000 tpy. Approx 70% of the mills are located in Punjab, 20% in Sindh and 10% in NWFP. The industry is heavily capital intensive. During 2002-03, the sector produced Paper & Paper Board worth around Rs 14.3 billion, contributing 2.35% to the total manufacturing sector value. The sector is also contributing toward import substitution by saving millions of dollars by producing high & low quality Paper & Paper board locally.

The existing production units require technological up gradation through greater investments for overcoming the environmental hazards arising from their operations. The pulp and paper mills contaminate the environment both as a result of atmospheric pollution through gaseous discharges as well as water pollution through discharge of process and conveying water.

Table 1.21: Spot Analysis of Paper and Paper Board Sector

Number of Industries/Units	**100 Units**
⇒ Paper & Paper Board Manufacturing Units	44 Units
⇒ Wrapping and Packaging Paper Plants	38 Units
⇒ Writing and printing Paper Units	18 Units
Total Installed Capacity of the Sector	650000 tons per annum
Total Installed Capacity of Association Member Units	436500 tons
Production Reported by Association Member Units	354852 tons
Export Growth/Trend	Sporadic/ Rudimentary
Local Production as %age of Global Production	0.1%
Contribution to Total Exports of the Country	Nominal
Contribution to GDP (mp)	0.36%
Capital output ratios	1:0.35
Employment on sectoral basis	100000 persons (approx.)
Skilled and Unskilled Labor ratio	30:70
Capital labor ratios	4 employees (app.) per 1million of investment
Total sector-wise investment	Rs. 30 billion (approx)
Inflow of Foreign Direct Investment (wherever relevant	-

Value Addition	46% @
Technology	
⇒ Low Tech.	93%
⇒ Intermediate	7%
⇒ High Tech	-
Source of machinery	Finland, Sweden,& Korea

@ Based on audited accounts for 1998-99 of Packages Limited, Century Paper and Board Mills Limited, security Papers Ltd. And Malik Board & Paper Industries (Pvt) Ltd.

1.3.1.10. Plastic Sector

The Pakistan Plastic industry comprises of an up-stream organized segment having 7 units and a down-stream segment dominated by a large informal sector of over 5,000 units. The down-stream plastic processing industry also comprises of an estimated 700 organized units. Total investment made by the large-scale upstream plastic industry is around Rs. 5.677 billion. An estimated Rs 10 billion has been invested by the down-stream plastic industry of Pakistan. The plastic industry of Pakistan has seen a remarkable average annual growth rate of around 15 per cent during the last four years against a global average of 8 per cent despite severe technical and institutional impediments.

Table 1.22: Demand & Supply – Major plastic Raw Materials

(000 M. Tones)

Product	Consumption 2001-02	Estimated demand	
		2004-05	2009-10
Poly Ethylene (PE)	157.50	235.00	340.00
Poly Propylene (PP)	144.00	150.00	205.00
Poly Vinyl Chloride (PVC)	78.00	95.00	120.00
Poly Styrene (PS)	23.40	35.00	45.00
TOTAL	**402.90**	**515.00**	**710.00**

Source: ENAR PETROTECH Services

Plastics material being consumed in industry includes thermoplastics and thermosetting resins. Among the thermoplastics category, bulk consumption is of Polyethylene (PE), Polyvinyl Chloride (PVC), Polypropylene (PP) and Polystyrene (PS). The thermosetting resins being consumed are urea formaldehyde, phenol formaldehyde, melamine formaldehyde and Polyester resins.

Import of main raw materials like PE, PP, PS, PVC, Acrylic Polymers, Polyester Fibre and Polyethers constitute three fourth of the total plastics import. The total consumption of major thermoplastics (i.e. PE, PVC, PP, PS) during 2002-03 is estimated at 412,000 metric tons. With the exception of PVC, total requirements of thermoplastics are being met through imports. In 2001-02 import bill of thermoplastics (including VCM and styrene) was estimated to be over US$ 260.00 million.

The PVC requirement of the downstream processing industry is now largely being met by Engro Asahi and Polymers Limited with its 100,000 M. Tons PVC plant at Karachi. Major products being manufactured by the plastics processing industry of Pakistan include a wide range of medium to good quality products like household utensils, dinnerware, furniture, toys, plastic sheets, floor coverings, tiles, pipes and piping materials, polypropylene bags for cement and fertilizer, shopping bags, baskets, bottles and containers, a variety of packaging materials for pharmaceuticals, cosmetics, processed foods and dairy products, PVC/ plastic coated electric and telephone cables, kitchen gadgets and other decorative items. Table 1.23 shows the breakdown of plastic materials with growth figures.

Table 1.23: Breakdown of Plastic Materials with Growth

Plastics	End Use Industries	Growth
Poly Vinyl Chloride (PVC)	Pipes, Artificial Leather, Cable Coating, Packaging, Footwear	10%
Poly Ethylene (PE)	Film for packaging, Bottles and Pipes	27%
Poly Propylene (PP)	Woven Bags, Auto Parts, Packaging, Pipes, House Ware and Medical Applications.	17%
Polystyrene (PS)	House and Sanitary Wares, Auto Parts, Electrical Parts	6%

Source: Industrial Digest of Pakistan 2004

During the last ten years, investment has been made by small and medium size enterprises for manufacture of PVC tiles, doors, windows, laminated films, refrigerator and deep freezer parts, footwear, auto parts, industrial laminates, melamine tableware, collapsible tubes, and many other plastic products.

The types of processes being employed by the industry include extrusion, blow and injection moulding and calendaring, etc. The injection and blow-moulded products include household articles, automotive or industrial parts, bottles, containers, shoes, etc. The products made by employing extrusion process include packaging film, pipes, wires, cables and woven bags or cloths. The total plastic materials processing capacity in the country is estimated to be around 500,000 MTPY.

1.3.1.11. Food Processing Industry

The processed food and beverages industry is considered to be one of the largest industrial sectors in Pakistan. It accounts for approx. 29% of total production and 17% of total employment in the manufacturing sector.

Table 1.24: Processed Food and Beverages Sector Profile

Products

Fruit and Vegetable Processing	25 Units
Capacity	30000 M. tons
Sea food	26 Units
Capacity	
Production	25000 M. tons
Confectionery	23 Units
Capacity	30300 M. tons
Biscuit and Bread	42 Units
Capacity	46830 M. tons
Production 80%	37464 M. tons
Cereals	1 Units
Capacity	350 M. tons Corn Flakes 325 M. tons Rice Cereals
Production	100% of Capacity
Beverages	157 Units
Capacity	800 million litres
Production	750 million litres
Fruit Juice/Pulp	25 Units
Capacity	400000 M. tons
Meat and Poultry Processing	3 Units
Capacity (Meat Processing)	600000 Kg/Annum
Poultry	8000 birds/hour
Production	Operating below Capacity
Dairy	38 Units
Capacity (Milk Processing)	795 million litres
Ice-cream	47.5 million litres
Production (Milk)	365 million litres

Industrial digest of Pakistan 2005

The total value of food and beverages production is over Rs 48 billion.

The industry includes:
Segments Products
Sea Food Chilled or frozen fish, fish meat,
Live Stock & Poultry Fresh Beef, Mutton, Poultry meat, processed beef, mutton (sausages & smoked meat), ready to cook poultry meat etc
Fruits & Vegetables Fresh fruit & vegetable processing Jams, Pickles, Ketchups, sauces, canned products, etc
Beverages Carbonated soft drinks, fruit juices/pulp, syrup, fruit based drinks
Confectionery Sweets, Toffees, candies
Biscuits & Breads Biscuits, wafers, white & brown bread, rusks etc.
In addition there are small vegetable dehydration, spices, cereals and seasoning facilities

Dairy, Sugar, grains, flour mills, hydrogenated vegetable oil industry etc. are covered independently in other sector profiles.

The existing fruit and vegetable processing industry is concentrated around Karachi, Lahore and Peshawar. Approximately 25 firms with an estimated installed production capacity of 30,000 M. tons produce squashes, jams & jellies, pickles and canned fruits and vegetables. The production of fruit preserves is currently estimated at 15,000 metric tons; jams jellies and marmalades 2,000 metric tons; pickles and chutney 10,000 metric tons; tomato ketchup 10,000 metric tons and syrups and squashes 18 million bottles. Their plant capacities, however, are under-utilized and can be increased to 2 – 3 times their present level.

Sea Food

The sea coast of Pakistan yields large varieties of fish including shrimp, crab, lobster, sardines, salmon, pomfret, sole & tuna. Of this 47% is fit for human consumption. Marine production accounts for 73% of total fish production in the year 2003. There are 26 fish processing plants with capacity to process 253.75 M. tons of fish & shrimp daily. Only 20 plants are operational. Out of these 17 plants are involved in production of frozen products, one in canning and 8 in fish meal. Eight plants have received export certification from Pakistan Marine fisheries department and 3 are in process of being approved. Almost all the frozen & canned sea food products are exported. Bulk of the processed fish meal is utilized in the country in the manufacture of poultry feed.

Confectionery

There are about 23 units in the organized sector which together have a capacity of 30,300 metric tons of sweets, 12,000 metric tons of toffees, 7,800 metric tons of bubble gum, and 4,200 metric tons of chocolates, a combined capacity of 54,300 metric tons. Actual production is estimated at over 32,000 metric tons per year. In addition, a number of small units in the informal sector, which collectively have an estimated capacity of 12,000 metric tons produce approximately 5,000 metric tons of confectionery per annum.

Cereals

The Pakistani market for cereals for PFY –03 was estimated at USD 3.5 million approximately. Domestic supply relies on a single Pakistan Army owned and operated unit which produces 350 metric tonnes of corn flakes and 325 metric tons of rice cereal and porridge annually.

Spices

The local production of spices includes peppers, coriander, turmeric and ginger.
Production in the years 2002-03 has been as under:

	(M.ton)
• Coriander	2200
• Turmeric	39800
• Ginger	36

(Source Agricultural Statistics of Pakistan 2002-03)

Beverages

Beverage processing includes carbonated soft drinks (CSD), fruit juices, syrups and juice flavoured drinks. The per capita consumption of carbonated drinks is 16 bottles of 8 ounce each per annum. The total demand for CSD is 90 million cases, which contains 24 bottles each of 8 ounces. Pakistan has the lowest per capita consumption of CSD in the world. There are about 157 beverages processing plants meeting the overall demand of the country. Both Pepsi and Coca-cola have established concentrate plants in Pakistan and supervise franchise rights on behalf of their parent company in USA. Both companies distribute their own products through distributors. The market for CSD within 5 years has grown from 2-3% to 10-12% on this account (Industrial Digest of Pakistan 2005).

Fruit Juice

The demand for fruit juices is only 20-25% of the demand for CSD. Pakistan currently has 24 fruit juice/pulp processing plants and a number of small units in the informal sector. The present installed capacity is estimated around 400,000 metric tons per annum. The fruit juice market is estimated between 2.5 billion to 2.8 billion Rupees.

1.3.1.12. Sugar Sector

Pakistan is the 5th largest country in the world in terms of area under sugar cane cultivation, 11th by production and 60th in; yield. Sugarcane is the primary raw material for the production of sugar. Since independence, the area under cultivation has increased more rapidly than any other major crop. It is one of the major crops in Pakistan cultivated over an area of around one million hectares.

The sugar industry in Pakistan is the 2nd largest agro based industry comprising 81 sugar mills with annual crushing capacity of over 6.1 million tones. Sugarcane farming and sugar manufacturing contribute significantly to the national exchequer in the form of various taxes and levies. Sugar manufacturing and its by-products have contributed significantly towards the foreign exchange resources through import substitution.

Table 1.25: Spot Analysis of sugar Industry

No. of Mills	81 (71 - operational, 2 - under construction, 4 - completed)
Crushing Capacity	6.1 Million tones
Contribution to Economy	
Share in GDP	1.9 %
Employment	1.5 Million (directly & indirectly)
Total investment	PKR 100 Billion (Approx.)
Average Yield per Hectare	46.8 Tones
Total Cane Production	45.0 – 55.0 Million Tones
Cane Available	30.0 – 43.0 Million Tones
Average Recovery of Sugar	9.1 (vs. world average 10.6%)

Per Capita Consumption	25.8 kgs. Per Capita
Contribution to Exchequer	Rs. 12.16 Billion

Table 1.26: Sugarcane Production and Recovery

Year	Cane Crushed Tonnes	Sugar Made Tonnes	Recovery
2001-02	36,708,638	3,197,745	8.71%
2002-03	41,786,689	3,652,745	8.74%
2003-04	43,661,378	3,997,010	9.15%
2004-05	32,101,739	2,922,126	9.10%
2005-06	30,090,632	2,588,176	8.59%

Table 1.27: Sugar Production by type of raw Material (In Tonnes)

Year	Sugarcane	Beet	Raw	Total
2001-02	3,197,745	29,172	22,111	**3,249,028**
2002-03	3,652,745	22,066	1,945	**3,676,759**
2003-04	3,997,016	23,796	-	**4,020,806**
2004-05	2,922,125	11,373	182,303	**3,115,801**
2005-06	2,588,176	8,934	401,396	**2,998,506**

Sugar industry is mostly located in the rural areas of Punjab and Sindh. A small percentage of total production is produced in the NWFP. Previously, Punjab was partly dependent on supply of sugar from Sindh, but lately the establishment of some large scale units in Punjab has made the Province self-sufficient in the commodity. Sugar production is seasonal activity. The mills, at an average operate for 150 days, and supplies are made throughout the year. The province wise sugar production is given in following table.

Table 1.28: Province wise sugar production

(In Tonnes)

Province	2005-06	2004-05	2003-04	2002-03
Punjab	1,832,228	2,182,330	2,599,490	2,351,102
Sindh	1,038,122	801,063	1,221,268	1,158,674
NWFP	128,157	132,407	176,252	166,983
TOTAL	**2,998,507**	**3,115,801**	**3,997,010**	**3,676,759**

1.3.1.13. Textile Industry

Textile industry is the dominant-manufacturing sector in Pakistan. It is based on locally available raw cotton, employs 38% of total industrial labour force and contributes 27% of industrial value

addition with 67% share in total exports of the country. Textile production comprises of cotton, cotton yarn, cotton fabric, fabric processing (Grey-dyed-printed), home textiles, towels, hosiery & knitwear and readymade garments.

Table 1.29: Spot Analysis of Textile Sector

Total number of Units	
Ginning	1221 (installed capacity: one million bales on single shaft basis, total capacity: 20 million bales on three shaft basis)
Spinning	521
Composite Units	50
Spinning Units	471
Weaving	
Large	140
Small	425
Power Looms	23652 (shuttle looms)
Finishing	
Large	106
Small	625
Garments	
Large	600
Small	4500
Knitwear	700
Towels	400
Total Capacities	20 Million Bales
Spinning	1818 Million Kg Yarn
Weaving	4897 Sq. Mtr. Fabric
Finishing	4600 Million Sq. Mtr.
Garments	685 Million PCS
Knitwear	550 Million PCS
Towels	55 Million Kgs
Contribution to total exports	53.7% (2008-09)
Contribution to GDP	11% of total GDP
Sector Employment	16 Million
Skilled and unskilled ratio	70:30
Total Sector Investment	315% of total manufacturing investment
Value Addition (in Aggregate)	27 %

Source: Industrial Digest of Pakistan 2004

1.3.1.14. Cement Industry

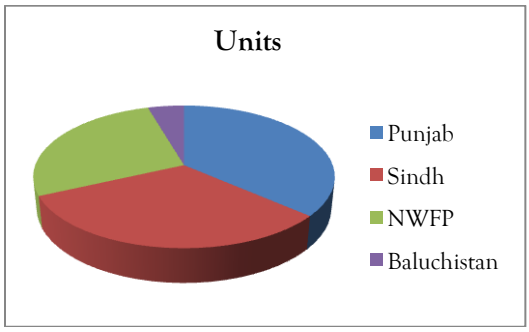
Cement Industry is indeed a highly important segment of industrial sector that plays a pivotal role in the socio-economic development. There Are Presently 29 Cement Plants with installed production capacity of 44.09 Million Tones in the Country, 19 are in the north zone while 10 are in south zone. The north with the installed production capacity of 35.81 Million Tones (80%) while the south with installed capacity of 8.89 Million Tones (20%) compete for the domestic market of over 19 Million Tones. Most of the cement industries in Pakistan are located near/within mountainous regions that are rich in clay, iron and mineral capacity. Cement sector is contributing above Rs. 30 Billion to the national exchequer in the form of taxes. The industry is providing job opportunities to more than 150,000 people across the country.

Table 1.30: Spot Analysis of Cement Industry

Installed Capacity	39 Million Tones
No. of Units	29
Local Demand (2007-08)	22.6 Million Tones
Production 2008-09 (July-Feb.)	19.2
Projected Capacity 2010-11	48 Million Tones

Source: Ministry of Industries and Production

Fig 1A: Geographical distribution of cement industry in Pakistan



Source: Industrial digest of Pakistan 2004

1.3.1.15. Oil & Gas Sector

The primary commercial energy supplies during 2007-08 were 62.9 million tonnes of oil equivalent (mtoe). The share of natural gas in primary energy supplies during 2007-08 was 47.5% followed by oil 30.5 and LPG 0.7%. Natural gas production during the year was 3,973 million cubic feet per day while oil production was 69,954 barrels per day.

Oil consumption increased by 7.3% during 2007-08 over the preceding year. Main increase was in transport sector (18%) followed by domestic (14%), agriculture (12%) and power (5%) sectors. The consumption declined in industry and other government sectors by 33% and 5%. Product wise, gasoline consumption increased by 27.3% and HSD by 13.5% while FO increase was only 1.2%

over the last year. Imports of petroleum products increased by 8.4% as compared to the previous year. HSD imports increased by 13.5% while FO imports decreased by 1% during 2007-08. The refineries production was up by 4.2% producing about 10% more quantities of HSD and gasoline during 2007-08 as compared to the preceding year.

Natural gas consumption increased slightly by 4.4% during 2007-08 as compared to the previous year. Main increase was in transport sector (28%) followed by domestic (10%), commercial (8%) and industry (5%). Natural gas consumption decreased during 2007-08 in cement industry by 13% and in power sector by 1% over the previous year.

Coal production increased by 13% in 2007-08 over the previous year due to multifold increased production from Barkhan coalfield in Balochistan. The coal imports have also gone up by 40.8% resulting in overall increase in coal supplies/consumption by 28.1% over the last year. Major part of the increased supplies is assumed to have been consumed in cement and other industries. Consumption of coal in power generation decreased by 1.3% from 164,397 tonnes in 2006-07 to 162,200 tonnes in 2007-08.

Table 1.31: Primary Hydrocarbon Energy Supplies by Source

Unit: TOE
%Share

Source	2007-08	
	Quantity	% Share
Oil	19206441	30.5%
Gas	29872105	47.5%
LPG	418952	0.7%
Coal	5783844	9.2%

Source Energy Yearbook 2008, HDIP

Table 1.32: Sectoral Consumption of POL Products by Province (2007-08)

Unit: Tones
TOE

Energy Products	Domestic	Industry	Agriculture	Transport	Power	Other Govt.	Total
Punjab	86036	573840	101450	5131082	3997678	84985	9975071
	88755	580645	105658	5406918	3903793	88501	10174269
Sindh	18865	302315	6666	2564444	1450097	167817	4510204
	19459	306462	6945	2696579	1412951	176685	4619081
NWFP	13746	152805	1152	1349525	1835	56520	1575583
	14180	152645	1200	1420252	1923	59205	1649405
Balochistan	1941	35343	83	204133	1634323	1179	1877002
	2002	350892	86	215127	1591395	1239	1845742
A. J. & K.	373	6888	0	135298	-	0	142559
	385	7241	0	142661	-	0	150288

Energy Products-Total	120961	1071191	109351	9384482	7083933	310501	18080419
	124781	1082885	113889	9881537	6910062	325631	18438785

Unit: TOE

Non-Energy Products	Domestic	Industry	Agriculture	Transport	Power	Other Govt.	Total
Punjab	-	175145	0	43857	4142	24109	247253
Sindh	0	101858	-	25905	2069	19379	149209
NWFP	-	14311	-	5866	547	10608	31332
Balochistan	-	2680	-	3870	282	6882	13714
Azad Kashmir	-	298	-	799	-	5316	6413
Non-Energy Total	0	294290	0	80297	7040	66294	447921

Source: Energy Yearbook 2008, HDIP

Fig 1B: Petroleum Products Consumption by Sector

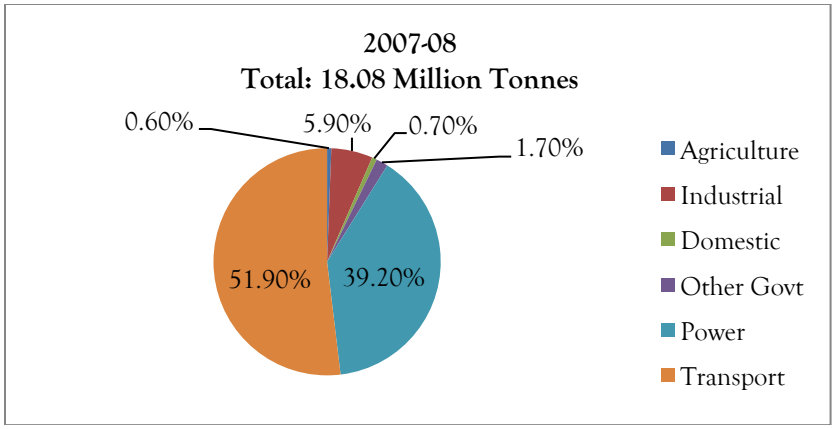


Table1.33: Import of Crude Oil

Qty. in TOE
(Value in Million US$)

Refinery	2007-08
Bosicor Refinery	790760
	817488
	(550.59)
Pakistan Refinery	849852
	878577
	(567.72)

National Refinery	2223469
	2298622
	(1518.52)
PARCO	4559532
	4713644
	(3104.03)
Total	8423613
	8708331
	(5740.86)
Annual Growth Rate of Qty.	2.40%

Source: Energy Yearbook 2008, HDIP

Table 1.34: Import of Petroleum Products

Unit: Qty. in Tonnes
Qty. in TOE
(Value in Million US$)

Products	2007-08
100/LL	121499
	126614
	(122.75)
HSD	4507873
	4739127
	(3863.08)
High Sulphur Furnace Oil	3921425
	3818292
	(1913.94)
Low Sulphur Furnace Oil	346906
	337782
	(199.76)
Motor Spirit	127386
	136099
	(106.44)
Total	9025089
	9157914
	(6205.97)
Annual Growth Rate of Qty.	8.35%

**For convenience of calculations, the conversion factors for HSFO and LSFO have been assumed as same.*
Source: Energy Yearbook 2008, HDIP

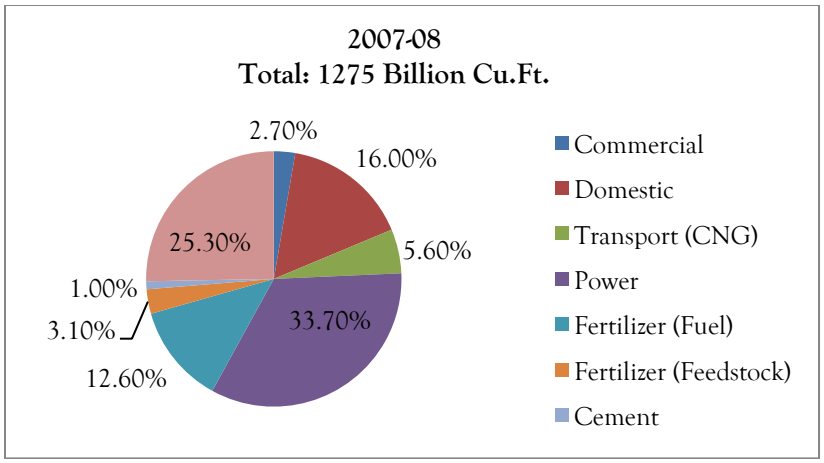
Table 1.35: Import of Petroleum Products

Unit: Qty. in Tonnes
Qty. in TOE
(Value in Million US$)

Products	2007-08
Crude Oil	-
	-
Energy Products Naptha	944898
	1009529
	(778.16)
Motor Spirit	41392
	44223
	(35.36)
HSD	20052
	21081
	(21.51)
Kerosene	-
	0
	-
JP-1	330827
	341281
	(374.60)
Furnace Oil	169
	165
	(0.09)
Total Energy Products	1337338
	1416279
	(1209.72)
Asphalt	0
	-
Lubes	-
	-
Grand Total	1337338
	1416279
	(1209.72)

Source: Energy Yearbook 2008, HDIP

Fig 1C: Natural Gas Consumption by Sector



Source: Energy Yearbook 2008, HDIP

Table 1.36: Natural Gas Consumption 2008-09 by Sector

Unit: Billion CFt
(Percent change)

Sectors	2008-09 (July-March)
Domestic	172
	-0.5%
Commercial	26.4
	3.2%
Industrial	234
	2.8%
Pakistan steel Mills/ Gen. Industry*	16901
	395483
Cement	6
	-35.3%
Fertilizer	150
	0.7%
Fertilizer (as Fuel use)/ (as feedstock)	40001
	782979
Power	278
	-13.1%
Transport	65725
	27.1%
Total	66591.4
	-15.1%
Annual Growth Rate	4.45%

Source: Energy Yearbook 2008, HDIP

Table 1.37: Natural Gas Consumption 2007-08 by Province

Unit: Million CF1 TOE

Sectors	Punjab	NWFP	Sindh	Balochistan	Total
Domestic	118648	17589	59648	8150	204035
	2776354	411585	139563	190710	4774412
Commercial	21151	2314	9858	582	33905
	494925	54146	230677	13619	793367
Gen. Industry*	180446	12155	111846	215	305662
	4222431	307832	2617196	5031	7152491
Pakistan steel Mills	-	-	16901	-	16901
	-	-	395483	-	395483
Cement	7155	2162	3419	0	12736
	167435	50586	80005	0	298025
Fertilizer (as feedstock)	108920	31	51112	-	160062
	2123340	722	1021564	-	3145626
Fertilizer (as Fuel use)	27782	28	12191	-	40001
	539712	656	242612	-	782979
Power	146848	-	203436	79608	429892
	3219637	-	4351401	921882	8492919
Transport	45192	9438	17198	190	72018
	1057504	220849	402433	4446	1685232
Total	656141	44717	485609	88745	1275212
	14601338	1046376	10737134	1135687	27520535

** Includes 5091 MMcft as Shrinkages at JJVL in 2005-06*

Source: Energy Yearbook 2008, HDIP

Table 1.38: Production of Coal by Field

Unit: Tonnes

Province/Field	2007-08
BALOCHISTAN	
Scr Range	117681
Degari	43175
Sharigh	184989
Sinjidi	120515
Mach	293340
Hamai-Khost-nasaka-Zardalu	93931
Duki	564944
Pir Ismail Ziarat	318166

Abegum	11697
Barkhan/Chamalong	520185
Sub-Total	2268623
PUNJAB	
Makerwal/ Salt Range	553453
Sub-Total	553453
SINDH	
Lakhra	1038926
Jhimpur	19936
Sub-Total	1058862
NWFP/FATA	
Makerwal/Gulakhel/Kohat, FATA	242969
Sub-Total	242969
Total: Tonnes	4123907
TOE	1845036
Annual Growth Rate	13.21%

**Field-wise breakup not available*

Source: DG (Minerals), Provincial Directorates of Mineral Development.

Table 1.39: Import of Coal*

Unit	2007-08
Tonnes	5986940
TOE	3938808
Import Value (Million Rs)	(15720)
Annual Growth Rate	40.83%

**Includes coal imported by Pak Steel for use as coke.*

***Include 458356 tonnes of metallurgical coke imported by Pak Steel*

Source: Federal Bureau of Statistics, Pakistan Steel Mills Corporation.

Table 1.40: Consumption of Coal by Sector

Unit: Tonnes
TOE

Sector	2007-08
Domestic	1000
	447
Brick-Kiln industry*	3760707
	1682540
Cement/Other Industry**	5720972
	3721727
Pak Steel***	465968
	306560

Power (WAPDA)	162200
	72568
Total: Tonnes	10110847
TOE	5783844
Annual Growth Rate	28.08%

Note: Sectoral consumption data of coal is mostly not available, except for power sector and has, therefore, been estimated.
**Estimated by deducting other uses of indigenous coal from the total production.*
***Include indigenous as well as imported coal.*
****Imported coal/coke used as coke in Pak Steel.*
Source: Cement Factories, DG (Minerals), FBS, Pak Steel, PMDC, WAPDA.

1.3.1.16. Chemical Industry

Overview of Chemical Industry

Chemicals are divided in two main categories from value addition point of view. Those produced in large and bulk quantities but with lower value addition are called **Commodity Chemicals**. Examples are fertilizers and soda ash, etc. **Specialty Chemicals** are those produced in smaller quantities with higher value addition. Examples are dyes & pigments, pharmaceuticals and enzymes, etc. Chemical sector plays a vital role in the economic development of the country. This sector is diversified and covers a vast range of products.

At the time of independence, chemical industry in Pakistan was practically non-existent. Over the years, some traditional sectors have developed, however the Chemical Industry in Pakistan is still at a very nascent stage. In early 50's, PIDC was setup by the Government, for industrialization of the country. As a result, a large chemical estate comprising Pak American Fertilizers, Maple Leaf Cement, Antibiotics (Penicillin) and Pak Dyes & Chemicals, was established at Iskanderabad (DaudKhel), district Mianwali. This estate played an important role and served as a nucleus for chemical industry in Pakistan.

In 1960's, another chemical complex was set up in private sector at Kala Shah Kaku, Lahore. Chemical factories also started emerging at Karachi due to the investment friendly policies which gave confidence to the investors. Total investment in 2003 in chemical industry was at around Rs 360 billion.

At present there are nearly 30 chemical companies with an estimated investment of about Rs. 3.5 billion. The larger enterprises include, Fauji Fertilizers, ICI Pakistan, Engro Chemical, dawood Hercules, Clariant Pakistan, Sitara Chemicals, Colgate Palmolive, Berger Paints, BOC Pakistan, Sindh Alkalis and Dyno Pakistan.

Following are the major end products under this sector:

- Petrochemicals
- Soda Ash & Sodium Bicarbonate
- Fertilizers
- Caustic Soda & Chlorine

- Synthetic Fibers
- Sulfuric Acid & Other acids
- Alcohol from Molasses
- Organic Chemicals
- Pesticides
- Dyes & Pigments
- Plastics & Resins
- Textile & Tannery Chemicals
- Paints & Varnishes
- Water Treatment Chemicals
- Oleo Chemicals & Soaps, Detergents and Cosmetics
- Food Chemicals
- Paper & Paper board
- Essential Oils

Pakistan's total imports have exceeded US$ 10 billion out of which chemicals imports constitute approximately US$ 2 billion. A detailed list of the main chemicals imported during 2008-09 along with their quantities & values is given at Table 2.2. Similarly main chemicals exported to various countries during the same period are listed at Table 2.3. In following section there a brief summary about various chemicals produced in Pakistan will be given.

Table 1.41: Chemical Related Groups (data not provided)

Chemical Group	Import	Export
Organic Chemicals		
Plastics & Resins		
Pharmaceuticals		
Pesticides and others		
Fertilizers		
Paper and Paper Board		
Dyeing and Tanning Chemicals		
Inorganic Chemicals		
Synthetic Fibers		
Essential Oils		
Glass		
TOTAL		

i. Petrochemicals

Petrochemical products currently form an essential base for production of wide range of industrial and consumer products. At present, the petrochemical industry of Pakistan is limited to production of polyvinyl chloride (based on imported VCM), synthetic fibers, i.e. polyester,

polyamide, aromatics (Benzene, Toluene, Xylene), Purified Terephthalic Acid (PTA) and carbon black.

Pakistan has no facility to produce basic petrochemicals like Ethylene, Propylene, Butadiene, Styrene, etc. and they are being imported in bulk. Petrochemicals provide raw materials for plastics, detergents, dyes, paints & varnishes and pesticides industry in Pakistan. They are also used as additives in the lubricating oils. Most of the specialty and fine chemicals belong to the petrochemical group.

Pure Terephthalic Acid (PTA)

Purified Terepthalic Acid (PTA) is basic raw material for production of polyesters. In 1998 ICI Pakistan setup PTA production facility at Port Qasim, Karachi. The facility is capable of producing 400,000 MTPY of PTA with an investment of US$ 450 million. The plant production during last four years ranged between 175,832 to 397,000 metric tons. The current requirement of
PTA is estimated to be around 450,000 metric tons. The requirement is being shared by local production and imports in ratio of 76:24.
The demand/supply pattern of PTA during 1998-2003 is presented below:

Table 1.42: Demand/Supply Pattern of PTA

(Metric Tons)

Year	Demand	Supply		
		Local	Imports	Exports
1998-99	395747	175832	219915	-
1999-00	392905	262811	148199	18105
2000-01	366934	329143	128257	90465
2001-02	449814	395803	126955	72944
2002-03*	223459	202828	87393	51217

**July- December*
Source: ICI Pakistan

Aromatics (BTX)

Aromatics constitute main classes of hydrocarbons. Three most important aromatics Benzene, Toluene and Xylene are commonly known as BTX. In Pakistan benzene is used for production of insecticides, toluene is used for production of Tri Nitro Toluene (TNT) and solvents. Xylene is produced as mixed Xylene, which is used as solvent in paint industry and for formulation of various pesticides and as surface coating agents. Paraxylene and orthoxylene are derived from mixed Xylene. Paraxylene is used as a raw material for production of PTA while orthoxylene is used for production of phthalic anhydride.

Historically, BTX requirements of the country have been met from local production and imports. The local production was from a small unit of National Refinery Limited. The unit has a capacity of 25,500 MTPY of Benzene, Toluene and Xylene. The unit uses reformat as feedstock. Throughout its existence the plant has been operating at lower capacity owing to operational and production economics. This unit is no longer in operation. After start of ICI's PTA production

facility Paraxylene imports have been started. BTX imports during 1998-03 are shown in following table.

Table 1.43: Btx Imports

(M. Tons)
(Million Rs.)

Year	Benzene		Toluene		Xylene		Total (BTX)	
	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
1997-98	49	22	6205	113	14827	281	21081	396
1998-99	27	3	8360	143	131163	2171	139530	2316
1999-00	36	1	9255	174	252297	5481	261588	5658
2000-01	50	1	141177	311	252940	6917	267107	7229
2001-02	28	1	16140	351	296623	7566	312791	7918
2002-03*	65	1	11339	253	118398	3246	129802	3500

**July-December*
Source: Federal Bureau of Statistics

Carbon Black

Carbon black is the general term for a number of jet black, sub micron size pigments, comprised essentially of pure carbon. Carbon black is primarily used as reinforcing and filling agent for manufacture of tyres and rubber products. Small volumes are also consumed in manufacture of dyes and printing ink.

Carbon black's requirement of the Country is being met by local production as well as imports. The local production is originating from National Petrocarbon plant located at Pipri, Pakistan Oil Complex. The plant is capable to produce around 10,000 metric tons per annum of various grades of carbon black. The plant uses carbon oil as feed stock being produced and supplied by National Refinery Limited (NRL). The market supply and demand pattern of carbon black is presented in table below:

Table 1.44: Demand and Supply Pattern of Carbon Black

(M. Tons)

Year	Demand	Supply	
		Local	Imports
1998-99	10921	5054	5867
1999-00	11369	6153	5216
2000-01	8922	4523	4399
2001-02	8212	5148	3064
2002-03*	3274	2638	1587

**July-December*
Source: National Petro-carbon (Pvt) Ltd. (2002-03)*

Mono-ethylene Glycol (MEG)

Mono-ethylene glycol (MEG) is one of the most important synthetic organic liquid used for manufacturing of polyester fiber and as anti-freezing agent. In Pakistan MEG is primarily being consumed as input for manufacturing of polyester fiber and yarn. The quantum of MEG being consumed as anti-freezing agent is very small. At present, all the requirements of MEG are being met from imports. In 2001-02 122,000 metric tons of MEG was imported at a value of Rs. 3.12 billion (US$ 52.14 million). The imports during 1997 – 2002 are presented below:

Table 1.45: Imports of Mono-ethylene Glycol (MEG)

(M. Tons)
(Million Rs.)

Year	Imports	
	Quantity	Value
1997-98	126623	3675
1998-99	166792	3251
1999-00	174024	4447
2000-01	174943	4828
2001-02	121875	3129
2002-03*	105753	2896

**July-December*

Source: Federal Bureau of Statistics

The MEG requirements during last decade have been increasing at an annual growth rate of 10%. By 2009-10 the MEG requirements will increase to 260,000 metric tons.

ii. Fertilizers

Fertilizers are key input for agriculture. They improve the quality of crops in the form of high nutrient value and increase plant resistance to diseases and climatic conditions. The demand of fertilizer increases proportionately with the growing population. Nitrogen, Phosphorus and Potassium are major nutrients required by soil. These nutrients are provided by the following popular fertilizers.

- Urea,
- Calcium Ammonium Nitrate (CAN),
- Single Super Phosphate (SSP),
- Triple Super Phosphate (TSP),
- Nitro-Phosphate (NP),
- Di Ammonium Phosphate (DAP),
- Sulfate of Potash (SOP), NPK

Urea represents 71% of total fertilizers consumed in Pakistan while DAP 15% and other fertilizers like CAN, NP, SSP and NPK have 14% share.

Table 1.46: Spot Analysis of Fertilizer Sector

Number of manufacturing units operating in the sector	**10**
Total capacity (000 M. tons) (All Fertilizers)	5757
Production 2002-03 (000 M. tons)	5269
Export growth/trend contribution to GDP	0.4%
Employment on sectoral basis	7.563
Skilled and unskilled labor ratio	2:1
Capital output ratio (at market prices)	1:0.70
Total sector wise investment (Rs. in Billion)	87.0
Value addition	63%
Technology	High tech

Raw Materials & Process

Raw materials used for the manufacture of fertilizers are ammonia, carbon dioxide, phosphate rock, phosphoric acid, sulfuric acid, limestone and potash. Ammonia is manufactured by reforming the methane in natural gas. Ammonia is then reacted with different materials to produce fertilizers containing Nitrogen. Ammonia & Nitric acid is used to produce Ammonium Nitrate. Phosphate rock or Phosphoric acid is necessary to produce phosphatic fertilizer. Sulphuric acid is reacted with crushed phosphate rock to produce SSP.

Production Capacity

Presently, there are ten operating fertilizer units in the country. Out of these, four units are in the public sector, while six are in the private sector. One of the private sector unit, Pak China, is closed**.** The average annual growth rate in the sector was 7% during the last ten years. The share of fertilizer sector in GDP is around 0.4% and total investment in this sector is approximately Rs 87.0 billion. The capacities of existing fertilizer plants are given below:

Capacities of Existing Fertilizer Plants

Fauji Jordan Fertilizer Company (FJFC), Karachi is the only plant designed to produce DAP fertilizer with annual capacity of 450,000 tons but it is closed since September 2001. Efforts are under way to restart the plant. Prices for nitrogenous fertilizers were deregulated in 1986 while phosphatic fertilizers were deregulated in 1993. Fertilizer Policy of 1989 offered incentives, such as duty free imports of plant and machinery, tax holiday for 8 years and lower rate of feed stock prices for 10 years, which have helped increasing the urea production capacity from 2.2 million tons in 1990s to 4.2 million tons today. Since 1990, an investment of over US$ 1.2 billion has been made in this Sector.

Table 1.47: Capacities of Existing Fertilizer Plants

	Plant	Product	Year of Establishment	Present Capacity
1.	Fauji Fertilizer Company-I, Goth Macchi (FFC-I)	Urea	1982	695000
	Fauji Fertilizer Company-II, Goth Macchi (FFC-II)	Urea	1993	635000
	Pak Saudi Fertilizers, Mirpur Mathelo	Urea	1980	557000
2.	Fauji Jordon Fertilizer Company (FJFC), Karachi	Urea	1998	550000
		DAP*	1998	450000
3.	Engro Chemical Pakistan Limited (ECPL), Dhaharki	Urea	1968	850000
4.	Pak American Fertilizers (PAFL), Daudkhel	Urea	1998	346000
5.	Dawood Hercules Chemicals Limited (DHCL), Lahore	Urea	1971	445000
6.	Pak China Fertilizers Ltd. (PCFL), Haripur	Urea*	1982	102000
7.	Pak Arab Fertilizers Ltd. (PAFL), Multan	Urea	1962	92400
		CAN	1978	450000
		NP	1979	3604500
8.	Lyallpr Chemicals & Fertilizers Ltd. (LCFL), Jaranwala	SSP	1958	72000
9.	Hazara Phosphate Fertilizers, Haripur	SSP	1989	90000
10.	Engro Chemical Pakistan Limited (ECPL), Karachi	NPK	2002	100000
	Total			**5738900**

**Closed*

Source: National Fertilizer Development Centre

Domestic fertilizer production meets 70-80% of local demand. The gap between fertilizer demand and domestic production is filled through imports. As the domestic production of fertilizer has registered a growth in recent years, the fertilizer imports declined by 10.45% in 2001-02. During the current fiscal year 2008-09 (July-March), the fertilizer imports remained at 401 thousand nutrient tones. (Pakistan Economic Survey 2008-09)

To enhance the fertilizer production in the country, expansion/BMR of Fauji Fertilizer Bin Qasim Limited (FFBL) for 220 thousand tones of DAP has been completed and started to yield production from April 2008. A new project of Fatima Fertilizer Company with a capacity of 400

thousands tones of urea, 450 tones of CAN, 400 thousands tones of NP and 300 thousands tones of NPK is under construction. This will start production by 2010. Engro Chemical is installing a new urea plant with annul capacity of 1300 thousand tones. The plant will be operationalized by 2010-11. Suraj Fertilizer Industries has set up a new plant of SSP (18 percent) at Harappa (Sahiwal) with production capacity of 150 thousand tones annually which will start production in May/June 2009. The Pak American Fertilizer Company owned by Azgard Nine Group has purchased Hazara Phosphate plant of SSP fertilizer, the last fertilizer unit working in public sector. In addition, few companies have started production of SSP with the annual production capacity of around 20 thousand tones at small scale level.

% Share of Products in Total Fertilizer Off take

The soil in Pakistan generally tends to be deficient in nitrogen, therefore, urea is the most used fertilizer. DAP is used, as most of the phosphatic fertilizers are used to counter the effect of acidic urea and maintain levels of fertility in the soil. Urea, therefore, represents 71% of total fertilizer consumed, DAP accounts for 15% of the total consumption while other fertilizers like CAN, AS, NP, TSP and NPK's have almost 14% share. The same is depicted in the following table.

Table 1.48: Production and Off Take of Fertilizer

(000N/tons)

Year	Domestic Production	Import	Total	Off take
2003-04	2539	764	3303	3222
2004-05	2718	785	3503	3694
2005-06	2832	1268	4100	3804
2006-07	2747	796	3543	3672
2007-08	2822	876	3698	3581
2007-08 (Jul-Mar)	2076	818	2894	2878
2008-09 (Jul-Mar) P	2150	401	2551	2691

P: Provisional

Source: National Fertilizer Development Centre

Table 1.49: Season-Wise Consumption of Fertilizer

(000N/tons)

Year	Kharif				Rabi			
	N	P	K	All	N	P	K	All
1997-98	981	153	7	1141	1089	13	13	1461
1998-99	987	201	6	1194	1070	15	15	1348

1999-00	1075	217	8	1300	1133	362	10	1504
2000-01	1134	311	9	1454	1211	360	14	1585
2001-02	1049	329	8	1386	1111	295	9	1415
2002-03	1117	258	9	1384	1201	422	12	1635
2008-09								

Pakistan Agricultural Statistical Book 2002-03

Table 1.50: Import of Fertilizer

Year	**000 Nutrient Tons**				**Value in Million Rs.**
	N	P	K	TOTAL	
2003-04	286.9	415.7	11.1	764.10	9025
2004-05	421.8	425	5.0	784.71	-
2005-06	233	416	13.8	1268.31	-
2006-07	194	369	16.5	796.00	-
2007-08	178.5	429.5	17.7	876.30	-
2008-09 P	215.7	542.4	7.9	401.00	14068

P: Provisional, (Jul-Mar)
Source: Pakistan Economic Survey 2008-09, Source: Federal Bureau of Statistics,
Pakistan Agricultural Statistical Book 2002-03

Natural Gas

The fertilizer sector is the second largest consumer of natural gas (22- 25%) after power sector (37.1%). Natural gas prices prevailing in Pakistan ranges between US$ 1.5 to 2.0 per MM Btu. The consumption of gas during 2007-08 was 200, 061 mcft.

iii. Synthetic Fibers

Synthetic Fibers are important manufactured raw materials used in the production of blended yarn. These are blended with natural (cotton) or artificial/ Synthetic Staple Fibers for the manufacture of apparel/household textiles. Pakistan's synthetic Fiber industry is currently producing Polyester and Acrylic Fibers. Chemi Group of Companies conceived a project with collaboration of Swiss and Chinese suppliers for manufacturing of Viscose Staple Fiber (VSF) with production capacity of 11,500 M. tons against total demand of around 26,000 – 28,000 MTPY. The unit namely Chemi Viscofibre is located in Nawabshah has been set up at a total cost of Rs 1.873 billion. The polyester staple Fiber industry has developed as the main synthetic fiber industry during the last decade in response to growing demand for synthetic fiber for the

production of blended yarn. The polyester sector remains the largest and critical segment of Pakistan's synthetic fiber industry.

Production Capacity

The total installed capacity for manufacture of Polyester Staple Fiber (PSF) is 620,000 MTPY. The country's demand of PSF is being entirely met through local production. The PSF industry has been able to successfully substitute imports with the result that no significant PSF imports have been made during the last five years except for an average import of 10,000 – 12,000 tons of specialty fiber per annum. The installed capacities of major PSF producers are listed in table below:

Table 1.51: Installed Capacities of Major PSF Producers

Company	Year of Establishment	Capacity, MTPY (2001-02)
Dewan Salman, Hattar, Haripur	1992	250000
ICI polyester, Sheikhupura	1982	114000
Ibrahim Fibre, Faisalabad	1996	208000
Rupali Polyester, Sheikhupura	1988	24000
Pak Synthetic, Hub	1991	24000
Total Capacity		620000

Source: Dewan Salman Fibre and ICI Pakistan Ltd.

Polyester Fiber intermediates are derived from aromatics and olefin chains. These include Pure Terephthalic Acid (PTA), Mono Ethylene Glycol (MEG), Paraxylene (PX), and Acrylonitrile (ACN) for the manufacture of synthetic Fibers like Polyester Staple Fiber (PSF) and Acrylic Staple Fiber (ASF).

Acrylic Staple Fiber

There is only one unit of Dewan Salman Fiber producing acrylic staple Fiber. The plant has an installed capacity of 25,000 MTPY but is utilizing only 50% of the capacity at present.

Polyester Filament Yarn (PFY)

The filament yarn industry uses polyester chips (Textile Grade) as raw material for manufacturing of synthetic fabrics/blended fabrics like suiting, shirting and sheeting. Currently, there are 21 units involved in the manufacturing of synthetic filament yarn with an installed capacity of around 105,000 MTPY. The local demand for polyester filament yarn is between 85,000 - 90,000 MTPY.

Due to low prices of Filament Yarn, an import of 29,661 M. tons was made during 2001-02 as compared to 7,973 M. tons in 1998-99.

The following tables depict name of companies producing polyester chips and polyester filament yarn along with annual production capacities:

Table 1.52: Polyester Chips

Company	Product	Capacity MTPY (2001-02)
Rupali Polyester Sheikhupura	Polyester chips-Textile grade	14000
Novatex, Karachi	Polyester chips-Textile grade	40000
Rupafil Sheikhupura	Polyester chips-Textile grade	30000
Total Polyester Chips		84000

Source: Overview of Chemical Industry of Pakistan

Table 1.53: Polyester Filament Yarn

Company		Capacity MTPY (2001-02)	Status
A. Production based on PTA and MEG, as Raw Materials			
Rupali Polyester	Sheikhupura	11000	Operational
Rupafil Ltd.	Sheikhupura	14000	Operational
Gatron Ind. Ltd-I	Hub	31000	Operational
Gatron Ind. Ltd-II			
National Fibres Ltd.	Karachi	3000	Closed
Total (A)		59000	
B. Production based on Polyester Chips			
Spintex		10000	Operational
S.G Fibers	Karachi	9000	Operational
Polyron Ltd.	Hub	4000	Closed
Pak Fiber	Karachi	2000	Closed
Progressive Fiber	Karachi	1400	Partially Closed
Fayaz Filament Ltd.	Karachi	3000	Partially Closed
Talon Ltd.	Karachi	700	Operational
Bengal Fiber Ind Ltd.	Karachi	3000	Operational
Dilon Limited	Karachi	1000	Operational
Kohinoor Fibers	Faisalabad	1500	Operational

Ahsan Industry		600	Operational
Ahmad Factory		600	Operational
Tri-star Polyester	Karachi	3000	Closed
Sindh Industries	Karachi	500	Operational
Indus Polyester	Karachi	2000	Operational
Tawakkal Polyester	Karachi	1600	Closed
Papa Sierra Fibers Ltd.	Hattar	2100	Closed
Total (B)		46000	
Grand Total (A+B)		105000	

Source: Overview of Chemical Industry of Pakistan

The end-user of synthetic filament yarn is the Art Silk Industry or small power looms sector which is scattered all over the country as cottage industry.

Nylon Filament Yarn

Presently only one unit is engaged in the manufacture of Nylon Yarn. Two units are already closed, the names and production capacities are depicted in table below.

Table 1.54: Nylon Filament Yarn

Company	Capacity MTPY 2001-02	Status
Bengal Fibers Industries, Karachi	1000	Operational
Dilon Ltd., Karachi	1800	Closed
Nilonm Nylon Mills Ltd.	800	Closed

Source: Overview of Chemical Industry of Pakistan

iv. Molasses

Molasses is uncrystallised syrup extracted from raw sugar during the refining process. The Pakistan sugar sector has the capacity to produce over 2.5 million metric tons (MMT) of molasses available for processing into ethanol. To maximize returns, the sugar industry processes molasses to produce anhydrous and hydrous ethanol. Countrywide, nineteen distillery units have an annual ethanol production capacity of over half a million tons. In 2007, Pakistan exported more than 273,000 tons of ethanol (hydrous plus fuel ethanol). Higher production and exports are expected in the ensuing years.

Ethanol exports have risen steadily over the past ten years, as distilleries convert larger volumes of molasses into value added ethanol. At present, over a 50 percent of locally produced ethanol is exported at an average price of about $500/MT. Main destinations include: Europe, Far Eastern (Korea, Japan, Taiwan and the Philippines) and Middle East (Dubai and Saudi Arabia).

(Source: USAID Gain Report 2009)

Table 1.55: Year Wise Molasses Production and Ethanol Export

Year	Molasses Production (Million Metric Tones)	Ethanol Export (Metric Tones)
2002-2003	2.048	61,710
2003-2004	2.122	99,711
2004-2005	1.497	122,104
2005-2006	1.438	169,233
2006-2007	1.911	273,079
2007-2008*	2.650	315,846

**Projected*

Source: USAID Gain Report 2009

Molasses is industrially most important raw material in the manufacture of variety of products such as; distillery products, chemicals like; lactic acid, citric acid bakers yeast, acetone, butanol, and aconite acid, which are an important chemical, used in various industries.

v. Pesticides

Agriculture productivity is largely dependent upon the use of pesticides. Huge losses in crop output caused by pest attack can be saved by proper and optimum use of pesticides. Pesticides are also used for household hygiene.Pesticides used for crop protection are classified according to their functions like insecticides, fungicides, rodenticides and weedicides etc. Pests can destroy approx. 40% crop in pre-harvest and post-harvest period and therefore the use of chemical compounds for the protection of plants from pests, diseases and weeds have attained great importance in agriculture. Besides the advantage of increasing the crop yield there are several disadvantages of using the pesticides. The excessive and continuous use of pesticides contaminates food grains and pollutes the underground water resources.

Table 1.56: Overview of Pesticides Production

Firm	Formulation			Repacking		
	Liquid Litre	Solids Kg.	Granules Kg.	Liquid Litre	Solid Kgs.	Granules Kgs.
Welgreen Chemicals, Lahore	-	-	-	8000	-	-
Warble (Pvt) Ltd., Multan	42000	-	8000	16000	8000	-
Reliance Chemicals, Karachi	12000	2000	-	12000	4000	-
FM United	16000	-	-	20000	10000	-

(Pvt) Ltd., Lahore						
Agrolet Chemical Industry, Multan	48000	-	-	48000	-	-
Agricides (Pvt) Ltd., Karachi	3000	4000	-	3000	4000	-
Edgro (Pvt) Ltd., Karachi	4200	4500	-	4200	4500	-
Granular (Pvt) Ltd., Karachi	-	-	14000	3000	-	-
Pakistan Agro Chemicals, Karachi	24000 (16000+8000)	3000	3000	24000 (16000+8000)	3000	3000
Syngenta, Karachi	20000 (17000+3000)	-	6000	20000	4000	6000
R.B. Avari (Pvt) Ltd., Karachi	8000	-	4000	5000	-	4000
Union Agro Industries, Karachi	-	-	12000	-	-	-
Bayer DAS (Pvt) Ltd., Karachi	7500	-	-	12000	3000	-
Famy Industries, Karachi	12000	1500	-	12000	15000	-
N.I.C.L., Karachi	-	5000	-	6000	2000	-
Pak China Chemicals, Lahore	96000	-	-	96000	-	-
AventisCrop Science, Karachi	22500	-	-	30000	2500	-
Marvi	32000	10000	-	32000	10000	-

Agrochem., Karachi						
ICI Pakistan, Lahore (closed down formulation plant)-	-	-	-	-	-	-
Grand Total	347200	30000	47000	361200	70000	13000

Source: Prospects of Chemical Industry of Pakistan 2004

Presently, the basic manufacturing facilities for pesticides do not exist in the country. However there were two manufacturing units for the production of Dichloro Diphenyl Trichloro Ethane (DDT) and Benzene Hexa Chloride (BHC) in Pakistan, located at Kala Shah Kaku (Punjab) and Nowshera (NWFP). The total installed capacity of these two units for DDT and BHC were 2,020 and 2,310 MTPY respectively. These units are closed for last many years because both pesticides have been banned for use in Pakistan. Generally, Chlorine containing pesticides have been banned in the world.

Pesticides used at present are either organic or inorganic in nature. Organic group contains natural plant oils, nicotine and pakerthsum as natural pesticide. It also contains synthetic pesticides as compound of chlorine like DDT, BHC and endrin, aldrine, dialdrine, heptachlor, etc. Twenty four (24) pesticides including above compounds have been banned in Pakistan because they were hazardous to human health and environment.

Since pesticides were subsidized their imports remained under Government control till 1979 when 75% share was passed to private sector while remaining 25% was retained by the Government. However, since February 1985, all subsidies were withdrawn and private sector was fully made responsible for import, distribution and sales of pesticides throughout Pakistan except Balochistan. Pesticides were allowed to be imported under generic names from 1991. This resulted in several times increase in pesticides business and improved the yield of all crops especially cotton. The formulation industry, which started in 1980s, got a real boost and developed in 1990s. In the year 2000, the local formulation exceeded the imported pesticides.

Presently, the installed capacity for the formulation of various types of pesticides is more than the local requirement. According to Ministry of Food, Agriculture and Livestock (MINFAL), there are about 30 companies involved in the formulation of pesticides. The local formulation products include liquid pesticides, powder and granules and contribute 67% in the local market. Most of the raw materials for formulation including active ingredients and pesticides in finished form are being imported. The sector growth rate is 3%. The installed capacities of the main 19 formulators are given below:

Liquid pesticides account for 95% of the total consumption. Remaining 5% are powder, dust or granules. Insecticides account for 88%, herbicides 11% and fungicides 1% of the total pesticides used for plant protection. Additional quantities of pesticides are used for public health and household.

Major use of pesticides is for the cotton crop, which consumes about 71% of the total pesticides used in Pakistan. Imports from China are on the rise presently catering for 60% demand.

vi. Alkyd Resins

Alkyd resins are the most important class of protective coatings and they are used in the manufacture of enamel paints. The raw materials for making alkyd resin are Phthalic Anhydride, Soya oil, Coconut oil, Glycerine, Xylene etc. Apart from a number of manufacturers in un-organised sector, there are thirteen known units manufacturing alkyd resins. Their production capacities are given below:

Table 1.57: Overview of Alkyd Resins Manufacturing Units

Manufacturing unit		**Installed capacity**	**Production**
Delta industries	Lahore	600	580
Nimir Resins Ltd.	Sheikhupura	551	228
Berger Paints Pakistan Ltd.		266	171
Royal Resin	Lahore	266	171
Complex Chemical	Hattar	181	76
BASFA	Lahore	85	38
Premier Resin	Lahore	85	38
Shalimar Polymer Ind.	Lahore	266	133
Shalimar Resin	Lahore	85	38
Millat Industries	Lahore	181	76
Champion Paint Ind.	Lahore	85	38
Crona	Lahore*	48	19
Impex Resin	Lahore	181	38
Total		2880	1644

**Temporary closed*

Source: Prospects of Chemical Industry in Pakistan 2003

Inspite of excessive installed capacity in the country, small quantity of Alkyd Resin is being imported as shown below in the table:

Table 1.58: Import of Alkyd Resins

(M. Tons)
(Million Rs)

Year	Quantity	Value

2002-03	24 MT	3 Millions Rs.

**July-December*

Source: Prospects of Chemical Industry in Pakistan 2003

vii. Paints and Varnishes

Paints are coloured & opaque coatings while varnishes are clear coatings. In Pakistan, they are categorized in three major segments.

- Decorative – household paints.
- Industrial & Automobile paints
- Refinish Paints – For repair and renovations.

The industry is fragmented with a large number of manufacturers and outlets all over Pakistan. The market is predominantly unorganized. The raw materials for the manufacturing of paints and varnishes include resin binder chemicals such as Alkyd resins, Phthalic anhydride, Soya bean oil, Linseed oil, Coconut oil, Vinyl Acetate Monomer (VAM), Glycols, Poly Vinyl Acetate (PVA) emulsion, Nitrocellulose, Plasticizers, Stabilizers, Pigments such as Titanium Dioxide, Lithopone, Organic pigments, Iron Oxides, Chromes etc. and solvents such as Xylene, Toluene, Butyl Acetate, Methyl Acetate, Ketone, mineral spirits. Only 5% of the raw materials are locally available while 95% are imported.

There are three major producers of paint in the country and they together meet the 45% local requirement. Remaining 50% demand is met by the unorganized sector and 5% through imports. The imports of paints are negligible and almost all demand is being met by local producers. Major local paint manufacturers include ICI Pakistan, Berger Paints and Buxly Paints. There are over 400 units manufacturing paints and varnishes in the unorganized sector. Productions of major local plants are given below:

Table 1.59: Production of Paints

Million liters/year

Name of Company	2002
ICI Pakistan	15.80
Berger Paints	8.20
Buxly Paints	1.10
Total	25.10

Source: Prospects of Chemical Industry in Pakistan 2003

Six manufacturers of decorative paints are ICI Pakistan, Berger Paints, Buxly Paints, Master Paints, Brighto & Gobbis. The industrial paints segment has a large number of applications and uses. Major players in this segment are ICI Pakistan and Berger Paints. Some industrial paints are imported.

Table 1.60: Import of Paints & Varnishes

(M. Tons)
(Million Rs)

Year	Quantity	Value
2002-03*	1725	219

**July-December*

Source: Prospects of Chemical Industry in Pakistan 2003

The refinish segment caters the requirements for maintenance of vehicles. Major players in this segment are ICI Pakistan, Berger Paints and Champion Paints. Oxyplast Karachi has the facility to produce powder coating paints. The raw materials are Polyester resin, Epoxy resin, Barium Sulphate, Titanium Oxide and curing agents.

Powder Coating Chemicals

The recent trend in the world is to apply powder coating instead of liquid paints and there are a lot of chemicals required for preparation of metal sheet before powder coating. These chemicals are basically known as pre-treatment or phosphating chemicals, which include degreasing, phosphating Anodizing chemicals etc. There are a number of small units producing above chemicals in Lahore and Karachi catering to the local manufacturers of home appliance like Dawlance, Waves and Multinationals including car makers like Toyota, Honda, Suzuki, etc.

viii. Oleo Chemicals

Oleo Chemicals are one of the important sectors of any modern economy, as these are used in various important consumer items. These comprise Distilled Fatty Acids (DFA), Fractionated Fatty Acids (FFA), Fatty Alcohols, Fatty Amines, Fatty Esters, Fatty Nitriles, etc. Oleo Chemicals are derived from various oils and fats and they are a renewable source. Almost all types of oils and fats may be used to produce oleo chemicals. The major advantage of oleo chemicals is their bio degradability. These are much more environment friendly as compared to other groups of chemicals. Oleo chemicals are used in soaps (laundry and detergent), shampoos, cosmetics, skin care products, pharmaceuticals, detergents, plastics and a number of other industries.

The basic raw materials, most commonly used are, Palm Stearin, Soyabean Oil, Coconut Oil, Palm Kernel Oil, Tallow, Cottonseed Oil, Rapeseed Oil, etc. Some vegetable oils contain more of certain acids than other vegetable oil, so raw material selection depends upon type of products to be produced. Some important specifications, which influence the application of the particular oil, are:

- Iodine Value (measure of degree of un-saturation),
- Saponification Value (type of fatty acids present in an oil),
- Acid Value (quantity of free fatty acids),
- Titre (physical appearance of oil at room temperature).

All the above specifications depend upon the particular fatty acid composition of any oil. Crystal Chemicals, Lahore was the first oleochemical plant installed in Pakistan in 1987 and continued its operation till 1997. This plant was producing Stearic Acid and Soaps. Nimir Industrial Chemicals Limited, Lahore were the second to install an olechemical plant in the country in 1998. This plant is still operative and produces Stearic Acid and Distilled Fatty Acids. A third plant by the name of Gamalux Oleochemicals is being installed at Karachi. This plant shall produce Distilled Fatty

Acids. There are other plants, being planned in Pakistan, which are expected to be installed in near future.

ix. Soaps, Detergents and Cosmetics

Soaps

Soaps and detergents are surface acting agents used for cleaning purposes. Basic raw materials for soap are tallow, palm stearin and caustic soda. There are several units in the organized as well as unorganized sector involved in the manufacture of soap, both toilet and laundry.

Detergents

Basic raw materials for detergents are Linear Alkyl Benzene (LAB) Sulfonates, Sodium Sulfate, Sodium Silicate, Bleaching powder, Rock salt, Caustic soda and Soda ash. Colgate-Palmolive is the leading manufacturer of Detergent Powders in the Country with present production capacity of 30,000 MTPY (2003). They are the only manufacturer of Sulfonic acid in the country. The production capacity of Sulfonic acid based on SO3 Gas and Sulfur is 3,600 MTPY. This capacity is not sufficient to meet their present requirement and are importing around 3,000 ton of Sulfonic acid. The country's total requirement for Sulfonic acid is estimated to be around 20,000 MTPY.

Colgate-Palmolive (Pakistan) Ltd. has started work on a new plant to manufacture Sulfonic acid with an investment of Rs 200 million. With this expansion, they would have additional capacity of 20,000 tons of Sulfonic acid, which will be sufficient to meet the country's demand. This plant can use both Branched Alkyl Benzene (BAB) and Linear Alkyl Benzene (LAB) to produce Sulfonic acid. The installed capacity of detergent of Unilever Pakistan Ltd is 9,000 MTPY. Their actual production is around 12,000 MTPY. The production of detergents in the form of powder, bar and liquid as reported by 66 units is given in table below. During 2002-03 around 50,000 Million Tones of Detergents were produced.

Cosmetics

Cosmetics sector covers tooth paste, shampoo, shaving cream, face cream, face powder and other face lifting beauty applications. The raw materials used are Talc, Calcium stearate, Kaolin, Zinc stearate, Magnesium Oxide/carbonate/stearate, Zinc Oxide, Sodium Laurl Sulphate, Beewax, Glyceryl monostearate, Methyl P-hydroxy Benzoate, Petroleum Jelly, Butyl and P-Hydroxy Benzoate, Stearic acid, Sodium Carboxy Methyl, essential oils and sorbitol. Unilever Pakistan, Colgate-Palmolive, Kohinoor Soap & Detergents and Wazir Ali Industries are major players in this sector. Small cosmetic manufacturing units are located in Mingora, Swat. The yearly production of cosmetics reported by 76 units is 3,63,311,000 containers.

x. Soda Ash & Sodium Bicarbonate

Soda Ash is chemically Sodium carbonate and it is commonly known as dhobi soda or washing soda. Soda Ash is used in the manufacture of glass, soaps, detergents, sodium silicate, paper, caustic soda, paint, petroleum refining, inorganic chemicals. High density soda ash contains 99% sodium carbonate and low density soda ash contains 98% sodium carbonate. Only high density soda ash is used in the manufacturing of glass. Total investment in this sector is about Rs 6 billion.

ICI Pakistan produces low as well as high density soda ash while Olympia Chemicals produces only low density soda ash.

Soda Ash is manufactured by Ammonia Solvey process forming sodium bicarbonate, which is calcined to sodium carbonate. Common Salt (sodium chloride) and limestone (calcium carbonate) are the basic raw materials. Total Soda ash production capacity is 265,000 tons per year. Both the plants producing soda ash are located in the Salt Range area.

Table 1.61: Soda Ash Capacity

(MTPY)

ICI Pakistan, Khewra	**225000**
Olympia Chemicals, Khushab	40000
Total Soda Ash Capacity	265000

Source: Manufacturers
Year: 2002

Production in the country is given in the table below. The local capacity is meeting most of the local demand and imports are at minimum level.

Table 1.62: Soda Ash Production

(000 M. Ton)

Year	Soda Ash Production
2008-09 P (Jul-Mar)	267.7

P=provisional
Source: Federal Bureau of Statistics
Ministry of Industries

xi. Caustic Soda, Chlorine and Related Products

Caustic Soda

Caustic soda is chemically known as sodium hydroxide. It is generally supplied to other industries in the form of 50% solution of sodium hydroxide or solid flakes. Caustic soda is used in a number of industries like soaps, detergents, textile, paper and paper board, oil refining, vegetable and ghee, industrial water treatment and rubber reclaiming.

Sodium Chloride (common salt) is the main raw material for manufacturing caustic soda. The electrolysis of Sodium Chloride solution produces caustic soda with the extensive use of electricity. The economics of this industry depends on the utilization of chlorine in manufacture of products like PVC. Presently, there are four major plants producing Caustic soda.

Table 1.63: Production and Import Data of Caustic Soda

'000' M. Tonnes

Year	Production	Imports
2008-09 P (Jul-Mar)	176.8	13832(2002-03*)

P=Provisional
Source: Federal Bureau of Statistics
Ministry of Industries

Chlorine

Chlorine is an essential and important by-product from the caustic soda plants. Production figures for the year 2008-09 are given below:

Table 1.64: Production of Chlorine

(000 M. Ton)

Year	Chlorine Production
2008-09 P (Jul-Mar)	12.4

P=Provisional
Source: Federal Bureau of Statistics
Ministry of Industries

Approximately 89 tons of chlorine is produced with each 100 ton of caustic soda. Chlorine is sold in cylinders for water treatment and some of it is converted to downstream products like hydrochloric acid, bleaching powder, Fullers earth, Sodium hypo-chlorite, Ammonium Chloride and Ferric Chloride. The remaining large quantity of Chlorine finds no use and at present it is being wasted by neutralization with lime. It is very important that available chlorine be utilized in making PVC for improving the economics of caustic plants. Alternately Hydrochloric acid (HCl) can be reacted with Phosphate rock for production of Phosphoric acid Pilot plant experiments have been conducted recently by Sitara Chemicals to produce Phosphatic fertilizers. If proved commercially successful, all the excess chlorine can find use in this application.
This shall ultimately reduce cost of caustic soda.

xii. Sulphuric Acid, Hydrochloric Acid & Nitric Acid

Sulphuric Acid

Sulphuric acid is an important chemical. Its demand is taken as a barometer of industry in any country. It is of great commercial importance for use in manufacture of fertilizers, other acids, heavy chemicals, dyes and pigments, lacquers, plastics, explosives, textile, paints, leather tanning, oil refining, water treatment, treatment of cotton seeds and other chemicals. It is generally marketed with 98% concentration.

Sulphur is the basic raw material. Sulphuric acid is manufactured by burning sulphur to sulphur dioxide. It is then converted to sulphur trioxide by catalytic oxidation. The resulting sulphur trioxide is absorbed in water to form sulphuric acid.

Table 1.65: Production Capacity of Sulphuric Acid

(MTPY)

Plants		Capacity
Lyallpur Chemicals & Fertilizers	Jaranawala*	33000

Hazara Phosphate	Haripur*	36300
POF	Wah Cantt.*	3300
PAEC	D.G. Khan*	8250
Rawal Chemicals	Hattar	8250
Amber Chemicals	Hattar	6600
Attock Chemicals	Hattar	16500
Rawal Chemicals	Sheikhupura	10000
Prime Chemicals	Sheikhupura	10000
Ittehad Chemicals	Lahore	3300
Karsaz Chemicals	Lahore	3300
Riaz Aslam Chemicals	Chunian	6600
Crescent Chemicals	Sukkur	10000
Exide Pakistan Limited	Karachi	16500
Pak Chemicals	Karachi	24000
Acid. Ind. Pvt. Ltd.	Karachi	26400
Total		222300

**Mainly for captive use*

First four listed plants are producing sulphuric acid for their captive use. Only surplus production is sold in the market. The reported production of sulphuric acid is listed below.

Table 1.66: Production of Sulphuric Acid

(000 M. Ton)

Year	Sulphuric Acid
2008-09 P (Jul-Mar)	74.5

P=Provisional
(Pakistan Economic Survey 2008-09)

Hydrochloric Acid

Hydrochloric acid is produced on demand by Ittehad Chemicals and Sitara Chemicals from the excess chlorine by-product available with them. The production capacities of both plants are given below.

Table 1.67: Production Capacity

(MTPD)

Plants	Capacity
Sitara Chemicals	800
Ittehad Chemicals	500
Total	1300

Source: Manufacturers
Year: 2002

Nitric Acid

Nitric acid is produced by POF Wah and Pak Arab Fertilizers, Multan for their captive use. Small local demand is met through their surplus production.

The latest production capacities of both plants are given below.

Table 1.68: Production Capacity

(MTPD)

Plants	Capacity
Pak Arab Fertilizers, Multan	455600
POF, Wah Cantt.	10000
Total	465000

Source: Manufacturers

Year: 2002

xiii. Organic Chemicals

Acetic Acid

Commercially, the acetic acid is usually produced by such chemical processes as the oxidation of acetaldehyde in air with the presence of catalyst. Acetaldehyde is itself formed from the oxidation of ethylene obtained from petroleum. One of the major uses of acetic acid is as an intermediate for making other chemicals. It can also be converted to acetic anhydride and acetate esters. Acetic anhydride is used to make acetate fibers and cellulose acetate, a plastic. Ethyl acetate is an important ester used as a solvent for varnishes and in nail polish remover. As a reagent, acetic acid is used to make synthetic, rubber, aspirin and other pharmaceuticals. It is also widely used as an acid and solvent. At present, there are three units in Pakistan.

i. Wah Nobel Acetates Ltd, (Wah)
ii. Ravi Rayon (Pvt.) Ltd. (Lahore)
iii. Midas Chemicals, (Raiwind Road, Lahore)

Wah Nobel was established with an investment of Rs 450 million including 140 million foreign exchange component, has a production capacity of 7,000 MTPY of Acetic Acid. The entire production is for captive use. Wah Nobel has production capacity of 6,000 MTPY of Ethyl and Butyl Acetates. Actual production of Ethyl, Butyl Acetates is around 1,800 MTPY each, due to lower demand in the country. Ravi Rayon has a production capacity of 3,000 MTPY of Acetic Acid. Midas Chemicals was established with a production capacity of 5,000 MTPY in Lahore, using Alcohol as a feedstock and soon will be in commercial production.

Table 1.69: Production Capacity

(MTPY)

S. No.	Name of Company		Capacity
1.	Wah Nobel Acetates Ltd.	Wah	7000
2.	Ravi Rayon (Pvt.) Ltd.	Lahore	3000
3.	Midas Chemicals, Raiwand Road	Lahore	5000
Total			15000

Source: Respective Manufacturers

Formic Acid

Formic acid is mainly used as a neutralizing agent in leather and textile industry. Formic acid is being manufactured by Tufail Chemical Industries Ltd. Lahore with a capacity of 5,000 MTPY. The raw material used by them is Sodium Formate.

Rice & Rice Husk

Rice is an important staple food for Pakistanis and its production is above 4 million tons per year. Rice is being used to produce Glucose, Fructose and Maltose. However, rice husk is normally used as fuel and it is not being utilized for value addition. Rice husk can be used to manufacture furfural, which finds use in various applications of synthetic rubber, resins, perfumery, dyes, plastics and oil refineries, etc.

Formaldehyde 37%

Formaldehyde is a raw material for the manufacture of Urea formaldehyde and Phenol formaldehyde. The raw material used for Formaldehyde is Methanol, which is being imported at the moment. There are six companies engaged in the manufacture of Formaldehydes in the country out of which three main players are Wah Nobel, Dynea Pakistan Ltd. and Super Chemicals Pakistan Limited. Wah Nobel is planning 15,000 MTPY increase in capacity by June 2004.

Table 1.70: Production Capacity

(MTPY)

S. No.	Name of Company		Capacity
1.	Wah Nobel	Wah	15000
2.	Dynea Pakistan Ltd.	Karachi	39000
3.	Super Chemicals Ltd.	Karachi	30000
4.	Pakistan Resins Ltd.	Azad Kashmir	12000
5.	Izhar Enterprises Ltd.	Lahore	9000
6.	HTG Petrochemicals	Hub	6000
Total			111000

Specialty Chemicals

Specialty Chemicals are those, which are developed and produced to fulfill exact requirement of a customer (tailor made products). These are made normally in batch process on a smaller scale and have high value addition. They are more technology oriented rather than being capital intensive.

Specialty Chemicals cover a wide range of products. Their raw materials and intermediates are derived from various organic and inorganic chemicals. The raw materials such as Aniline, Phenol, O-Toluidine, Ethylene Oxide and Propylene Oxide are not being manufactured in Pakistan, due to economy of scale and lack of feed stocks. Intermediates such as Naphtaline Pyridones, Pyrazolones, Naphthol AS, H. Acids, O-Acid, K. Acid and ZR Acid, etc. are produced in medium to small industries catering to specialty chemicals industrial segment. These intermediates are not being manufactured in Pakistan because of absence of feedstock e.g. Benzene is a feed stock for Aniline

which is a raw material for N-Methyl Aniline which in turn is an intermediate used for the production of Dyes, Pigments, Chemicals and resins, etc.

A few intermediates are being manufactured in Pakistan such as Phathalic Anhydride for DOP by Nimir Chemicals, Wah Noble producing Acetic Acid and Acetic Acid Ester, PTA by ICI Pakistan for Polyester Fiber industry. Tufail Chemicals are producing Formic Acid.

Finished Products
These raw materials and intermediates are used to produce a number of Specialty Chemicals in the following sectors:

- Dyes & Pigments
- Textile and Tannery Chemicals
- Water Treatment Chemicals
- Food Chemicals
- Essential Oils

Each of the above sectors has been discussed separately in the following sections:

xiv. Dyes & Pigments
Dyes are intensely coloured substances used for the coloration of various substrates including paper, leather, fur, hair, foods, drugs, cosmetics, waxes, greases, petroleum products, plastics and textile materials. They are retained in these items by physical adsorption, salt or metal complex formation, solutions mechanical retentions or by the formation of covalent bonds. Dyes are applied to textile fibers by two distinct processes, dyeing and printing, of which dyeing is much more extensively used. Dyes are classified in accordance with their chemical constitutions or their application to textile fibers and for other coloring purposes.

Pigments are differentiated from the dyes, although they are for the same purpose of imparting color to the article. Pigments are insoluble liquors to color the surface of the material and imparting the opacity to it.

Classification of Dyes
Acid Dyes:
Acid dyes are water soluble anionic dyes that are applied to nitrogenous fibers, such as wool, silk, nylon and modified acrylic fibers from acid or neutral baths.. Acid dyes are not substantive to cellulosic fibers, chemically the acid dyes consist of Azo, anthraquinone, triphenylmethane, Amine etc.

Basic Dyes:
The appeal of the basic dyes lies in their brilliant shades, some of them being fluorescent. Unfortunately their brilliance is not matched by their fastness. Basic dyes are applied to wool and silk for brightness. Basic dyes are water-soluble and dissociate into amines and colored actions.

Disperse Dyes:
Disperse dyes are colored organic compounds, which are only very slightly soluble in water and therefore, dying is carried out with aqueous dispersion. It is the most successful type of dye for coloration of cellulose acetate fibres and also used on polyamides, poly acrylonitriles, polyesters and cellulose triacetate.

Reactive Dyes:
The most recent technological contribution to textiles has been the development of reactive dyes. Reactive dyes are unique as they are the only class to dyes that actually form a chemical bond with textile fiber and this bond gives them their excellent wash fastness properties. They are highly soluble in water. The major substrate includes Cotton, Rayon, Wool, Silk and Nylon.

Sulfur Dyes:
These are amorphous, colloidal materials of high molecular weight and are of variable composition. Sulfur dyes are insoluble substances, which are brought into soluble form for dyeing by treatment with a hot solution containing alkali and sodium sulfide. Sulfur dyes are particularly rich in blacks of good value and shades.

Vat Dyes:
Vat dyes are complex organic molecules that are insoluble in water, but when their carboxyl groups are properly reduced in a solution of caustic soda to leuco, they exhibit an affinity for cellulosic fiber. The shades are of excellent wash fastness, chlorine fastness and light fastness.

The environmental impact of textile production is considerable. Most textiles are to be dyed and printed. More than 10,000 different dyes are available for this process and much is known about the potential dangers. The ETAD (Ecological and Toxicological Association of the Dyestuff manufacturing Industry) tested more than 4,000 dyes for acute toxicity and found that approximately 1 % of the dyes were toxic. The dyes involve certain chemicals that are hazardous to the human skin. Some Azo coloring agents have carcinogenic properties or may form amines (breakdown products) which have carcinogenic and mutagenic properties. Approximately 70% of all dyes used in the textile industry are Azo dyes. There are about 2000 different Azo dyes of which approximately 200-300 may be hazardous.

The Pakistan textile industry is traditionally based on the manufacture and export of spinning yarn and threads. Today around two hundred large and medium sized processing mills exist along with thousands of small dye houses. It is estimated that this industry consumes over 22,000 tons of dyestuff and pigments annually. The shares of different type of dyes consumed are given as follows:

- Reactive dyes 34.27 %
- Acid dyes 09.00 %
- Basic dyes 05.77 %
- Vat dyes 02.24 %
- Disperse dyes 15.00 %
- Pigments 23.00 %

- Direct dyes 03.07 %
- Sulfur dyes 07.65 %

Pigments are opaque colored objects and they are ground to very fine size for the manufacture of paints and printing ink. Pigments are always used with some oil based solvent.

Small quantities of Direct Dyes and Pigment Dyes are being manufactured locally. The intermediates required for dyes are being imported especially from China. There are 6 units in the organized sector and 7 in unorganized sector involved in the production of dyestuff. The production capacity of the six main units is as given below:

Table 1.71: Production Capacities for Dyes and Pigments

(MTPY)

Name of Company		Capacity
BASF	Karachi	25000
Sandalbar	Faisalabad	8500
Clariant	Karachi	5500
M.B. Dyes	Gadoon Amazai	3600*
Chemi Dyestuff Industries	Karachi	700
Gadoon Dyes Chemical	Gadoon Amazai	600
Total		43900

**Current Capacity is 1200 MTPY.*
Source: Delta Industries (Pvt.) Ltd.

Table 1.72: Demand of Dyes and Pigments in Textile Industry

(M. Tons)

Commodity	Import 2002-03*	Production 2002-03*	Consumption 2002-03*
Disperse Dyes	1734	N.A.	-
Acid Dyes	979	320	1299
Basic Dyes	535	-	535
Direct Dyes	227	740	967
Vat Dyes	748	-	748
Reactive Dyes	3195	975	4170
Sulphur Dyes	1261	-	1261
Pigments & Prep.	1650	1350	3000
Total	10329	3385	11978

**July-December*

Source: Sandal Dyestuff Industries Ltd.

Titanium Di-Oxide (TiO2)

There are two industrial grades of titanium dioxide pigment

1. Rutile grade used for manufacture of paints and plastics
2. Anatase grade used in polyester fibre and paper industry.

Rutile grade is normally manufactured via chloride process from rutile ore and Anatase grade is manufactured via sulphate process using ilmenite ore. Rutile grade is capital and energy intensive project. This project is viable only for large scale manufacturer. Moreover, neighbouring Saudi Arabia has this facility which serves extensive market including Pakistan. Pakistan imports about 3,000 tonnes of TiO2 to manufacture paints and plastics. Current requirement of anatase grade titanium dioxide is approximately 10,000 MTPY. Therefore, it may be practical to establish a 10,000 MTPY facility to manufacture anatase grade to cater needs of polyester fibre industry of Pakistan. Saudi Company the National Titanium Dioxide Company may be approached to share the equity and facilitate the acquisition of technology. Sulphuric acid one of the major raw materials is being manufactured in Pakistan and other material ilmenite can be either imported or locally available ilemenite can be upgraded. The capital cost is estimated to be around US$ 35 million.

xv. Textile & Tannery Chemicals

The textile industry uses a large number of textile chemicals for processing of different types of textile fibers, natural as well as synthetic. Total value of textile chemicals used in Pakistan is about Rs 2.0 billion annually. The chemicals used in the textile industry are soaps, detergents, caustic soda, softeners, wetting agents, emulsifiers, biocides, thickener, binders, acids, dyes & pigments, waterproofing agents, foam stabilizers, optical brighteners, stabilizers, hydrogen peroxide, bleaching powder, soda ash and sodium carbonate.

There are several small units manufacturing textile chemicals but still large quantities are being imported. Followings are the capacities of textile and tannery chemicals of eight major producers.

Table 1.73: Capacities of Textile and Tannery Chemicals

(MTPY)

Company	Location	Capacity
Clariant	Jamshoro (Sindh)	20000
BASF	Karachi	15000
M.B. Dyes	Gadoon Amazai	12000
Universal	Karachi	8000
ICI	Karachi	6700
Sandalbar	Faisalabad	6000
Nimir Chemicals	Lahore	6000
Delta Chemicals	Lahore	2550
Total		**62250**

Source: Prospects of Chemical Industry in Pakistan 2003

Year: 2002

Other companies like CIBA, Universal Karachi, Sandalbar Faisalabad, MB Dyes Gadoon, Penta Karachi, Beta Lahore are also producing textile chemicals. Optical brightener, a textile and paper chemical, is being manufactured by Delta Lahore and Clariant Faisalabad. Sodium Dichromate, a tannery chemical, is being manufactured locally. Nitro cellulose based lacquers and Fat liquors are also made locally by BASF for tanning industry.

Hydrogen Peroxide

Hydrogen peroxide is prepared by Anthraquinone Auto Oxidation Process. The process involves reforming of natural gas to obtain hydrogen gas. Hydrogen is then absorbed in anthraquinone solution to form a complex compound called hydroquinone. This compound is oxidized with oxygen to yield hydrogen peroxide. Finally, hydrogen peroxide formed is separated in water phase which is concentrated subsequently. Hydrogen peroxide is used in a number of industries as oxidizing, bleaching and sterilizing agent. It is safe and convenient to use because it is environment friendly chemical. It is mainly used in the bleaching of fibers whether cotton or wood pulp. It also enhances the absorbing capacity of fiber, thus suppressing the requirement of other chemicals. In Pakistan, it is widely used in the textile sector for bleaching, in food packaging, as a disinfectant and clinically in the pharmaceutical sector. The textile and fabric sector consumes about 90% hydrogen peroxide.

xvi. Water Treatment Chemicals

Several types of chemicals are used in the treatment of municipal and industrial water. They include corrosion inhibitors, oxygen scavengers, chlorine, alum, pH regulators, activated carbon and ion exchange resins. Most of these chemicals are being imported. Some simple chemicals like sulphuric acid, caustic soda, alums, chromates, activated carbon and chlorine are being manufactured locally. Some companies are involved in formulation of water chemicals from the imported chemicals.

xvii. Food Chemicals

Food Chemicals can either be natural or synthetic. They are used to give colour to food, enhance taste and increase their shelf life etc. They can be classified in six main groups:

- Preservatives
- Colours
- Flavour enhancers
- Antioxidants
- Stabilizers
- Sweeteners

A number of units are engaged in the manufacture of different Food Chemicals in Pakistan in organized as well as in un-organized sector. Two major units in organized sector are given below:

Table 1.74: Food Chemical Products & Capacity

(MTPY)

S. No.	Company Location		Products	Capacity
1.	Habib Arkady Ltd.	Karachi	Sorbital	7500
			Glucose	45000
			Fructose	45000
			Maltose	45000
2.	Leiner Pak Gelatin Ltd., Kala Shah Kaku	Lahore	Halal Gelatina	3000
			Di-calcium phosphate	15000

Source: Prospects of Chemical Industry in Pakistan 2003

xviii. Essential Oils and Perfumes

Essential oils are odoriferous organic volatile bodies of oil character. They are insoluble in water but freely soluble in alcohol, ether, minerals and fatty oils. They are composed of a number of chemical compounds like aldehydes, ketones, hydrocarbons, alcohols, oxides and lactones, etc. They are used in soaps and cosmetics, pharmaceuticals, confectionary, aerated water, attars, perfumery items, scented tobacco and aggarbati, etc.

World standard Essential oils are not being manufactured in Pakistan. Manufacture of essential oil is scattered all over the country in un-organized sector using very low technology and without following any standard specifications. As such for high quality use, these oils are being imported.

1.3.2. Agriculture Sector

Agriculture has a vital role directly and indirectly in generating economic growth. The importance of agriculture in economy is seen in three ways

- It provides food for consumers and fibre for domestic Industry.
- It is a source of scarce foreign exchange earning.
- It provides raw material for industrial goods.

It has strong backward linkages by providing farm inputs such as chemicals, fertilizers & machinery and forward linkages by supplying raw material to food and fibre processing in the non-agriculture sector. Agriculture is essential for sustainable improvement in internal and external balances. Export of agricultural products contributes major portion of export earning by the country.

Among the agricultural raw products, the major export items are rice, cotton, citrus fruit, dates, mangoes and cane melons.

Amongst the semi processed and processed items, cotton yarn, clothes, carpet and leather products are exported. Agricultural is equally crucial to industry. About 60-70% of industrial establishments in Pakistan are based on agricultural commodities such as food manufacturing, tobacco, textile,

leather, footwear, cotton yarn, wood work, chemical, fertilizers, pesticides and agricultural machinery, etc.

Food Grains: Wheat, rice, jawar, maize, bajra & barley
Cash Crops: Sugarcane, Cotton, Tobacco, Sugar beet & fruits.
Pulses: Gram, Mung, Mash, Masoor, Mattar, Other Kharif & Rabi pulses.
Oilseeds: Rapeseed & Mustard, Sesame, Groundnut, Linseed, Castleseed and other oil seeds.
Vegetables: Chillies, Onion, Garlic, Corriander, Turmeric, ginger, Potato and Tomato
Fruits: Citrus fruit, Mango, Banana, Guava, Apricot, Peach, Pears, Plums, Almonds, Apple, Grapes, Pomegranate, Dates.
Condiments: Chillies, Onion, Garlic, Coriander, Turmeric, Ginger

Major Crops
There are four major crops by value;
1. Wheat
2. Rice
3. Cotton
4. Sugarcane
5. Other major crops are:
a) Maize
b) Coarse grains

Table 1.75: Overview of National Economic Sector

ISIC Rev.4 Code	Economic Sector and Related Activities	Contribution to Gross Domestic Products (%)	Output Value (Pk. Rs.)	Growth rate (%)
Sector of Agriculture, Forest and Fisheries				
A01	Agriculture, hunting and related service activities	21.8		4.7
A02	Forestry	0.2		-15.7
B05	Fishery	0.4		2.3
Sector of Mining and Extraction				
C10-14	Coal/oil/Natural Gas/Minerals/Metals	2.5		1.3
Sector of Manufacturing Industry		18.2		-3.3
	Large scale	12.1		-7.7
	Small and household scale	4.7		7.5
C10	Food products			
C11	Beverages			
C12	Tobacco products			
C13-15	Textile/wearing apparel/leather			

C16	Wood and of products of wood and cork			
C-17	Paper and paper products			
C18	Printing and recorded material			
C19-22	Coke, refined petroleum products, chemicals, pharmaceutical products, plastic products			
C23	Non-metallic mineral products			
C-24-25	Basic metals and fabricated metal products			
C26	Computer, electronics, and optical products			
C27	Electrical equipment			
C28-30	Machinery and equipment, motor- vehicles other transport equipment			
C30-33	Others			
Sector of Services				
E41	Electricity and gas distribution	1.5		-3.7
Ej66	Finance and insurance	6.2		-1.2
F45	Construction	2.09		-10.8
G50-52	Wholesale and retail trade	17.5		3.1
I60-64	Transportation, storage and Communication	10.3		2.9
L75	Public admin and defense	6.1		5.0
P95	Ownership of dwellings	2.7		3.5
.....				
O90-93	Social service activities	11.1		7.3
TOTAL				

Source: Pakistan Economic Survey 2008-09

Table 1.76: Structure of Manufacturing/Agricultural Sector

Sector	**Micro Farms/Facilities** (%)	**Small Farms/Facilities** (%)	**Medium Farms/Facilities** (%)	**Big Farms/facilities** (%)
Industrial/ Manufacturing Sector	Data not available	Data not available	Data not available	Data not available
Agricultural Sector	do	do	do	do

TOTAL				

Table 1.77: Breakdown of Agricultural Production by Region

Region/province/Season	Major Crops	Total Production of Crops (000 tonnes)	Total Number of Employees	Size of Productive Areas # of Hectares(000)
	Cotton*			
Punjab		9062.0		2424.8
Sindh		2536.2		607.4
NWFP		0.5		0.2
Baluchistan		56.4		21.9
Total		11655.1		3054.3
	Rice			
Punjab		3286.0		1723.5
Sindh		1817.7		594.0
NWFP		128.3		61.7
Baluchistan		331.4		136.2
Total		5563.4		2515.4
	Sugarcane			
Punjab		40306.0		827.2
Sindh		18793.9		308.8
NWFP		4792.0		104.8
Baluchistan		28.1		0.5
Total		63920.0		1241.3
	Maize			
Punjab		2694.0		534.5
Autumn		1689.2		391.3
Spring		1004.8		143.2
Sindh		1.8		2.8
NWFP		903.6		509.0
Baluchistan		5.0		5.4
Total		3604.7		1051.7
	Jowar (Sorghum)			
Punjab		104.3		188.7
Sindh		41.2		58.7
NWFP		3.4		5.8
Baluchistan		21.2		28.2
Total		170.1		281.4
	Bajra (millet)			

Punjab		223.5		367.5
Sindh		77.0		155.2
NWFP		2.3		4.1
Baluchistan		2.2		3.8
Total		305.0		530.6
	Sesamum			
Punjab		27.505		65.542
Sindh		3.189		7.254
NWFP		0.173		0.341
Baluchistan		1.921		3.283
Total		32.788		76.420
	Wheat			
Punjab		15607.0		6402.0
Sindh		3411.4		989.9
NWFP		1071.8		747.4
Baluchistan		868.6		410.5
Total		20958.8		8549.8
	Barley			
Punjab		28.9		32.8
Sindh		4.4		8.2
NWFP		31.9		32.5
Baluchistan		22.2		17.6
Total		87.4		91.1
	Gram			
Punjab		387.5		989.0
Sindh		45.6		48.2
NWFP		15.5		38.2
Baluchistan		26.0		31.4
Total		474.6		1106.8
	R&M Seeds including Canola			
Punjab		103.300		127.400
R&M Seeds		99.856		123.849
Canola		3.444		3.551
Sindh		52.957		51.356
R&M Seeds		50.267		49.088
Canola		2.690		2.268
NWFP		8.109		17.498
R&M Seeds		7.621		16.419
Canola		0.488		1.079
Balochistan		20.669		38.330

R&M Seeds		18.481		35.028
Canola		2.188		3.302
Total		185.035		234.584
R&M Seeds		176.225		224.384
Canola		8.810		10.200
	Tobacco			
Punjab		19.9		16.6
Sindh		0.4		0.3
NWFP		84.9		32.7
Baluchistan		2.6		1.8
Total		107.8		51.4

**=cotton Production is in thousand bales of 375lbs each.*
Source: Federal Bureau of Statistics (Agriculture Statistics Section)

Table 1.78: Breakdown of Industrial Production by Region

Region	Major Products	ISIC 3.1	Total value of Production	Number of Industrial Facilities	Number of Employees
Punjab	Food products and beverages	15	393955650	1121	86087
	Tobacco product	16	10682544	2	
	Textile	17	458538159	765	303276
	Wearing apparel; dressing and dyeing of fur	18	64487623	160	36627
	Tanning and dressing of leather	19	18630077	108	1633639
	Wood and wood products	20	1857835	26	1415
	Paper and paper product, Publishing and printing	21&22	48366934	72	10862
	Coke, refine petroleum product	23	64070578	10	1408
	Chemical and chemical products	24	123269296	214	26584
	Rubber and plastic products	25	5439299	71	3504
	Other non-metallic mineral products	26	48338103	147	13959
	Basic metals	27	56937655	207	7691
	Fabricated metal	28	430429	90	3698

	products				
	Machinery and equipment	29	41598109	309	17016
	Office, accounting and computing machinery	30			
	Electrical machinery and apparatus	31	14428270	40	8013
	Radio, television and communication equipment	32	237515	4	418
	Medical, precision and optical instruments, watches and clocks	33	9402805	89	7994
	Motor vehicles, trailers and semi-trailers	34	25895611	58	6699
	Other transport equipment	35	5792537	33	3646
Sindh	Food products and beverages	15	159045854	556	39015
	Tobacco product	16	10105025	3	142455
	Textile	17	249672362	447	106761
	Wearing apparel; dressing and dyeing of fur	18	38106139	165	25746
	Tanning and dressing of leather	19	8038076	30	3937
	Wood and wood products	20	6062952	19	1649
	Paper and paper product,	21	2806694	29	1547
	Publishing and printing	22	8528675	37	3490
	Coke, refine petroleum product	23	187567264	11	2052
	Chemical and chemical products	24	192896314	167	33888
	Rubber and plastic products	25	16383579	51	3512
	Other non-metallic mineral products	26	39000499	46	8209

	Basic metals	27	63061585	55	20924
	Fabricated metal products	28	12255849	42	4345
	Machinery and equipment	29	16569417	43	7408
	Electrical machinery and apparatus	31	29552473	17	3278
	Radio, television and communication equipment	32	264866	4	158
	Medical, precision and optical instruments, watches and clocks	33	1930218	6	1325
	Motor vehicles, trailers and semi-trailers	34	124822531	69	10994
	Manufacture of other transport equipment	35	31564802	11	9096
	Furniture	36	2158118	17	1671
NWFP	Food products and beverages	15	40236770	118	7865
	Tobacco product	16	31614041	8	1955
	Textile	17	22807332	74	24380
	Wearing apparel; dressing and dyeing of fur	18	38300	4	69
	Wood and wood products	20	562167	12	527
	Paper and paper product,	21	2605692	27	991
	Publishing and printing	22	161625	4	187
	Chemical and chemical products	24	8527728	71	3942
	Rubber and plastic products	25	6917236	32	1613
	Other non-metallic mineral products	26	37062109	238	12029
	Basic metals	27	2731573	12	319
	Fabricated metal	28	1143809	9	364

	products				
	Machinery and equipment and other transport equipment	29&35	1064985	14	948
	Electrical machinery, radio, television and communication equipment	31&32	7091801	9	4092
	Furniture	36	1747807	41	3082
Balochistan	Food products and beverages	15	12043560	36	1728
	Textile	17	35920658	42	3220
	Wood and wood products	20	3278443	3	363
	Paper and paper product, Publishing and printing	21&22	1600911	5	698
	Coke, refine petroleum product	23	19317857	7	420
	Chemical and chemical products	24	24356800	28	3956
	Rubber and plastic products	25	3310099	15	600
	Other non-metallic mineral products	26		8	1578
	Basic metals	27		11	949
	Fabricated metal products, machinery and equipment, etc	28&29	5693331	6	600
	Electrical machinery, radio, television and communication equipment	31&32	4010475	3	52
	Motor vehicles, trailers and semi-trailers and other transport equipment	34&35	12670490	14	3397
	Furniture	36	165439	4	123
	Recycling	37	280910	30	520
Islamabad	Food products and beverages	15	9678602	29	1149
	Textile, tanning, wood products	17,19&20	92472	4	163

	Paper and paper product, Publishing and printing	21&22	373287	6	376
	Coke, refine petroleum product	23			
	Chemical and chemical products	24	2915948	16	3369
	Rubber and plastic products and other non-metallic products	25&26	4002982	44	4723
	Fabricated metal products, machinery and equipment, etc	28&29	236622	4	129
	Electrical machinery, radio, television and communication equipment	31&32	1320696	4	571
	Furniture	36	65700	4	72
	Recycling	37	3637299	6	340

Source: CMI 2005-06
Federal Bureau of Statistics

Table 1.79: Releases of Concern by Major Economic Sectors

ISIC Rev.4 Code	**Economic Sector and Related Activities**	**Major Pollution Emissions by Chemical Type**	**Media to which Emissions are Released: Air, Water, Soil**	**Wastes Emitted as Solids, Liquids or Gases by Volume and Weight if known**
Sector of Agriculture, Forest and Fisheries				
A01	Crop and animal production, hunting and related service activities	Pesticides, CO2	Soil, Air	Data not available
A02	Forestry and Logging	Earth gases	Air	-
A03	Fishing and aquaculture	BOD, COD	Water	-
Sector of Mining and Extraction				
B04-09	Coal/oil/Natural Gas/Minerals/Metals	BOD, COD, CN	Water, soil,air	-
Sector of Manufacturing Industry				-

C10	Food products	H2O, oils, BOD	Soil, oils	-
C11	Beverages	BOD, COD, detergents	Water	-
C12	Tobacco products	BOD, COD	Air	-
C13-15	Textile/wearing apparel/leather	Dyes	Soil,water	-
C16	Wood and of products of wood and cork	Saw dust, paints, polish	Air	-
C-17	Paper and paper products	Chemicals	Water, soil	
C18	Printing and recorded material	Solvents, pigments	Water, soil	-
C19-22	Coke, refined petroleum products, chemicals, pharmaceutical products, plastic products	BOD, COD, Bioactive materials	Soil, water	-
C23	Non metallic mineral products	BOD, COD	Water	-
C-24-25	Basic metals and fabricated metal products	Fluxes, metal dust	Air, soil	-
C26	Computer electronic and optical products	Glass, radiation, chemicals	Air, soil, water	-
C27	Electrical equipment	Chemicals	Air	-
C28-30	Machinery and equipment, motor vehicles, and other transport equipment	CO2, chemicals, HHC	Air, soil	-
Sector of Services				
D	Electricity, gas, steam and air conditioning supply	CO2, magnetism, BOD, COD	Air	-
E	Water supply, sewerage, waste management	BOD, COD	Soil, water	-
F	Construction	Solid waste	Soil, water	-
G	Wholesale and retail trade, repair of vehicles and motorcycles	Packaging, plastics, etc	Soil	-
H	Transportation and storage	CO2, SO2	Air	-
I	Accommodation and food services	BOD, COD	Water	-
S	Other services activities (dry cleaning)	BOD, COD	Water	-
TOTAL	NA			-

Source: Ministry of Science and Technology

1.4. Industrial Employment by Major Economic Sectors

Identify the relative importance of different industries that may have implications for the safe management of chemicals.

Table 1.80: Industrial Employment by Major Economic Sector

ISIC Code	Description	Number of Facilities	Total Employment	Output Value (000) (per year)
31	Food Industry	1,860	135,844	614,949,436
32	Textile/Clothing	1,329	438,657	766,980,442
	Leather and Leather Goods	142	17,033	267,419,86
	Ginning and baling of Fiber	-	-	-
33	Wood and Wood Products, Printing	62	4,013	117,749,05
34	Paper and Paper Products	133	1,4071	54955338
	Printing and Publishing	47	4,080	948,8480
35	Chemical/Coal/Petro/ Plastic Products	494	71650	351398361
	Drugs and Pharmaceutical Products	228	36336	90140972
36	Non-Metallic Mineral Products	482	40417	138,074,595
37	Basic Metals Industry	291	30223	130491855
38	Fabrication of Machinery And Equipment	144	8777	219,445,13
39	Other Manufacturing Industries	372	25154	600,217,53
	Mining and Extraction Coal/Oil/Natural Gas/ Minerals/Metals	Data not provided	-	-
	Electric Generation	Data not provided	-	-
	Dry Cleaning	Data not provided	-	-
TOTAL		**5584**	**826192**	**227,696,763,6**

CHAPTER NO: 2

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Chapter 2

2. Chemical Production, Import, Export, Storage, Transport, Use and Disposal

2.1. Chemical Production, Import, Export and Use

Table 2.1: Chemical Production, Import and Export

Chemical Type	Production/ Manufacturing (tones/year & value)	Imports (tones/year & value(Min Rs))	Formulation/ Packaging (tones/year & value)	Exports (tones/year & value)
Pesticides (agricultural, public health and consumer use)	*54103T	16495 T& 5498	NA	NA
Fertilizers	2150T	401000 T	NA	NA
Petroleum Products	7138000T	7094T	NA	NA
Industrial Chemicals (used in Manufacturing /Processing facilities)	1168876T	NA	NA	NA
Consumer Chemicals	355032 MT Matches (Mil. Boxes) 6435 Paints and varnishes (Ltr) 62756	NA	NA	NA
Other Chemicals (unknown mixed use	NA	NA	NA	NA
TOTAL	**8664058T**	**424589T & 5498**		

**Source: 2004-05, FISA*
P=Provisional (July-March)
Source: Pakistan Economic Survey (2008-09)

2.1.1. Raw Materials Import and Export for Chemicals and Related Industry

Table 2.2: Chemical Imports by Commodities July 2008 - April 2009

HS Code	Commodity	Unit	Quantity	Value
Inorganic Chemical				
28012000	Iodine	Kg	74746	106739
28013000	Fluorine, Bromine	Kg	25	23
28020010	Sulphur, Sublimed/Precipitated	Kg	101009	6373
28020020	Sulphur Colloidal	Kg	600	13
28030010	Carbon Black (Rubber Grade)	Kg	1265403	80447
28030020	Acetylene Black	Kg	288211	32887
28030090	Other Carbon	Kg	1199267	130213
28041000	Hydrogen.	Cubm	1559	2434
28042100	Argon	Cubm	41998	86218
28042900	Other, Rare Gases.	Cubm	26188	54176
28043000	Nitrogen	Cubm	908	2088
28044000	Oxygen	Cubm	237	283
28046100	Silicon 99.99% by Weight	Kg	23000	3268
28046900	Other Silicon	Kg	236369	26259
28047000	Phosphorus	Kg	332406	72687
28048000	Arsenic	Kg	25065	4679
28049000	Selenium	Kg	250144	51446
28051100	Sodium	Kg	49851	1096
28051200	Calcium	Kg	2439	500
28051900	Other Alkali Metals	Kg	21013	5478
28053000	Rare-Earth Metal Ns	Kg	~	~
28054000	Mercury	Kg	19560	20029
28061000	Hydrogen Chloride (Hcl Acid)	Kg	21928	1204
28062000	Chlorosulphuric Acid	Kg	100	3
28070000	Sulphuric Acid; Oleum	Kg	1045	54
28080010	Nitric Acid	Kg	2288717	80448
28080090	Sulphonitric Acids	Kg	740	34
28091000	Diphosphorus Pentaoxide	Kg	37364	1951
28092010	Phosphoric Acid	Kg	217686573	28136379
28092090	Phosphorous Acid	Kg	697526	70732
28100010	Oxide Of Boron	Kg	52865	3741
28100020	Boric Acid	Kg	1763210	97730
28111100	Hydrogen Fluoride	Kg	147580	6866
28111910	Other Hydrogen Cyanide	Kg	~	~
28111920	Phosphour/Hypo Phosphoric Acid	Kg	26600	2729
28111990	Oth Inor Oxygen Comp Non-Metal	Kg	451044	48852
28112100	Carbon Dioxide	Kg	14265	3274
28112200	Silicon Dioxide (Silica)	Kg	1468248	309100
28112910	Sulphurous Acid Gas	Cubm	~	~
28112990	Oth Inorganic Acids/Compounds	Cubm	163995	13674
28121010	Carbonyl Dichloride (Phosgene)	Kg	~	~

28121090	Oth Halides/H-Oxides Non-Metal	Kg	46	10
28129000	Oth Halide/Halide Oxides	Kg	29676	7903
28131000	Carbon Disulphide	Kg	1000	70
28139000	Oth Suphide Of Non-Metals	Kg	525	63
28141000	Anhydrous Ammonia	Kg	"	"
28142000	Ammonia In Aqueous Solution	Kg	380	121
28151100	Sodium Hydroxide Solid	Kg	2725160	114664
28151200	Sodium Hydroxie Aqueous Sol	Kg	1800	75
28152000	Potassium Hydroxide (Caustic)	Kg	342558	32287
28153000	Peroxides Of Sodium/Potassium	Kg	10	1
28161010	Magnesium Hydroxide	Kg	144878	17286
28161090	Oth Hudroxide &Peroxide Of Mg	Kg	3130	423
28164000	Strontium,Oxide,H-Oxide,Peroxi	Kg	1547	323
28170000	Zinc Oxide; Zinc Peroxide	Kg	774261	120450
28181000	Artificial Corundum Not Defin	Kg	215538	21231
28182000	Aluminium Oxide O/T Artificial	Mt	1724	103344
28183000	Aluminium Hydroxide	Kg	2648572	203921
28191000	Chromium Trioxide	Kg	433509	84153
28199010	Chromium Oxide	Kg	55568	8873
28199020	Chromium Hydroxide	Kg	"	"
28201010	Mangnanese Dioxide, Electrolyte	Kg	419225	30086
28201090	Other, Manganese Dioxide	Kg	272	20
28209000	Other, Manganese Oxides	Kg	28749	2163
28211010	Iron Oxides	Kg	2396741	166237
28211020	Iron Hydroxides	Kg	16910	1276
28212000	Earth Colours	Kg	560	53
28220000	Cobalt Oxide & Hydroxide	Kg	379058	38766
28230010	Titanium Dioxide	Kg	3659708	591126
28230090	Other Titanium Oixdes	Kg	795	121
28241000	Lead Monoxide(Litharge,Masicot	Kg	42626	6365
28249000	Other, Lead Oxides	Kg	809531	155590
28251000	Hydrazine Hydroxylamine Salt	Kg	49154	12056
28252000	Lithium Oxide And Hydroxide	Kg	47426	9193
28253000	Vanadium Oxides And Hydroxides	Kg	4735	5540
28254000	Nickel Oxides And Hydroxides	Kg	"	"
28255000	Copper Oxides And Hydroxides	Kg	22	7
28256000	Germanium Oxid/Zirconiumdioxid	Kg	1207	254
28257000	Molybidenium Oxides/Dioxides	Kg	78	43
28258000	Antimony Oxides	Kg	37922	45651
28259000	Oth Inorganic Base/Metal Oxide	Kg	20790	10038
28261200	Flourides Of Aluminium	Kg	9620	2217
28261900	Other, Flourides	Kg	359086	33776
28263000	Sodium Hexafloroaluminate	Kg	10000	1117
28269000	Other,Complex Fluorine Salts	Kg	29075	8851
28271000	Ammonium Chloride	Kg	169017	10371
28272000	Calcium Chloride	Kg	244902	18675
28273100	Chlorides Of Magnesium	Kg	159754	12427
28273200	Chlorides Of Aluminium	Kg	335	55
28273500	Chlorides Of Nickel	Kg	84932	12087
28273900	Oth Chloride Oxides, Bromides	Kg	630721	59561
28274100	Chloride Oxide/Hydroxide Coper	Kg	"	"

28274900	Oth Chloride Oxide/Hydroxides	Kg	26283	2516
28275100	Sodium Potasium Bromomides	Kg	47478	8674
28275900	Oth Bromide/Bromide Oxide	Kg	25590	5752
28276000	Iodides And Iodide Oxides	Kg	9424	10765
28281010	Comercial Calcium Hypochlorite	Kg	3006	1002
28281090	Other Calcium Hydrochlorides	Kg	428	513
28289000	Oth Hypochlorites/Hypobromites	Kg	15139	15461
28291100	Chlorates Of Sodium	Kg	21280	1532
28291910	Potassium Chlorates	Kg	3717925	314475
28291990	Oth Chlorates & Perchlorates	Kg	618	54
28299000	Oth Bromates/Perbromate/Iodate	Kg	21477	2759
28301010	Dithionites Of Sodium	Kg	5772063	227118
28301090	Other Polysulphides	Kg	1440011	71190
28309000	Oth Sulphides Not Chem-Defined	Kg	194982	14517
28311010	Dithionites Of Sodium	Kg	4167338	536964
28311090	Other Sulphoxylates Of Sodium	Kg	316880	33363
28319010	Formaldehyde Sulphoxylates	Kg	2687381	270802
28319090	Other Sulphoxylates	Kg	96	14
28321010	Oth Sodium Hydrogen Sulphite	Kg	2281406	149422
28321090	Oth Sodium Sulphite	Kg	3179848	178382
28322010	Ammonium Sulhite	Kg	~	~
28322090	Other Sulphite	Kg	74850	6855
28323000	Thiosulphates	Kg	57498	4163
28331100	Disodium Sulphate	Kg	20612226	271794
28331900	Other Sodium Sulphates	Kg	4785068	181134
28332100	Magnesium Sulphate(Epsom Slate	Kg	28961	7284
28332200	Sulphates Of Alumunium	Kg	262974	21949
28332400	Sulphates Of Nickle	Kg	226592	64461
28332500	Sulphates Of Copper	Kg	154353	36310
28332700	Sulphates Of Barium	Kg	368370	17328
28332910	Sulphates Of Ferrous	Kg	543409	56076
28332920	Sulhates Of Lead	Kg	464171	47235
28332940	Oth Sulphates Of Zinc	Kg	1136743	90115
28332990	Other Sulphates	Kg	1886346	180034
28333000	Alums	Kg	5957	633
28334000	Peroxosulphates (Persulphates)	Kg	101484	9297
28341010	Sodium Nitrate	Kg	708529	31291
28341090	Other Nitrites	Kg	164050	11932
28342100	Nitrates Of Potassium	Kg	85805	3978
28342900	Other Nitrites	Kg	349396	20377
28351000	Phosphinates & Phosphonates	Kg	268603	30142
28352210	Phosphates Of Mono Sodium	Kg	27238	2538
28352290	Phosphates Of Di-Sodium	Kg	403814	64568
28352400	Phosphates Of Potassium	Kg	100028	18844
28352500	Calcium Hydrogen-Orthophosphat	Kg	1165291	93357
28352600	Oth Calcium Phosphate (Pure)	Kg	189783	22727
28352910	Phosphates Of Aluminium	Kg	~	~
28352920	Phosphates Of Sodium	Kg	9750	970
28352930	Phosphates Of Trisodium	Kg	273445	23971
28352990	Other Phosphates	Kg	313150	31088
28353100	Sodium Triphosphate	Kg	11760747	1134092

28353900	Other, Polyphosphates	Kg	1037190	126967
28362000	Disodium Carbonate Natural	Kg	8607730	277017
28363000	Sodium Hydrogen Carbonate	Kg	6760209	168756
28364000	Potassium Carbonate	Kg	1689675	104872
28365000	Calcium Carbonate	Kg	2198384	100705
28366000	Barium Carbonate	Kg	5589000	131414
28369100	Lithium Carbonate	Kg	26691	1933
28369200	Strontium Carbonate	Kg	~	~
28369910	Magnesium Carbonate	Kg	190813	13743
28369920	Carbonates Of Ammonium	Kg	71316	5045
28369930	Bicarbonates Of Ammonium	Kg	5696626	146467
28369990	Other, Carbonates	Kg	340072	11100
28371100	Cyanides Of Sodium	Kg	291442	41918
28371900	Oth Cyanide/Oxides	Kg	12022	1536
28372000	Complex Cyanides	Kg	5944	779
28391100	Sodium Metasilicates	Kg	364020	38648
28391910	Sodium Silicate	Kg	56911	6615
28391990	Other, Silicate	Kg	5349	731
28399000	Other, Metal Silicate	Kg	131426	19587
28401100	Sodium Tetraborate Anhydrous	Kg	1764	151
28401900	Oth Disodium Tetraborat (Refine)	Kg	2670892	110144
28402000	Other, Borates	Kg	7842	351
28413000	Sodium Dichromate	Kg	1513222	279016
28415010	Sodium Chromate	Kg	1191	177
28415090	Oth Chromate Di/Per Chromates	Kg	36330	6585
28416100	Potassium Permaganate	Kg	47200	6573
28416900	Oth Maganite Maganate/Permagan	Kg	7758	1684
28417000	Molybdates	Kg	701	1212
28418000	Tungstates (Wolframates)	Kg	47	56
28419010	Sodium Stannate	Kg	1260	186
28419090	Oth Salts Of Oxometallic Acids	Kg	1499	1202
28421000	Double Or Complex Silicates.	Kg	705694	62335
28429010	Fulminates, Cyanates &Thiocyanat	Kg	1000	250
28429090	Other Salts Of Inorganic Acids	Kg	705289	71229
28432100	Silver Nitrate.	Kg	2398	21325
28432900	Other, Silver Compounds	Kg	1498	1679
28439000	Other Compounds, Amalgams	Kg	3357	2430
28441000	Natural Uranium, Its Comp Alloy	Gm	2154036	36713
28443000	Uranium Deplet Thorium It Comp	Gm	179566	3934
28444000	Radioactive El/Isotop Comp Aly	Gm	3013130	73186
28461000	Cerium Compounds.	Gm	44584	4328
28469000	Oth Rare Earth Metal Compounds	Gm	72409	1403
28470000	Hydrogen Oxide Solid With Urea	Kg	30570256	1416030
28480000	Phosphides, Chemicaly Defined	Kg	~	~
28491000	Calcium Carbides	Kg	3812561	218526
28492000	Silicon Carbide	Kg	234432	19485
28499000	Other Carbide	Kg	2524	1724
28500000	Hydride, Nitride, Azide, Brmd Etc	Kg	21817	13021
28520000	Comp Inorg/Organic Of Mercury	Kg	18290	14330
28530000	Oth Inorganic Copm Amalgams	Kg	6774	4971

Organic Chemical

15200000	Glyserol, Crude Water & Lyes	Ltr	155643	20538
22071000	Undenature Ethyl Alcohol O/Spr	Ltr	367	191
22072000	Ethyl Alcohol/Oth Spirits Den	Ltr	265	134
38231100	Stearic Acid	Kg	1744340	177229
38231200	Oleic (Olive) Acid	Kg	172867	19168
38231300	Tall Oil Fatty Acids	Kg	13010	1555
38231910	Palm Fatty Acid Distillate	Kg	16045408	477765
38231920	Palm Acid Oil	Kg	20168621	671623
38231930	Zinc Stearate	Kg	1401837	37384
38231990	Other, Acid Oil From Refining	Kg	15356157	356486
38237000	Industrial Fatty Alcohols	Ltr	227337	37901
29011010	Satur Butane, Pentane & Hexane	Kg	54008	5552
29011090	Oth Saturate Acyclic Hydcarbon	Kg	640718	129713
29012100	Unsaturated Ethylene.	Kg	5405777	350256
29012200	Unsaturated Propene (Propylene)	Kg	~	~
29012400	Unsaturate Buta-1, 3-Diene/Isop	Kg	~	~
29012910	Unsaturated Heptanes	Kg	~	~
29012990	Oth Unsaturat Acylic Hydcarbon	Kg	550307	113593
29021100	Cyclohexane	Kg	623	180
29021910	Cyclopentane	Kg	74825	15068
29021920	Limonene (Dipentene)	Kg	755621	83315
29021990	Other Cyclopentane	Kg	25830	3026
29022000	Benzene, Pure	Kg	19098	2031
29023000	Toluene, Pure	Kg	7630047	734888
29024100	O-Xylene	Kg	11803777	1230742
29024300	P-Xylene	Kg	225858328	19678379
29024400	Mixed Xylene Isomers	Kg	1928400	175921
29025000	Styrene	Kg	15778046	1619005
29026000	Ethylbenzene	Kg	24714	2677
29027000	Cumene	Kg	115	12
29029010	Nepthalene	Kg	375296	37910
29029090	Other, Cyclec Hydrocarbons	Kg	446727	58749
29031190	Oth Saturated Chloromethane	Kg	5565	860
29031200	Dichloromethane (Methylen Chlrd	Kg	5895725	326897
29031300	Choloroform (Trichloromethane)	Kg	313030	26014
29031400	Carbon Tetrachloride	Kg	~	~
29031500	Ethylene Dichloride (1,2-Di Ch)	Kg	468674	46932
29031990	Other Chloromethane	Kg	414900	42590
29032100	Unsaturated Vinyl Chloride	Kg	63350734	5134735
29032200	Unsaturated Trichloroethylene	Kg	2391277	152863
29032300	Unsaturate Tetrachloroetylene	Kg	1566474	86942
29032900	Oth Unsatur Deriv Acycl H'carb	Kg	1243	87
29033100	Ethylene Dibromide (1, 2, Dibrom)	Kg	1266	89
29033910	Other Bromomethane (Methyl Bromi)	Kg	118	11
29033920	Other Diflouromethane	Kg	~	~
29033930	Other Tetrafluoreothane	Kg	526127	128015
29033940	Oth Ingredients For Pesticides	Kg	26000	6582
29033950	Oth 1, 13, 3, 3-Pentafluoro-2(Tri	Kg	1744	858
29033990	Oth Halogenat Deri Hydrocarbon	Kg	30646	28409
29034100	Trichloroflouromethane	Kg	~	~

29034200	Dichlorodifluoromethane	Kg	35513	12374
29034300	Trichlorotrifluoroethanes	Kg	61	21
29034400	Dichlorotetrafluoroethanes	Kg	~	~
29034510	Pentachlorofluoro Methane	Kg	27300	4545
29034530	Tetrachlorodifluoroethanes	Kg	~	~
29034540	Heptachlorofluoropropanes	Kg	6819	5562
29034570	Dichlorohexafluoropropanes	Kg	~	~
29034590	Oth Derv Perhalogen W/Fluorine	Kg	35290	18958
29034700	Oth Perhalogenated Derivative	Kg	11832	6064
29034910	Chlorodifluoromethane	Kg	818152	150505
29034920	Dichlorotrifluoroethan	Kg	20000	2860
29034990	Oth Chlorodifluoromethane	Kg	317166	57487
29035100	1,2,3,4,5,6hexachloro Cyclohex	Kg	25002	6554
29035900	Oth Helogen Deriv Cyclanic Etc	Kg	40692	8473
29036110	Chlorobenzene	Kg	136	28
29036120	O-Dichlorobenzene	Kg	12	12
29036130	P-Dichlorobenzene	Kg	15011	1654
29036900	Oth;Halogen Deriv Armat H'carb	Kg	1147	1178
29041010	Benzene Sulphonic Acid	Kg	159730	30642
29041090	Other Sulphonic Acid	Kg	59153	12134
29042010	Nitrobenzene (Mirbane Oil)	Kg	61400	7111
29042090	Oth Deriv Only Nitro/Nitro Grp	Kg	12031	1603
29049010	Trichloronitromethane	Kg	4220	619
29049090	Oth Derivative Nitro/Nitroso	Kg	105413	15424
29051100	Saturat Methanol (Methyl Alchl)	Ltr	25029273	1520067
29051210	Saturated Propyl Alcohol	Ltr	1464460	162060
29051220	Saturated Isopropyl Alcohol	Ltr	4929996	536398
29051300	Satur Butan-I-01(N-Butylalvhl	Ltr	355950	60386
29051400	Other Saturated Butanols	Ltr	2222937	292778
29051600	Satur Octanol/Isomers Thereof	Ltr	8651097	1381827
29051710	Saturated Stearyle Alcohol	Ltr	21819	2465
29051720	Saturated Cetyl Alcohol	Ltr	163019	24728
29051910	Iso Nonyl Alcohol (Ina)	Ltr	27	5
29051990	Oth Saturated M-Hydric Alcohol	Ltr	25661	8075
29052200	Unsatur Acyclic Terpene Alcohl	Ltr	56535	35351
29052900	Oth Unsatur Monohydric Alcohol	Ltr	18217	11769
29053100	Ethylene Glycol (Ethanediol) Meg	Ltr	142549884	12441756
29053200	Propylen Glycol (Propan-1,2-Dio	Ltr	3810506	584680
29053900	Other, Diols	Ltr	548291	87627
29054100	2-Ethyl-2(Hydroxymethly-Propan	Ltr	42911	5704
29054200	Pentaerythritol	Ltr	1588064	236483
29054300	Mannitol	Ltr	147456	35191
29054400	D-Glucitol (Sorbitol)	Ltr	76457	21680
29054500	Glycerol	Ltr	4922643	434751
29054900	Other, Poluhydric Alcohols	Ltr	16958	5035
29055900	Other Halogenated, Sulphonated	Ltr	31959	6606
29061100	Menthol	Ltr	154881	84150
29061200	Cycloexanol, Methyl/Dimethyl	Ltr	30400	2844
29061300	Sterols And Inositols	Ltr	7464	5396
29061910	Oth Terpineols	Ltr	98874	20835
29061990	Oth, Cyclanic, Cyclenic Cycloter	Ltr	19571	11038

29062100	Benzyl Alcohol	Ltr	72203	26910
29062990	Oth Ungredients For Pesticides	Ltr	65234	25262
29071100	Phenol (Hydroxybenzene) It Salt	Ltr	1873598	254708
29071200	Cresols And Their Salts	Ltr	56815	9258
29071300	Octylphenol, Nonylphenol/Isomer	Ltr	3830	940
29071500	Napthols & Their Salts	Ltr	7320	2613
29071900	Other Monophenols	Ltr	54497	25029
29072100	Resorcinal And Its Salts	Ltr	11018	6209
29072200	Hydroquinone (Quinol) Its Salt	Ltr	33361	7960
29072300	4,4-Isopropyldenediphenol/Salt	Ltr	59333	13325
29072900	Other, Polyphenols	Ltr	49423	28383
29081100	Pentachlorophenol (Iso)	Ltr	504	249
29081910	Oth 4-Chloro, 3-Methylephenol	Ltr	2771	1980
29081990	Oth Deri Of Phenols/Ph Alcohol	Ltr	12740	9070
29089900	Oth Sulphonated Der Of Phenols	Ltr	106169	63500
29091100	Diethyl Ether	Kg	238	114
29091910	Methyl Tertiary Butyle Ether	Kg	--	--
29091990	Other, Acylic Ether	Kg	102098	42135
29092000	Cyclanic,Cyc Ether Halogen Der	Kg	1110	457
29093000	Aromatic Ether Halogen Sulph't	Kg	80273	23790
29094100	2,2-Oxydiethanol(Diethyl Glycl	Kg	2564067	269026
29094300	Monobutyl Ether, Ethylen Glycol	Kg	170355	34892
29094410	Oth Ingredients For Pesticides	Kg	130754	24446
29094490	O-Monoalkylether, Ethylen, Glyco	Kg	1454143	194997
29094910	Nitrosated Base Pesticides	Kg	82	12
29094990	Oth Nitrosated Base Pesticides	Kg	456063	70870
29095000	Ether-Phenols, Etheralch Phenol	Kg	24943	4806
29096000	Alch Peroxid, Eth Peroxid, Keton	Kg	335031	56194
29101000	Oxirane (Ethylene Oxide)	Kg	36396	8246
29102000	Methyloxirane (Propylene Oxide)	Kg	76	19
29103000	1-Chloro-2, 3-Epoxypropane	Kg	31870	5976
29109000	Oth, Epoxide, Epoxyalch, Epoxyphl	Kg	2680	484
29110000	Acetal Hem/Acetal, Oxyfunc Hel	Kg	4738	1313
29121100	Methane Without Oth Oxygn Func	Kg	422692	35200
29121200	Ethane Without Oth Oxygen Func	Kg	29862	6269
29121900	Oth, Acyclic Aldehyd W/O Othoxy	Kg	537895	93245
29122100	Benzaldehyde W/O Oth Oxy Func	Kg	48899	9324
29122900	Oth Cyclic Aldehyd W/O Oxy Fun	Kg	43836	13335
29123000	Aldehyde-Alchohols	Kg	16762	3451
29124100	Vanillin (4-Hydroxy-3-Methoxybz	Kg	71292	48090
29124200	Ethylvanilin (3-Ethoxy-4hydroxy	Kg	28958	17534
29124900	Oth Aldehyde-Ether/Phenol/Oxyg	Kg	8638	2750
29126000	Paraformaldehyde	Kg	565351	38041
29130000	Halogen, Sulphonat, Nitrat Derv	Kg	16221	2673
29141100	Acetone	Kg	602492	59822
29141200	Butanone (Methyl Ethyl Ketone)	Kg	1912511	250563
29141300	4-Methylpentan-2-One	Kg	72713	12031
29141900	Oth, Acyclic Ketone W-Out Oxy-F	Kg	10388	4877
29142100	Camphor	Kg	5390	3373
29142200	Cyclohexanone, Methylcyclohexon	Kg	144102	34353
29142300	Ionones And Methylionones	Kg	5745	2784

29142910	Isophorone	Kg	3812	928
29142990	Other Isophorone	Kg	3877	1220
29143100	Phenylacetone (1-Phenylpropan-2	Kg	1779	338
29143900	Oth, Aromatic Ketone W/O Oxygen	Kg	5299	1377
29144000	Ketone-Alcohol Ketone-Aldehyde	Kg	347104	46547
29145000	Ketone-Phenol/Ketone W/O Oxygn	Kg	24331	16757
29146100	Anthraquinone	Kg	92752	31764
29146900	Other Quinones	Kg	85511	33049
29147000	Halgenatded, Sulphonated, Deriva	Kg	7458	2938
29151100	Formic Acid	Kg	3367817	300523
29151210	Sodium Formate, Calcium Formate	Kg	8010140	278326
29151290	Other, Salt Of Formic Acid	Kg	81513	15056
29151300	Esters Of Formic Acid	Kg	3829	472
29152100	Acetic Acid	Kg	11771342	847310
29152400	Acetic Anhydride	Kg	22530	4294
29152910	Calcium Acetate	Kg	34487	4643
29152920	Lead Acetate	Kg	5452	849
29152930	Oth Sodium Acetate	Kg	610990	30694
29152940	Oth Cobalt Acetate	Kg	45671	8579
29152990	Oth Acetic Acid And Its Salts	Kg	23062	3433
29153100	Ethyl Acetate	Kg	2388733	249789
29153200	Vinyl Acetate	Kg	6930121	734208
29153300	N-Butyl Acetate	Kg	109094	11479
29153600	Dinoseb (Iso) Acetate	Kg	36614	4423
29153910	Benzyl Acetate	Kg	98680	15837
29153920	Amyl Acetate	Kg	25133	4673
29153990	Other, Esters Of Acetic Acid	Kg	1557614	240452
29154000	Mono/Di/Trichloroacetic Acid-S	Kg	40758	7781
29155000	Propionic Acid, Its Salt/Esters	Kg	268449	42088
29156010	Butyric Acids,	Kg	139278	19500
29156020	Salt/Esters Of Butyric Acids	Kg	154452	24970
29156030	Salt/Esters Of Valeric Acids	Kg	16000	1999
29156090	Oth Botanoic/Petanoic Acids/Sl	Kg	63156	10402
29157010	Stearic Acid (Chemically Pure)	Kg	6896	1260
29157090	Oth Palmitic/Stearic Acid/Salt	Kg	90909	24788
29159000	Oth Sat Acyclic Monocarboxylic	Kg	1123679	304871
29161100	Unsatu Acrylic Acid/Its Salts	Kg	707382	101188
29161200	Unsaturate Ester Acrylic Acid	Kg	6754556	1108936
29161300	Unsatu Methacrylic Acid/Salts	Kg	46099	10609
29161400	Unsatu Ester, Metharylic Acid	Kg	1699654	343505
29161510	Unsaturated Oleic Acid	Kg	28211	2827
29161520	Unsaturat Salt/Deriv, Oleicacid	Kg	680	158
29161590	Oth Oleic, Linoleic Acid/Salt	Kg	93033	15410
29161910	Oth Maleic Acid, Azdn (2-Azobis)	Kg	19000	2797
29161990	Oth Unsat Acylic M-Carbox Acid	Kg	216684	41601
29162000	Cyc-Lanic, Lenic Lotepheni Acid	Kg	20659	30535
29163110	Benzoic Acid,	Kg	130012	20112
29163120	Sodium Benzoate	Kg	290780	41304
29163190	Oth Benzoic Acid/Salt/Esters	Kg	87382	15296
29163200	Benzoyl Peroxide/Benzyl Chlrid	Kg	9645	2449
29163500	Esters Of Phenylacetic Acid	Kg	1379	421

29163910	Ibuprofen	Kg	203101	156443
29163920	Aromatic Monocarboxylic Pestic	Kg	~	~
29163990	Oth Unsat Acylmonocarboxy Acid	Kg	235391	124689
29171110	Oxalic Acid	Kg	1619993	118566
29171190	Other Salts And Esters	Kg	540	122
29171200	Adipic Acid, Its Salts/Esters	Kg	191430	22912
29171300	Azelaic/Sebacic Acid/Salt/Estr	Kg	107378	17695
29171400	Maleic Anhydride	Kg	641287	82400
29171900	Oth Acyclic Polycarboxyl Acid	Kg	166273	35812
29172000	Cyc-Lanic, Lenic Loterpenc Acid	Kg	114260	19460
29173200	Dioctyl Orthophthalates	Kg	538331	93624
29173300	Dinony/Didecyl Orthophalates	Kg	~	~
29173410	Dibutyl Orthophthalates	Kg	196518	30021
29173490	Oth Esters Orthophthalic Acid	Kg	537990	74431
29173500	Phthalic Anhydride	Kg	2062846	208242
29173610	Pure Terphthalic Acid (Pta)	Kg	21918439	2703508
29173690	Oth, Terphthalic Acid/Its Salts	Kg	39600	4738
29173910	Iso Phthalic Acid	Kg	658822	87177
29173990	Oth Polycarboxylic Acids/Der	Kg	46358	9187
29181110	Lactic Acid	Kg	312356	33299
29181190	Oth Lactic Acid, Its Salt/Ester	Kg	134223	34400
29181200	Tartaric Acid	Kg	86640	19100
29181300	Salt & Ester Of Tartaric Acid	Kg	1282	678
29181400	Citric Acid	Kg	6262483	561972
29181510	Sodium Citrate	Kg	610088	55118
29181590	Oth Citric Acid/Salts/Esters	Kg	149688	33972
29181600	Gluconic Acid, Salts & Esters	Kg	1042931	248817
29181800	Chlorobenzilate (Iso)	Kg	~	~
29181910	Benzilic Acid	Kg	129	50
29181990	Oth Lactic Acid Its Salt/Ester	Kg	103994	31316
29182110	Salicylic Acid	Kg	6701	1120
29182120	Sodium Salicylate	Kg	1000	163
29182130	Methyl Salicylate	Kg	21499	3308
29182190	Oth Salicylic Acids Their Salt	Kg	25004	7979
29182210	Asparin	Kg	136460	37218
29182290	Oth O-Acetylsalicylc Acid/Salt	Kg	8490	1943
29182300	Oth Ester, Salicylic Acid/Salts	Kg	38289	10685
29182900	Oth Carboxylic Acid+Phenol Fun	Kg	140505	56689
29183000	Carboxylic Acid+Aldehyde/Keton	Kg	132857	44143
29189100	2, 4, 5-T (Iso) (2, 4, 5-Trichloroph	Kg	2974	1338
29189910	Oth Ingredients For Pesticides	Kg	68480	26573
29189990	Oth Carboxylic Acid, Nitrosated	Kg	479561	374212
29191000	Tris (2, 3-Dibromoproply) Phospha	Kg	561	408
29199010	Oth Ingredients For Pesticides	Kg	5950	2886
29199090	Oth Lactophosphates & Deriva	Kg	48094	35088
29201100	Parathion (Iso) &Para-Mathyl Dri	Kg	20	7
29209010	Sulphonic Esters/Derivatives	Kg	5002	1734
29209020	Nitrosated Base Pesticides	Kg	~	~
29209030	Diethyl Phosphite	Kg	47	19
29209090	Oth Inorganic Ester/Derivative	Kg	27925	23084
29211100	Methylamine, Di/Tri & Its Salt	Kg	334418	58002

29211910	Paraxylidine Sulfamic Acid	Kg	22	5
29211920	Bis (2-Chloroethyl)	Kg	418	156
29211940	Trichlomethine (Inn) (Tris (2-C	Kg	..	..
29211950	N, N-Dialkyl (Methyl, Ethyl, N-P	Kg	..	..
29211990	Oth Amine Function Compounds	Kg	94818	46256
29212100	Ethylenediamine And Its Salts	Kg	46823	22520
29212200	Hexamethylenediamine/Its Salts	Kg	9399	3921
29212910	Aceto Acetic Ortho Anisidine	Kg	1297	378
29212990	Other Acyclic Polymines/Salts	Kg	195252	41973
29213000	Cy-Clanic, Lenic Loterpeni/Salt	Kg	77606	27973
29214110	Aniline	Kg	132343	21364
29214190	Other, Dimethylaniline	Kg	5423	1388
29214200	Aniline Derivatives/Its Salt	Kg	810395	170571
29214310	Oth Toluidine/Derivativ/Salt	Kg	..	..
29214390	Toludines/Salts For Pesticides	Kg	149896	42586
29214400	Diphenylamine/Its Deriv/Salt	Kg	39295	12987
29214510	Sodium Naphthionate	Kg	13897	2575
29214590	Oth 1-Naphthylamine, Deri/Salts	Kg	180949	53235
29214900	Oth, Aromatic Monoamin Der/Salt	Kg	447805	142759
29215110	Diaminotoluene Base Pesticides	Kg	678440	103397
29215190	Oth Aromatic Polyamies &Salts	Kg	406150	128110
29215900	Oth Aromatic Polyamin Der/Salt	Kg	379658	116538
29221100	Monoethanolamine And Its Salts	Kg	282901	67811
29221200	Diethanolamine And Its Salts	Kg	372846	92101
29221310	Triethanolamine	Kg	133398	22506
29221390	Oth Triethanolamine &Its Salts	Kg	24631	6377
29221400	Dextropropoxyphene&Its Salts	Kg	20182	4107
29221911	N,N-Dimethyl-2-Aminoethanol/Sa	Kg	2100	659
29221919	Oth N-Propyl Or Isopropyl	Kg	53364	11694
29221930	Methyldiethanolamine	Kg	84511	24923
29221990	Oth N,N-Dialkyl (Methyl,Ethyl)	Kg	1706879	568867
29222100	Aminohydroxynephlene Acid/Salt	Kg	1311981	323131
29222900	Oth Amino Napthol/Phenol Ether	Kg	704320	203364
29223900	Oth Amino Aldehydes	Kg	52653	19221
29224100	Lysine/Its Ester Salt Thereof	Kg	8770022	1012183
29224210	Monosodium Glutamate	Kg	3480440	300068
29224290	Oth Glutamic Acid/Its Salt	Kg	27581	9885
29224300	Anthranilic Acid And Its Salts	Kg	1145	310
29224400	Tilidine (Inn) And Its Salts	Kg	665	200
29224910	Other Alanine	Kg	474240	153319
29224990	Oth Amino Acids And Salts	Kg	1217106	1102817
29225000	Amino-Alcoh-Phenols,Amino Acid	Kg	347021	343434
29231000	Choline And Its Salts	Kg	55290	47953
29232000	Lecithin/Oth Phosphoaminolipid	Kg	804343	83724
29239010	Betain	Kg	103338	75098
29239090	Oth Ammonium Salt/Hydro/Lecith	Kg	187505	100444
29241100	Meprobamate (Inn)	Kg	125	41
29241200	Fluoroacetamide(Iso)Monocroto	Kg	..	..
29241910	Acetamide	Kg	11319	4542
29241920	Phenacaetine(Acet-P-Phenetedid	Kg	199	99
29241990	Other Acyclic Amides	Kg	2654359	400095

29242100	Ureines/Deriv/Salt Thereof	Kg	207152	98789
29242300	2-Acetamidobenoic Acid	Kg	~	~
29242910	Paracetamole	Kg	721929	232366
29242920	Aceto Aceto Ortho Toluidine	Kg	5000	1470
29242930	Cyclic Amides Pesticides	Kg	16720	13484
29242990	Oth Cyclic Amide Deriv/Salts	Kg	1082634	846762
29251100	Saccharin And Its Salts	Kg	312519	115565
29251900	Oth Imide/Deriv/Salt Throf	Kg	8608	3583
29252100	Chloimeformrd (Iso)	Kg	350	130
29252910	Diphenyl-Guanidine	Kg	1364	703
29252990	Oth Imine/Its Deriv Salt Throf	Kg	442353	224766
29261000	Acrylonitrile	Kg	3813535	614562
29262000	1-Cyanoguanidine (Dicyandiamide	Kg	194213	29100
29269010	Alphacyano, 3-Phanoxybenzyl Etc	Kg	80	59
29269020	S-Alpha Cyano, 3-Phenoxybenzyl	Kg	484392	196930
29269040	N-Methylptrolidon	Kg	133	65
29269050	Nitrile-F.C Base Pesticides	Kg	7750822	2434194
29269090	Oth Nitrile-Function Compounds	Kg	104509	70788
29270010	Benzene-Diazonium Chloride	Kg	2000	1229
29270020	Benzene-Diazonium Teraflurobor	Kg	7874	2889
29270090	Oth Diazo-,Azo-/Azoxy-Compound	Kg	453469	67556
29280010	Phenyl-Hydrazine	Kg	6813	2044
29280090	Oth Organic Derv Hydrazine Etc	Kg	74642	47564
29291000	Isocyanates W-Nitrogen Functio	Kg	6561860	2051744
29299010	Isocyanides	Kg	22003	6911
29299090	Oth Comp With Oth Nitrogn Func	Kg	1101991	77287
29302010	2-N,N-Dimethyl Amino-1 Sodium	Kg	258	63
29302020	Thiocarbamates Bas Epesticides	Kg	625043	181426
29302030	Oth Ingredients For Pesticides	Kg	2769	1108
29302090	Other Organo Sulphur Compounds	Kg	690983	151307
29303000	Thiuram Mono-,Di-,Tetrasulphid	Kg	3357	656
29304000	Methionine	Kg	2522252	881012
29309010	2 N,N-Dimethylanino1,3disodium	Kg	11737	5819
29309020	O,S-Dimethyl Phosphoramidothio	Kg	~	~
29309030	S-S,2-Dimethylamino,Bis(Thio)	Kg	56000	48141
29309040	Diafethiuran Tech Dispropyl	Kg	1217259	360331
29309050	O-O Dithyl Phosphoro Thioate	Kg	210006	81412
29309060	O-4 Bromo,2-Chlorophenyle O-Et	Kg	334090	170665
29309070	O,O Duethyl Phosphorothioate	Kg	15898	9663
29309091	[S-2-(Dialkyl (Methyl, Ethyl, N-P	Kg	17723	5202
29309092	2-Chloroethylchloromethylsulph	Kg	68	29
29309093	O,O-Diethyl S-[2-(Diethylamino	Kg	33	10
29309099	Oth Organo-Sulphur Compounds	Kg	148013	44479
29310010	Oth Organo Pesticides	Kg	4628	2314
29310020	O-Alkyl (<C10, Incl Cycloalkyl)	Kg	~	~
29310030	[O-2-(Dialkyl (Methyl, Ethyl, N-P	Kg	~	~
29310090	Oth Organo-Inorganic Pesticide	Kg	894654	273607
29321100	Tetrahydrofuran	Kg	2069	2159
29321200	2-Furaldehyde (Furfuraldehyde)	Kg	95	43
29321300	Furfuryl Alcoh/Tetrahydrfurfyl	Kg	34994	26246
29321900	Oth Heterocyclic Comp Unfused	Kg	43262	58034

29322100	Coumarin, Methyl/Ethyl Coumarin	Kg	3866	2882
29322910	4, 5, 6, 7-Tetrachlorophalide	Kg	283	349
29322920	Oth Lactones For Pesticides	Kg	3878	3501
29322930	Isoascorbic Acid	Kg	1500	738
29322990	Oherte Trochloropthalide	Kg	64788	100744
29329100	Isoafrole	Kg	-	-
29329300	Piperonal	Kg	-	-
29329500	Tetra Hydro Cannabinols	Kg	600	4476
29329910	2,3 Dihydro,2-2dimethyl,7benzo	Kg	654282	525179
29329990	Oth Heterocyclic Comp W/Oxygen	Kg	191710	294892
29331100	Phenazone & Its Derivative	Kg	49384	53593
29331900	Oth Comp Unfuse Pyrazole Ring	Kg	24857	24715
29332100	Hydantoin And Its Derivatives	Kg	8796	15437
29332900	Oth Comp Unfuse Imidazole Ring	Kg	542581	590433
29333100	Pyridine And Its Salts	Kg	7658	7023
29333200	Piperidine And Its Salts	Kg	-	-
29333300	Alfentanial (Inn)(Anileridine)	Kg	41478	221616
29333910	Chloropheniramine & Isoniazid	Kg	9751	12660
29333920	Pyrazinamide	Kg	25214	43367
29333930	Unfused Pyidine Base Pesticide	Kg	85995	54580
29333990	Oth Comp Unfuse Pyridine Ring	Kg	657288	1364687
29334100	Levorphanol (Inn) & Its Salts	Kg	3350	5263
29334910	Amodiaquine	Kg	15433	20029
29334920	Quinoline	Kg	3058	5134
29334930	Chloroquine Sulphate	Kg	9518	9956
29334940	Chloroquine Phosphate	Kg	34006	50937
29334990	Oth Comp Quinoline/Iso Qu-Ring	Kg	254222	515512
29335200	Malonylurea/It Deriv/Salt Thof	Kg	192	319
29335300	Allobarbital (Inn)(Ambarbital)	Kg	1439	2152
29335400	Oth Derivatives Of Malonylurea	Kg	1832	2703
29335500	Loprazolam (Inn) Mecloqualone	Kg	-	-
29335910	O-Diethyl, O, Iso Phropyl-6 Etc	Kg	198	411
29335920	1-Tert, Butyl-3(2,6 Iso Propyl)	Kg	500	952
29335930	Ciprofloxacin	Kg	76909	213065
29335940	Norfloxacin	Kg	4961	15102
29335950	Pyrimidin Ring Base Pesticides	Kg	79032	160907
29335990	Oth Comp Pyrimidine/Piper Ring	Kg	184598	490239
29336100	Malamine	Kg	2200412	313414
29336910	Pyrimethanine	Kg	2546	6021
29336920	Isoniazid	Kg	4357	4196
29336930	Cyanuric Chioride	Kg	102108	-
29336990	Oth Comp Unfuse Triazine Ring	Kg	89308	-
29337100	6-Hexanelactam (Epsilon-Caprol)	Kg	1138	-
29337200	Clobazam (Inn), Methprylon (Inn)	Kg	42489	-
29337910	Isatin (Lactam Of Istic Acid)	Kg	23959	-
29337920	1-Vinyl-2-Pyrrol-Idone	Kg	382	284
29337990	Other Lactams	Kg	47286	103593
29339100	Alprazolam (Inn) Camazepam (Inn)	Kg	32450	71230
29339910	Oth Ingredients For Pesticides	Kg	89195	99491
29339990	Other Hetrocyclic Copmounds	Kg	418010	1010360
29341010	Nucleic Acid Base Pesticides	Kg	3050	2138

29341090	Oth Heterocyclic Compounds	Kg	22446	66980
29342000	Comp Benzothiazole Ring System	Kg	125901	38591
29343000	Comp Phenothiazine Ring System	Kg	32996	54383
29349100	Aminorex(Inn),Bortizolam(Inn)	Kg	46981	23565
29349910	Furazolidone	Kg	67464	71596
29349920	Oth Nucleic Acid Base Pesticid	Kg	11396	9117
29349990	Other Heterocyclic Compounds	Kg	726295	2171193
29350010	O-Toluene-Sulphonamide	Kg	1360	1372
29350020	P-Amino-Benzene Sulphonamide	Kg	~	~
29350030	Sulpha-Pyridine(Inn)	Kg	12266	16562
29350040	Sulpha-Diazine	Kg	100	92
29350060	Sulphanilamide	Kg	1000	671
29350090	Other, Sulphonamides	Kg	233340	662341
29362100	Vitamin A Its Derivative Unmix	Kg	45117	126592
29362200	Vitamin B1/Its Deriv Unmixed	Kg	49353	91483
29362300	Vitamin B2/Its Deriv Unmixed	Kg	48360	97374
29362400	D-,Dl-Pantothenic Acid(Vitb3b5	Kg	92690	105916
29362500	Vitamin B6/Its Deriv Unmixed	Kg	46873	73329
29362600	Vitamin B12/Its Deriv Unmixed	Kg	46923	131477
29362700	Vitamin E/Its Derivative Unmix	Kg	642678	579868
29362800	Vitamin D/Its Derivative Unmix	Kg	311439	344499
29362900	Oth Vitamin/Its Deriv Unmixed	Kg	229307	383486
29369000	Oth Inter-Mixture Provitamins	Kg	69626	98980
29371100	Somatotropin Its Derivatives	Kg	4483	4952
29371200	Insuline And Its Salts	Kg	17786	48416
29371900	Other Polypetide Harmones	Kg	6067	12379
29372100	Cortisone/Hydro/Prednisone Etc	Kg	2031	97963
29372200	Halogenate Deriv Adernal Hormn	Kg	5471	301838
29372300	Oestrogens And Progestogens	Kg	2452	109387
29372900	Oth,Steroidal Harmones,Derivat	Kg	2840	125499
29373900	Oth Cetecholamine Harmones	Kg	227	1742
29374000	Amino Acid Derivatives	Kg	255	4176
29375000	Prostaglandins,Thromboxanes&Dr	Kg	543	18448
29379000	Oth Hormones/Its Derivatives	Kg	13474	635962
29381000	Rutoside(Rutin)/Its Derivative	Kg	300	728
29389090	Other Glycosides Natural/Salts	Kg	6655	49179
29391100	Concentrates Of Poppy Straw	Kg	528	28522
29391900	Oth Alkaloids Of Opium/Dervati	Kg	676	58905
29392010	Quinine Sulphate	Kg	590	5021
29392090	Oth Alkaloid Cinchona/Drv Salt	Kg	457	24256
29393000	Caffeine And Its Salts	Kg	103315	72997
29394100	Ephedrine And Its Salts	Kg	870	1302
29394200	Pseudeophedrine(Inn)/Its Salt	Kg	930	1389
29394900	Other, Ephedrine And Its Salts	Kg	23082	47672
29395100	Enetylline (Inn) And Its Salts	Kg	1000	843
29395900	Oth Theophylline/Aminophlline	Kg	45093	59625
29396100	Erogmetrine (Inn)And Its Salt	Kg	7	686
29396200	Ergotamine (Inn) And Its Salts	Kg	~	~
29396900	Oth Alkaloid Of Rye Ergot/Salt	Kg	1138	116704
29399100	Cocaine Ecgonine, Salts, Esters	Kg	18	187
29399910	Vege Alkaloids Base Pesticides	Kg	1	32

29399990	Other Vegetable Alkaloids	Kg	5854	120627
29400000	Sugard O/T Sucrose/Lactose Etc	Kg	508960	274842
29411000	Pencilline/Derv/Acid/Salt Etc	Kg	78507	165433
29412000	Streptromycin/Deriv/Salt Throf	Kg	17742	40527
29413000	Tetracycline/Deriv/Salt Throf	Kg	71460	134018
29414000	Chloramphenical/Deriv/Salt	Kg	32476	59343
29415000	Erythromycin/Deriv/Salt Throf	Kg	128763	756140
29419010	Cephalexin	Kg	5011	32432
29419020	Gramicid Trycidine	Kg	463	2628
29419030	Thricin	Kg	"	"
29419040	Cephradine Oral	Kg	8332	40314
29419050	Antibiotics Base Pesticides	Kg	228069	444908
29419060	Cefixime In Bulk	Kg	9643	162516
29419090	Other, Antibiotics.	Kg	363191	2442056
29420000	Other Organic Compounds.	Kg	3482	5904

Table 2.3: Exports of Chemicals during July 2008 – April 2009

HS Code	Commodity	Unit	Quantity	Value (Pak Rs. 000,)
Inorganic Chemical				
28011000	Chlorine	Kg	85129	4764
28012000	Iodine	Kg	45000	1451
28020010	Sulphur, Sublimed/Precipitated	Kg	115900	4002
28030010	Carbon Black (Rubber Grade)	Kg	15741	533
28030090	Other Carbon	Kg	300	255
28042900	Other, Rare Gases.	Cubm	"	"
28043000	Nitrogen	Cubm	"	"
28044000	Oxygen	Cubm	2261	4297
28046900	Other Silicon	Kg	500	60
28051100	Sodium	Kg	"	"
28051900	Other Alkali Metals	Kg	12500	142
28054000	Mercury	Kg	4900	1225
28061000	Hydrogen Chloride (Hcl Acid)	Kg	30731305	276811
28062000	Chlorosulphuric Acid	Kg	60363	664
28070000	Sulphuric Acid; Oleum	Kg	3485271	48855
28091000	Diphosphorus Pentaoxide	Kg	95	8
28092090	Phosphorous Acid	Kg	20000	1191
28100020	Boric Acid	Kg	10758	738
28112100	Carbon Dioxide	Kg	12050	836
28112200	Silicon Dioxide (Silica)	Kg	"	"
28112990	Oth Inorganic Acids/Compounds	Cubm	31400	195
28129000	Oth Halide/Halide Oxides	Kg	12006	1240
28142000	Ammonia In Aqueous Solution	Kg	62796	2139
28151100	Sodium Hydroxide Solid	Kg	108367	3844
28151200	Sodium Hydroxide Aqueous Sol	Kg	9070	576
28152000	Potassium Hydroxide (Caustic)	Kg	"	"
28153000	Peroxides Of Sodium/Potassium	Kg	550	56
28161090	Oth Hudroxide &Peroxide Of Mg	Kg	112500	1486

28170000	Zinc Oxide; Zinc Peroxide	Kg	420580	65647
28181000	Artificial Corundum Not Defin	Kg	~	~
28199010	Chromium Oxide	Kg	~	~
28209000	Other, Manganese Oxides	Kg	500	32
28211010	Iron Oxides	Kg	8692	812
28230010	Titanium Dioxide	Kg	3400	391
28251000	Hydrazine, Ydroxylamine Salt	Kg	7220	696
28259000	Oth Inorganic Base/Metal Oxide	Kg	5487	383
28261200	Flourides Of Aluminium	Kg	1283	77
28261900	Other, Flourides	Kg	1500	106
28269000	Other, Complex Fluorine Salts	Kg	330	23
28271000	Ammonium Chloride	Kg	1350447	42028
28272000	Calcium Chloride	Kg	2333364	44188
28273100	Chlorides Of Magnesium	Kg	20181	335
28273200	Chlorides Of Aluminium	Kg	11500	463
28273900	Other Chloride Oxides, Bromides	Kg	21897	863
28281010	Comercial Calcium Hypochlorite	Kg	284113	9312
28289000	Other Hypochlorites/Hypobromites	Kg	21000	1157
28291100	Chlorates Of Sodium	Kg	753931	12431
28291910	Potassium Chlorates	Kg	~	~
28301010	Dithionites Of Sodium	Kg	~	~
28301090	Other Polysulphides	Kg	914	32
28309000	Oth Sulphides Not Chem-Defined	Kg	14452	1192
28319010	Formaldehyde Sulphoxylates	Kg	100000	4284
28321010	Oth Sodium Hydrogen Sulphite	Kg	~	~
28321090	Oth Sodium Sulphite	Kg	~	~
28331900	Other Sodium Sulphates	Kg	~	~
28332500	Sulphates of Copper	Kg	500	37
28332940	Other Sulphates of Zinc	Kg	500	24
28332990	Other Sulphates	Kg	~	~
28333000	Alums	Kg	30	2
28342100	Nitrates of Potassium	Kg	~	~
28342900	Other Nitrites	Kg	~	~
28352290	Phosphates of Di-Sodium	Kg	99800	1243
28352500	Calcium Hydrogen-Orthophosphat	Kg	80000	3002
28352600	Oth Calcium Phosphate (Pure)	Kg	20000	839
28353100	Sodium Triphosphate	Kg	1826	95
28353900	Other, Polyphosphates	Kg	~	~
28362000	Disodium Carbonate Natural	Kg	3438814	74942
28363000	Sodium Hydrogen Carbonate	Kg	244154	9533
28365000	Calcium Carbonate	Kg	89580	1799
28369200	Strontium Carbonate	Kg	~	~
28369990	Other, Carbonates	Kg	280	12
28371100	Cyanides Of Sodium	Kg	25000	298
28371900	Oth Cyanide/Oxides	Kg	8500	298
28391910	Sodium Silicate	Kg	84929	4492
28391990	Other, Silicate	Kg	1965270	141154
28399000	Other, Metal Silicate	Kg	~	~
28401900	Oth Disodium Tetraborat (Refine)	Kg	~	~
28415010	Sodium Chromate	Kg	252000	4369
28416900	Oth Maganite Maganate/Permagan	Kg	100	3

28417000	Molybdates	Kg	200	40
28421000	Double Or Complex Silicates.	Kg	1000	241
28432900	Other, Silver Compounds	Kg	69848	418810
28439000	Other Compounds, Amalgams	Kg	~	~
28459000	Oth Isotopes & Their Compounds	Kg	~	-
28470000	Hydrogen Oxide Solid With Urea	Kg	290324	5990
28492000	Silicon Carbide	Kg	2627 113	
28499000	Other Carbide	Kg	~	~

Organic Chemical

22071000	Undenature Ethyl Alcohol O/Spr	Ltr	24006135	984263
22072000	Ethyl Alcohol/Oth Spirits Den	Ltr	229304730	10536844
38231100	Stearic Acid	Kg	64150	5172
38231200	Oleic (Olive) Acid	Kg	500	75
38237000	Industrial Fatty Alcohols	Ltr	25000	1172
29022000	Benzene, Pure	Kg	2225	351
29025000	Styrene	Kg	1260	97
29032900	Oth Unsatur Deriv Acycl H'carb	Kg	~	~
29033990	Oth Halogenat Deri Hydrocarbon	Kg	70899	4254
29051220	Saturated Isopropyl Alcohol	Ltr	32000	4611
29051300	Satur Butan-I-01(N-Butylalvhl	Ltr	250	38
29051400	Other Saturated Butanols	Ltr	~	~
29052900	Oth Unsatur Monohydric Alcohol	Ltr	5822	907
29053200	Propylen Glycol (Propan-1,2-Dio	Ltr	3150	447
29053900	Other, Diols	Ltr	18750	1192
29054500	Glycerol	Ltr	91400	5027
29054900	Other, Poluhydric Alcohols	Ltr	504	80
29061100	Menthol	Ltr	~	~
29071200	Cresols And Their Salts	Ltr	~	~
29071300	Octylphenol, Nonylphenol/Isomer	Ltr	200	13
29121200	Ethane Without Oth Oxygen Func	Kg	4000	699
29130000	Halogen, Sulphonat, Nitrat Derv	Kg	~	~
29151100	Formic Acid	Kg	90	10
29151210	Sodium Formate, Calcium Formate	Kg	~	~
29151290	Other, Salt Of Formic Acid	Kg	~	~
29152100	Acetic Acid	Kg	20160	890
29156020	Salt/Esters Of Butyric Acids	Kg	1422	211
29157010	Stearic Acid (Chemically Pure)	Kg	4250	268
29159000	Oth Sat Acyclic Monocarboxylic	Kg	30400	1267
29163910	Ibuprofen	Kg	~	~
29171110	Oxalic Acid	Kg	79	6
29173200	Dioctyl Orthophthalates	Kg	436498	27159
29173500	Phthalic Anhydride	Kg	3036134	298709
29173610 P	Ure Terphthalic Acid (Pta)	Kg	8561486	548906
29173690	Oth, Terphthalic Acid/Its Salts	Kg	64960	3248
29173990	Oth Polycarboxylic Acids/Der	Kg	100370	4453
29181110	Lactic Acid	Kg	200	17
29181200	Tartaric Acid	Kg	~	~
29181400	Citric Acid	Kg	250	24
29211100	Methylamine,Di/Tri & Its Salt	Kg	2500	63

29212100	Ethylenediamine And Its Salts	Kg	5750	1072
29214390	Toludines/Salts For Pesticides	Kg	56000	2144
29215900	Oth Aromatic Polyamin Der/Salt	Kg	1690	96
29221100	Monoethanolamine And Its Salts	Kg	20000	669
29224210	Monosodium Glutamate	Kg	300	18
29231000	Choline And Its Salts	Kg	-	-
29239010	Betain	Kg	134127	6506
29239090	Oth Ammonium Salt/Hydro/Lecith	Kg	100	9
29241910	Acetamide	Kg	937	66
29242400	Ethinamate (Inn)	Kg	-	-
29242930	Cyclic Amides Pesticides	Kg	225447	19163
29242990	Oth Cyclic Amide Deriv/Salts	Kg	18966	1052
29269050	Nitrile-F.C Base Pesticides	Kg	60550	21259
29269090	Oth Nitrile-Function Compounds	Kg	-	-
29309099	Oth Organo-Sulphur Compounds	Kg	-	-
29310040	O/T Org-Inorganic, Conta P-Atom	Kg	15671	5485
29329300	Piperonal	Kg	410	193
29331900	Oth Comp Unfuse Pyrazole Ring	Kg	-	-
29334990	Oth Comp Quinoline/Iso Qu-Ring	Kg	500	1112
29335500	Loprazolam (Inn) Mecloqualone	Kg	105	43
29335990	Oth Comp Pyrimidine/Piper Ring	Kg	2255	241
29336100	Malamine	Kg	3800	214
29362300	Vitamin B2/Its Deriv. Unmixed	Kg	-	-
29362700	Vitamin E/Its Derivative Unmix	Kg	20	1
29391100	Concentrates of Poppy Straw	Kg	-	-
29391900	Oth Alkaloids of Opium/Dervati	Kg	5000	1248
29394900	Other, Ephedrine and Its Salts	Kg	-	-
29395100	Fenetylline (Inn) and Its Salts	Kg	2500	595
29399100	Cocaine Ecgonine, Salts, Esters	Kg	12500	888
29419090	Other, Antibiotics.	Kg	1440	2971

2.2. Chemical Use by Categories

Table 2.4: Chemical Use by Categories

Type of Chemical	Number of Tons Used per Year in the Country
Pesticides – Agriculture	**NA**
Pesticides – Public Health	**NA**
Pesticides Consumers Use	***78132(M.Tons), 8138(Min. Rs.) (2003)**
Fertilizers	**2691 (2008-09)P**
Petroleum Products	**12892 (2008-09)P**
Industrial Chemicals (used in Manufacturing/processing facilities)	**NA**
Consumer Chemicals	**NA**
Other Chemicals (unknown/mixed use)	**NA**
TOTAL	**15583**

**Source: 2004-05, FISA*
P=Provisional (July-March), NA= Figures not available
Source: Pakistan Economic Survey (2008-09)

2.3. Storage of Chemicals and Related Issues

Table 2.5: Bulk Chemical Storage and Warehousing Facilities

Chemical Type	Size/Capacity (Volume in cubic meter or weight in tons)	Type of Facility	Location Area (Port, Industrial Complex, Urban Rural)	Labeling: Health and Environment Protection Measures
Pesticides (agricultural, public health, & consumer use)	-	-	-	-
Fertilizers	-	-	-	-
Petroleum Products	-	-	-	-
Industrial Chemicals (used in manufacturing / processing facilities)	-	-	-	-
Consumer Chemicals	-	-	-	-
Chemical waste	-	-	-	-
Other Chemicals (unknown mixed use)	-	-	-	-
Pesticides (agricultural, public health, & consumer use)	-	-	-	-
Fertilizers	-	-	-	-
Petroleum Products	-	-	-	-
Industrial Chemicals (used in manufacturing / processing facilities)	-	-	-	-
Consumer Chemicals	-	-	-	-
Chemical waste	-	-	-	-

Blank areas shows that data is not available

2.3 Transport of Chemicals and Related Issues

Table 2.6: Supply Chain for Bulk Chemical Distribution and Transportation

2.4. Chemical Waste

Table 2.7: Chemical Waste Generation and Trade

Type of Chemical Waste	Generation (tones/year)	Export (tones/Year	Import (tones/year)
Data not available	Data not available	Data not available	Data not available

2.4 Overview of Technical Facilities

Table 2.8: Facilities for Recovery and Recycling of Chemicals and Related Wastes

Location of facility, Operation or Process	Description of the Facility, Operation or Process	Recovery Operation (Annex IVB) R code	Capacity of the Facility (in metric tons)	Does the Facility Treat Wastes Imported? Yes/No
Data not available	Data not available	Data not available	Data not available	Data not available

2.5. Overview of Capacity for Disposal of Chemicals

Table 2.9: Facilities for Disposal of Chemicals and Related Waste

Location of Facility	**Description of the Facility, Operation or the Process**	**Disposal Operation (annex IVA)D code**	**Capacity of the Facility (in metric tones**	**Does the Facility Treat Wastes Imported? Yes/No**
Data not available	Data not available	Data not available	Data not available	Data not available

2.6. Stockpiles, Waste Deposits, and Contaminated Sites

Table 2.10: Obsolete Chemical Stocks, Chemical Waste Site, and Contaminated Areas

	Geographical Location (GPS Coordinates or Lat. Long)	**Main Content by Chemical or Groups of Chemicals/Wastes**	**Magnitude of the Site or Stocks; e.g. Small, Medium and Large**
Obsolete Chemicals	Data not available	Data not available	Data not available

2.7. Unintentionally Generated Chemicals

Data does not exist

2.8. Comments/Analysis

- The data related to obsolete chemical stocks, chemical waste site, and contaminated areas in general does not exist or not provided by the relevant stakeholders.
- There are very few waste disposal/ treatment/recycling facilities in the country. The information about these facilities could not be collected due to non availability of database.
- The capacities of existing waste recycling facilities are not known.
- There are records of waste material imported.
- The unattended chemical waste dumping sites scattered all over the country are a big health risk.
- The capacity for data collection on production, storage, transport, use and waste disposal of chemicals is generally low.
- There does not exist any data relevant to transport of chemicals.
- An inventory and registration mechanism is required for chemical storage at different sites in the country.

- Similar inventory and registration mechanism is required for transpiration of chemicals throughout the country.
- Pakistan is a signatory to Basal convention and actively participating it its activities.
- There is unchecked illegal traffic of banned chemicals especially pesticides through border movement especially in Balochistan. There should be some mechanism developed for control of illegal traffic, and capacity building of law enforcing agencies and custom department is to be done.
- Technical infrastructure for recycling and recovery as well as for disposal of chemicals in the country is at a very low profile.
- There is no sustainable monitoring mechanism for emissions from waste storage sites.
- Overall Pakistan has a poor capacity data acquisition of chemical waste production, storage recycling, monitoring which essential for proper waste management in the country.

CHAPTER NO: 3

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Chapter 3

3. Priority Concerns Related to Chemicals at all Stages in Their Life Cycles

3.1. Priority Concerns Related to Chemicals Import, Production, and use

3.1.1. Background

Most of the materials used in the manufacture of chemical and petrochemicals are flammable and explosive. Many chemicals and petrochemicals are toxic and some are carcinogenic. Because of the highly reactive compounds and the high pressures involved in manufacturing and handling potential explosion hazards, poisoning, and other associated health hazards are much more severe compare to other industries. Some materials used (e.g., chlorine and phosgene) are highly toxic and cause injury on contact. Other materials have long term effects sometimes even in low concentration.

Operational Hazards include accidental release of toxic substances, explosions or fires. Over all in the country there is a lack of preliminary hazard analysis in the small medium and even to greater extent in large enterprises with the exception of few industries.

Large quantities of water are used in the chemical industry for process, cooling, and washing and associated water contamination occurs. Unplanned urbanization and industrial growth in selected area generally and in urban centers particularly created huge environmental problems. Large quantities of industrial and sewage wastes find their ways either into the air or natural water bodies. All the big cities situated at the bank of the rivers dump their liquid and solid industrial wastes directly into their water bodies. According to an estimate Karachi only, dump its 600 million ton sewage daily into the sea. Lahore dumps about 200 million ton liquid and 100 million ton solid waste into river Ravi.

Due to open dumping of industrial/municipal wastes the underground quality of water, near and in the big cities is deteriorating with the passage of time. A brief environmental impact of priority sectors is as follows;

Pakistan's energy-related carbon emissions in 2001 totalled 29.2 million metric tons nearly triple the 1980 level of 9.3 million metric tons. Pakistan's per capita carbon emissions in 2001 were 0.2 metric tons per person.

The table given below gives an overview of the problem areas in the chemical life cycle:

Table 3.1: Description of Problem Areas

Area	Nature of Problem	City/Region	Brief Description of Problem	Chemical(s)/ Pollutant(s)	Present Status
Production	Mitigation of environmental pollution	Largely industrial states like Gadoon, Hattar, and industrial cities like, Karachi, Lahore, Peshawar, Gujranwala, Sialkot, Gujarat, Islamabad, etc	Industries and authorities are engaged in pollution abatement but the measures taken are not adequate so that pollution load receiving to environment is within its assimilative capacity	Treated untreated waste water, emissions, hazardous waste, rejected products, process rejects	Sizable pollution mitigation has been achieved in few areas through wastewater /hazardous waste treatment and disposal facilities. Incineration systems have been set up in few places.
	Implementation of environmental regulations	-	Lack of coordination in agencies		Statutory bodies required/funds/ technical support
	Industrial accidents	Industrial areas throughout the country	Accidental release of chemicals	Various chemical	On-site/ off-site emergency plans have been made by some larger units majority do not have such plans
	Disposal of Hazardous waste	Industrial areas in major cities	Ground water/ soil contamination/ dumping of waste	Heavy metals/ leachable chemicals	Treatment/ incineration/ disposal facilities have been developed in only few industries
	Occupational health	Industrial workers	The health problems are not identified after long time to exposures	Asbestos, Silica, VOCs, PCBs	Although awareness is increasing however proper training / system in Hazards identification is required/ on-site first aid facilities are

					lacking
	General safety awareness	Industrial workers and population close the industrial clusters	Lake of general safety awareness	Exposure to hazardous chemicals	Information on chemicals handled are seldom displayed except in few larger industries dissemination/ safety manuals required
	Transportation	Throughout the country	Accidental Spillage, lack of monitoring of vehicles, untrained drivers/handling staff	Hazardous chemicals	Training programmes for highway police, and transporters required, Guidelines / policies / highways codes need to improve
Use	Supplier Related	Throughout the country	Lack of information and training in handling and use, remedial measures in case of poisoning, contamination of ponds soil and ground water due to over usage	Hazardous chemicals especially pesticides, insecticides and other of toxic nature	The health hazards are manifested after a longtime, majority of farmers are uneducated and unaware of health and environmental implications
Transportation	Accidents/Awareness	Throughout the country	Accidental Spillage, lack of monitoring of vehicles, untrained drivers/handling staff	Hazardous chemicals/petroleum products	Training programmes for highway police, and transporters required, Guidelines / policies / highways codes need to improve
Disposal	Disposal of Hazardous waste	Industrial areas in major cities	Ground water/ soil contamination/ dumping of waste /emissions	Heavy metals/ leachable chemicals/GHGs	Treatment/ incineration/ disposal facilities have been developed in only few industries
Storage	Lack of proper storage facilities	Warehouses, areas where chemicals are stored	Accidents causing economic and life loses,	Hazardous chemicals/in-flammable	Poor enforcement of environmental laws

			untrained handling staff, lack of monitoring/lack of awareness		
	Occupational health	Warehouse workers	The health problems are not identified after long time to exposures	Asbestos, Silica, VOCs, PCBs /hazardous chemicals	Although awareness is increasing however proper training / system in Hazards identification is required/ on-site first aid facilities are lacking
	General safety awareness	Warehouse workers and population close to the warehouses	Lake of general safety awareness	Exposure to hazardous chemicals	Information on chemicals handled and stored are seldom displayed except in few larger warehouses dissemination/ safety manuals required
	Implementation of environmental regulations	-	Lack of coordination in agencies	-	Statutory bodies required/funds/ technical support
Import	Importation of consumer chemicals (like the chemicals which are unknown and/or of mixed use)	Throughout the country	Unknown chemicals are imported which are used in numerous micro-level units	Exposure to unknown chemicals	Consumer chemicals makes it difficult to monitor them/need for more steps taken in this regard like labelling
Distribution and Marketing	Lack of awareness	Throughout the country	Accidental leakage, untrained handling staff / Safety measures	Hazardous chemicals	Training programmes for highway police, and transporters required, Guidelines / policies / highways codes need to improve
	Marketing/Advertisement/ publicity	Throughout the country	Biased advertisement	Hazardous chemicals	Need for implementation

			(only benefits not side effects),Hazardous chemicals sometimes advertised (indirectly as a component of other products)		of advertisement laws regarding providing uses with complete information
	General safety awareness	General public	Lake of knowledge of harmful chemicals/ general safety awareness	Exposure to hazardous chemicals	Information on chemicals handled and stored are seldom displayed except in few larger companies/ dissemination/ safety manuals required

3.2. Overview of Priority Issues in some key Sectors

3.2.1. Pesticides

There are large stockpiles of obsolete pesticides scattered all over the Pakistan. In a study conducted under a POPs project, 168 pesticide sites were surveyed finding 1046 tones of obsolete pesticides in Punjab province, 73 tones at different sites in NWFP, 2000 tones in Sind, 62 tones in Balochistan. The data for Gilgit Baltistan and AJ& K does not exist. Around 250 tones of obsolete pesticides were found at storage sites of Federal Department of Plant Protection. There is no facility for Environmentally Sound Disposal of POPs in Pakistan.

The major use of pesticides is on cotton crop, the dominant sub-sector of Pakistan's agriculture
The cholinesterase (ChE) activity levels measured in the blood of cotton pickers in Multan and Bahawalpur divisions have showed chronic pesticides poisoning. (Tahir, et al., 2001) The residual effects of pesticides applied on crops appear in the food chain. The presence of residues in food and fiber products is threatening the export opportunities to markets in foreign countries.

The use of pesticides on crops is also resulting in the poisoning of domestic animals through various ways. The common sources of animal poisoning are;

- feeding fodders carrying sprayed chemicals
- chemicals residues in the cotton seed cake
- chemicals residues in the wheat straw

Animals succumbed to acute poisoning if fed accidently with poisoned fodder. Major consequences poisoning on animal health include loss in milk productivity (40 percent) loss in vigor (36 percent) and mortality (18 percent). The increased pesticides use severely affects the wild honeybee colonies in the area thus depriving farmer communities of sizeable direct and indirect

benefits. The direct loss is related to decline in production of honey and indirect loss is through reduced yield of pollinated crops due to decline in population of honeybees.

3.2.2. Hospital Wastes

Studies in Pakistan show that large hospitals generate 2.0 kg of waste, per bed per day. Of this, 0.5 kg can be categorized as biomedical risk waste. There are many small hospitals and clinics which also generate risk waste in significant quantities. Daily Medical Waste Generation (from both public & private sector hospitals) is Approx 0.8 million tons (Source: UN & HSA, MoH) Improper disposal practices results in reuse of discarded syringes, IV tubes, blood bags and other equipment which is not designed for either sterilization or reuse. If hospital waste is not properly managed and disposed of, it can result in injury by contaminated sharps and infection with Hepatitis B, C, and HIV. Pakistan – Population 160 million will rise to 250 million by year 2025. Amount of Hospital Waste generated will increase to alarming rates due to growth of population and healthcare facilities. No well established segregation system. Frequent dumping of hospital waste with municipal waste.

Pakistan is also facing such problems. There are no systematic approaches to medical waste disposal. Hospital wastes are simply mixed with the municipal waste in collecting bins at roadsides and disposed off similarly. Some waste is simply buried without any appropriate measure. The reality is that while all the equipment necessary to ensure the proper management of hospital waste probably exists, the main problem is that the staff fails to prepare and implement an effective disposable policy.

Infectious waste can cause diseases like Hepatitis A & B, AIDS, Typhoid, Boils, etc.
A common practice in Pakistan is the reuse of disposable syringes. People pick up used syringes from the hospital waste and sell them. Many drug addicts also reuse the syringes that can cause AIDS and other dangerous and contagious diseases.

Waste containing plastics are burnt, as result Dioxin is produced, which can cause Cancer, birth defects, decreased psychomotor ability, hearing defects, cognitive defects and behavioral alternations in infants. Flies also sit on the uncovered piles of rotting garbage. This promotes mechanical transmissions of fatal diseases like Diarrhea, Dysentery, Typhoid, Hepatitis and Cholera.

Under moist conditions, mosquitoes transmit many types of infections, like Malaria, Dungy virus and Yellow fever. Similarly, dogs, cats and rats also transmit a variety of diseases, including Plague and Flea born fever, as they mostly live in and around the refuse. A high tendency of contracting intestinal, parasitic and skin diseases is found in workers engaged in collecting refuse.

3.2.3. Ship Breaking Activities

Ship breaking activities in Gaddani entails a series of risky task and as a depot of hazardous substances which pose threats to the ambient environment and working people. Depending on their size and function, scrapped ships have an unloaded weight of between 5000 and 40, 000 tones, 95% of which is steel coated with between 10 and 100 tones of paint containing lead, cadmium, organotins, arsenic, zinc and chromium. Ships also contain a wide range of other

hazardous wastes, sealants containing PCBs; up to 7.5 tones of various types of Asbestos, several thousand litters of oil (engine oil, bilge oil, hydraulic and lubricant oils and grease). Tankers additionally hold upto 1000 cubic meters of residual oil. Most of these materials are defined as hazardous waste under the Basel Convention.

The associated procedures and processes associated with decommissioning for scrapping and disposal/recycling induce exposure to surroundings involving hazardous substances and dangerous/harmful situations and operations. Manual, low-paid unskilled workers are allowed to dismantle the ships and undertake the reprocessing/recycling operations without the provision of personal protective safety equipment. Scant attention is paid to health and safety issues and there is generally no systematic training of the workforce. Consequently, injuries and deaths are common place.

Pollution resulting from these activities has both immediate and long-term effects.
It should be noted that a number of the present scrapping facilities are located in the direct vicinity of significant fisheries. It has been reported that the fish stocks have seriously deteriorated following the establishment of scrapping activities. The major environmental concern is lack of containment to prevent toxins from entering into the water, sediment/ground and/or the air. From an occupational safety and health point of view, these factors add to the significance of insufficient precautions, facilities and planning of work.

3.2.4. Pharmaceutical Waste

Waste water pollution is the main issue of pharmaceutical sector in Pakistan. In pharmaceutical industry wastewater is mainly generated through the washing activities of the equipment. Though the wastewater discharge is small in volume; but is highly polluted because of presence of substantial amounts of organic pollutants. Solid waste usually comprises of expired or rejected medicines, spent solvents packaging material and damaged bottles. Level of waste water pollution varies from industry to in dusty depending upon the type of process and the size of the industry.

Studies (Hashmi Imran, 2005) have shown that waste water generated by pharmaceutical industry is heavily polluted with very high quantity of suspended solids, high quantity of organic and inorganic materials (indicated by high values of BOD and COD). Exceptionally high quantity of grease in the wastewater has been observed also. Oily and greasy layers slow down the stream flow and indirectly cause a number of treatment problems.

3.2.5. Printing Industry

Waste produced by printing industry differs from process to process. There are three major waste streams found in the printing industry. They include;

a) Air emissions – printing operations produce volatile organic compounds emissions from the use of cleaning solvents and inks as well as alcohol and other wetting agents used in lithographic printing. Larger printing facilities are also a source of Sulfur dioxide emissions. Finishing operations include final trimming, die cutting, folding, collating, binding, laminating embossing, and assembling operations and the primary waste in such operations are binding and laminating chemicals and scrap papers.

b) Water waste – water waste from printing operations, containing lubricating oils, waste ink, clean-up solvents, photographic chemicals, acids, alkaline and plate coatings as well as materials such as silver, iron, chromium, copper and barium.
c) Solid waste – including empty containers, used films packages, outdated materials, damaged plates, developed films, test production, bad printing or spoilage, damaged products and scrap papers.

3.2.6. Pulp and Paper Product

The significant environmental impact, of the manufacturing of pulp and paper, results from the pulping and bleaching process. In some process sulfur compounds and nitrogen oxides are emitted to the air. And chlorinated and organic compounds, nutrients and metals are discharged to the waste waters.

In the pulping process emissions of reduced sulfur compounds like total reduced sulfur (TRS), hydrogen sulfide, methyl mercaptan, dimethyl sulfide and dimethyl disulfide are emitted at the rate of 0.3-3 kilograms per metric ton of air dried pulp.

Waste water contains chlorinated organic compounds which may include dioxins, furans, and other absorbable organic halides. Phosphorus and nitrogen are also released into waste waters. The main source of nutrients nitrogen and phosphorus compounds is raw materials such as wood.

The principle solid waste of concern includes wastewater treatment sludge. Solid materials that can be reused include waste paper, which can be recycled and bark which can be used as fuel.

The most significant environmental issues are the discharge of chlorine-based organic compounds (from bleaching) and other toxic organics.

3.2.7. Electronic Waste

Despite being a signatory to the Basel Convention that restricted importing used/old computers, more than 500,000 used computers are brought in to the Pakistani computer market each year. USA, Singapore and some European countries are using Pakistan as a dumping ground for these obsolete computers. 15-40 % of these computers can be used and the rest is waste and recycled by women and children in godowns working in terrible conditions and exposed to toxic fumes from burning hardware and other material. Once the equipment arrives in Pakistan, it is separated according to the conditions. Working machine is sold in market, usable parts are removed and unusable machines are sent to the enterprising recycling industry in various parts of the Karachi. This is an overwhelming informal sector where occupational safety laws, health safeguards and prerequisites such as properly ventilated working areas are rarely in place.

These machines contain high amounts of hazardous materials such as lead, mercury, chromium and various sorts of plastics. Since the bulk of the imported consignment is obsolete or beyond repair so only useable parts are taken out the rest are discarded allowing unknown quantities of the poisons to seep into the country's environmental resources. Furthermore the health of all the people working in the unregulated 'recycling' of such equipment is compromised.

The waste generated by this industry is dumped into the Lyari River where it bisects Shershah, and eventually finds its way into the Arabian Sea where it contaminates the marine ecosystem. Some of the waste is dumped into the landfills where it contaminates the soil and after leeching through, pollutes subsoil aquifers.

Amongst the major contaminants is lead, used in glass panels, gaskets in computer monitors and the solder in circuit boards which damages the central/peripheral nervous system and the reproductive system and poisons the blood and kidneys. It also accumulates in the environments and has an acute effect on plants, animals and microorganisms.

Cadmium found in SMD chip resistors, infrared detectors and semiconductor chips, accumulates in kidneys and has an irreversible effect on human health. Mercury used in a large number of electronic items such as sensors, switches and printed circuit boards, enters the food chain very easily and damages the brain kidneys and harms foetal development. Meanwhile chromium, which is used decoratively or as corrosion protection passes easily through cell membranes and can potentially damage DNA while plastics and PVC release dioxins when burnt.

Table 3.2: Priority Concerns Related to Chemicals

Nature of Problem	Scale of Problem	Level of Concern	Ability to Control Problem	Availability of Statistical Data	Specific Chemicals Creating Concerns	Priority ranking
Air Pollution	High	High	Low	Medium	CO2Smoke	Medium
Pollution of Inland Waterways	High	High	Low	Low	Heavy Metals, BOD, COD	High
Marine Pollution	Medium	Medium	Low	-	Heavy Metals	Low
Ground Water Pollution	High	High	Low	Low	Virus, Bacteria	high
Soil Contamination	Medium	Medium	Low	Medium	Chemicals, Health Hazard	Medium
Chemical Residues in Food	High	High	Low	Low	Pesticides, Hormones	Medium
Drinking Water Contamination	High	High	Medium	Low	Virus, Chemicals	High
Hazardous Waste Treatment/ Disposal	Medium	Medium	Low	-	Bio hazard	High
Occupational	Medium	Low	Low	Low	Pesticides	Medium

Health: Agriculture						
Occupational Health: Industrial	Medium	Medium	Low	Low	Chemicals, Bio, Organic	Medium
Public Health	High	High	Low	Medium	Bio, Organic	Medium
Chemical Accidents: Industrial	Low	High	Medium	-	Acids, Alkalis, Organic solvents, etc.	Low
Chemical Accidents: Transport	High	High	High	Low	Chemicals, gases, poisons	Low
Unknown Chemical Imports	Medium	Low	Low	-	MSDS	Low
Storage Disposal of Obsolete Chemicals	High	High	Low	Medium	Pesticides	High
Air Pollution	High	High	Low	Low	CO2	Low
Chemical Poisoning/ Suicides	Medium	Medium	Low	-	Pesticides pills	Low
Persistent Organic Pollutants						
Others						

Source: Ministry of Science and Technology

3.2.8. Occupational Health and Safety Issues in SMEs

3.2.8.1. Furniture carpentry

In the furniture industry the surface finishing chemicals, particularly the lacquers, contain toxic material such as isocyanates and ethylene diamine catalyst for epoxy resins which are skin hazards. Exposure to these chemicals mist was excessive and could have serious health implications. No respiratory protection is used by the workers. Ventilation and isolation is often insufficient to control the exposure through inhalation and skin contact.

3.2.8.2. Ink production

Producing a batch of solvent based ink with certain specification entails mechanical mixing of 10-15% ink pigment powder, 60% mono- or mixture organic solvent, 22% resin (18% of which is resin solvent), and 5% antifoaming agents. During the process, workers are exposed through the respiratory and dermal routes to appreciable levels of powder and solvent vapour.

3.2.8.3. Foundry and electroplating

Silica dust from foundry sand, calcium carbonate dust, carbon dioxide and carbon monoxides gas due to incomplete combustion, and toxic metal fumes resulting from pouring the molten metal into the moulds are the main chemicals presenting a potential for exposure through inhalation. The waste, including the foundry sand is disposed of at open dump sites after exhaustive use. Small amounts of non-recyclable zinc are disposed of in open areas.

In the electroplating section of the industry, workers are potentially exposed to concentrated acids and alkali. They are also exposed to acid mist, cyanide mist and alkaline mist from electroplating baths. Exposure to the dust from the different chemicals could also occur during manual handling of the articles during weighing and transfer to baths. Workers on the grinding machines are potentially exposed to fine metal dust liberated from the metal pieces. Waste chemicals are normally disposed off by drainage in the public sewers.

3.2.8.4. Shoe making

Exposure to ahessives is the main occupational hazard in this industry. All operations are carried out manually. Workers are exposed through the respiratory route while handling adhessives which contain toluene. Workers on the grinding machines are exposed to leather and rubber dust containing adhesive residues and other colouring material. The main wastes produced during the production are leather cutoffs and empty containers containing residues of adhesives and unevaporated solvent. All waste is disposed of in municipal bins.

3.2.8.5. Gold electroplating

This industry uses a number of chemicals for gold plating. The potential for exposure to chemicals exists in all stages of the process. First the workers are likely to be exposed to alkali and cyanide mist from the degreasing bath. Exposure to nickel salts from the electroplating bath could occur. Manual handling of concentrated acids and alkalis exposed the workers to acid fumes and caustic soda dust. The grinding processes exposed the workers to dust containing metals and oxides.

3.2.8.6. Textile dyeing

The enterprises use a variety of numerous chemicals including acids, alkalis, bleaching agents, flammable and explosive solvents, dyes and pigments. The dyes involve certain chemicals that are hazardous to the human skin. Some Azo colouring agents have carcinogenic properties and may form amines which have carcinogenic and mutagenic properties. Approximately 70% of all dyes used in textile industry are Azo dyes. The process involves manual mixing of chemicals and numerous exposure patterns. Liquid waste from dyeing machines and a sedimentation tank are usually discharged into the municipal sewers. Some of the open drains within the enterprise could with time clog and lead to spillage within the vicinity.

In general, in SMEs chemical containers are not properly labelled. The majority of the SMEs store enough chemicals for weeks use on the premises. Only the larger enterprises store chemicals in hundreds and thousands of tonnes on premises. Others, such as pesticide formulators, stored large quantities during peak seasons only. All such storage faculties are devoid of any health and safety measurements.

In larger cities in Pakistan, chemicals are sold in wholesale markets such as those selling grocery items and cereals. The chemicals sold in such markets included toxic and flammable materials, which given their large quantities, posed grave dangers to residents and the public and the immediate environment. The situation would become particularly more serious when the goods are displayed outside the shops in an attempt to attract customers, causing encroachments of the road, a condition which, under hot climatic conditions, aggravates their dangers. The majority of the SMEs possess low fire and explosion potential.

In general, there is a marked absence of engineering and other occupational hygiene control measures in SMEs. Ventilation systems are uncommon, and the concept of substitution is unpopular. While in some enterprises workers use improvised personal protective equipment such as old car tyre tubes which are worn as boots to provide skin protection, proper personal protection is non-existent.

Similarly, the use of barrier creams and lotions for the protection against the deleterious effects of solvents is unheard of. Fire fighting emergency and first aid facilities are also inadequate. With the exception of a few enterprises, air monitoring is unknown. Few medium-sized enterprises had access to biological monitoring and social security systems, a privilege which the majority did not enjoy.

Most of the industrial chemicals used by SMEs are packaged in plastic containers which are corrosion proof and non-destructible. Such qualities encourage people to use the empty containers for other purposes including the storage of water and foodstuffs. This in turn allows chemical residues to contaminate water and food with subsequent short and long-term health effects.

Chemical liquids, solids, gases and fumes re released to the environment damaging not only cultivable land but polluting water sources and damaging the health of plants and other livings. The effect on the health of the public could not be easily assessed. The discharge of untreated chemical wastes from tanneries into the environment defies the imagination of mankind. In the following table some of the health issues in SMEs have been summarized:

Table 3.3: Health Related Issues in SMEs in Pakistan

Major Issue	Industry Process	Chemicals Used
Headache, skin problems	Auto repair (denting and painting	Calcium carbide, paint (nitrocellulose based), body filler (mixture of metal oxides and resins)
Headache, respiratory skin and eye problem	Laundries	Calcium hypochlorite
Headache and skin problems	Furniture, screen printing and tannery	Glue (formaldehyde and casein), Benzene and Chromic acid
Skin burns, scalds	Carpet washing, Wool dyeing	Sodium hydro oxide/Hypochlorite, Acetic acid, Sulphuric acid

Eye problems	Positive and Plate making (for printing presses)	Inkote, Polychrome, Eurogum, Integran
Headache, respiratory and skin problems	Paint manufacture	Titanium dioxide, Zinc oxide, Methylene chloride
Respiratory Problems	Chipboard manufacture, Polyurethane foam manufacture and Polyethylene glycol	Formaldehyde, Urea, Ammonia, Toluene disocyanate
Skin respiratory problems	Fiber glass manufacture, Pesticides packing, Surgical instruments manufacture	Styrene, Methyl ethyl ketone, Megamidophos, Cypermethrin, Trichloroethylene, Chromium sulphate
Burn, scalds, irritation	Soap and allied products manufacture	Sodium carbonate, Sodium nitrate, Sodium hypochlorite

3.3. Comments/Analysis

- The statistical data related to priority concerns of chemical management in Pakistan is very meagre. In absence of such critical information it is difficult to prioritise the issues.
- Database related to occupational accidents, chemical accidents, chemical poisoning, chemical injuries, drinking water contamination, food contamination, and deaths caused due to chemical accidents is absent. The industry as well as related institutions does not maintain any record.
- The mechanism for collection of relevant data should be developed on priority basis. This is very important for risk management of chemical cycle.
- Chambers of commerce and industries, trade associations, trade unions and NGOs can play a vital role to develop a sustainable mechanism for data collection, compilation and dissemination.

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Chapter 4

4. Legal Instruments and Non Regulatory Mechanism for Life Cycle Managing of Chemicals

4.1. Background

The chapters 1, 2 and 3 have highlighted the extent of the country, diversity and concentration of industry, chemical production and use, and major issues related to chemical sector. For sound management of these chemicals a well defined legal framework is required with implementation mechanism. In Pakistan a fairly comprehensive legislation exists which covers most of the stages of chemicals life cycle.

Due to cross-sectoral nature of chemical management, different rules, regulations, acts, or standards deal with the chemicals in different ways. There certain legal instruments which are crafted for particular category of chemicals, e.g. petroleum, pesticides, drugs and explosives. The other legal instruments are those which do not directly deal with chemicals but act indirectly for example, Motor Vehicle act. There are very comprehensive environmental laws in Pakistan which cover all aspects of chemical life cycle.

In addition to these legal instruments, there are non regulatory mechanisms adopted by industry itself, e.g. ISO 14001 for Environmental Management System, OHSAS (Occupational Health and Safety Assessment Series) and OHSMS (Occupational Health and Safety Management System). In the following section summary of the existing legal instruments related to chemical management in Pakistan is given. The table 4.2 gives a compressive list of all the laws, regulations. Acts, rules and other legal instruments along with the responsible ministries, chemical use categories, objectives of legislation and articles relevant to the chemical management.

4.2. Overview of National Legal Instruments Which Address the Management of Chemicals

The table 4.2 gives a compressive list of all the laws, regulations. Acts, rules and other legal instruments along with the responsible ministries, chemical use categories, objectives of legislation and articles relevant to the chemical management. Legal instruments in terms of Acts and Rules are classified into four broader categories with respect to their area of operation as follow;

1. Environmental Management
2. Chemical Safety and Emergency Management
3. Specific Chemicals Category
4. Chemicals Management

The enforcement ranking of the legal instruments has also been given in the table 4.2.

Table 4.1: List of Legal Instruments Related to Different Areas

No.	Area	Related Legal Instrument
1.	Acts and Rules Related to Environmental Management	Pakistan Environmental Protection Act (PEPA), 1997
		National Environmental Quality Standards (Self-Monitoring and Reporting by Industry) Rules 2001
		Pollution Charge for Industry (Calculation and Collection) Rules 2001
		National Environmental Quality Standards (Certification of Environmental Laboratories)
		Environmental Samples Rules 2001
		Provincial Sustainable Development Fund Board (Procedure) Rules 2001
		Pakistan Environmental Protection Agency Review of IEE and EIA Regulations 2000
		Environmental Tribunal Rules 1999
		Pakistan Standards and Quality Control Authority Act, 1996
		National Environmental Quality Standards 1993
2.	Acts and Rules Related to Chemical Safety and Emergency Management	Hazardous Substances Rules, 2003
		National Disaster Management Ordinance 2007
3.	Acts & Rules Related to Specific Category	Pakistan Nuclear Regulatory Authority Ordinance 2001
		The Agricultural Pesticides Ordinance, 1971
		The Explosive Substances Act 1908
		Health Care Waste Management Rules 2005
		Explosives Act 1884
		The Motor Vehicles Act, 1939
		Mines Act 1923
		Drugs Act 1976
		Pollution of Environment Caused by Smoke, Emitting Vehicles, Traffic Muddle,1996
		(Balochistan) (N.W.F.P) (Punjab) (Sindh) Motor Vehicles Ordinance, 1965
		West Pakistan Motor Vehicle Ordinance, 1965
		Petroleum Act 1934
		Regulation of Mines and Oil Fields and Mineral Development (Government Control) Act, 1948
		Pakistan Onshore Petroleum (Exploration & Production) Rules, 2009
4.	Other Acts and Rules Relevant to Chemical Management	The Dangerous Cargoes Act, 1953
		The Carriage of Goods by Sea Act, 1925
		The Railways Act, 1890
		The Karachi Port Trust Act, 1886
		The Pakistan Science Foundation Act, 1973
		The Territorial Waters and Maritime Zones Act, 1976
		The Balochistan Local Government Ordinance, 2001
		Sindh Local Government Ordinance 2001
		Sindh District Government (Conduct of Business) Rules 2001
		Provincial Sustainable Development Fund (Utilization) Rules 2003
		Port Qasim Authority Act 1973
		Factories Act, 1934
		Sindh Smoke-Nuisances Act 1912
		The Punjab Local Government Ordinance, 2001

		Pakistan Merchant Shipping Ordinance 2001
		Motor Vehicle Ordinance 1965
		Dangerous Cargoes Act 1953
		Ports Act 1908
		Export Processing Zones Authority Ordinance 1980
		Imports and Exports (Control) Act 1950
		Provincial Sustainable Development Fund Board (Procedure) Rules 2001
		The NWFP Local Government Ordinance, 2001
		The Islamabad Capital Territory Local Government Ordinance, 2002
		The Cantonments Ordinance, 2002
		Export Policy Order, 2008.
		The Customs Act, 1969 (IV of 1969)
		Import Policy Order, 2009

4.3. Summary Description of Key Legal Instruments Relating to Chemicals

4.3.1. Pakistan Environmental Protection Act (PEPA), 1997

The backbone of Pakistan's environmental protection system, PEPA, provides comprehensive legislative authority to address the range of environmental issues with its jurisdiction over all environmental mediums and grant of broad powers to regulatory bodies to implement any rules developed under the act.

Fresh Water/Air Pollution

Under PEPA 1997, the term environment is defined to include water (Section 2(x)(a)) and various forms of pollution are defined in detail. In Section 2(vi), the term discharge is defined as "spilling, leaking, pumping, depositing, seeping, releasing, flowing out, pouring, emitting, emptying or dumping" while Section 2(viii) defines effluent as "any material in solid, liquid or gaseous form or combination thereof being discharged from industrial activity or any other source." Emission standards, meanwhile, are defined in Section 2(ix) as "permissible standards established by the Federal Agency or a Provincial Agency for emission of air pollutants and noise and for discharge of effluents and waste." Section 11 prohibits discharges and emissions in excess of the limits prescribed under the National Environmental Quality Standards, or NEQS (see SRO 742(I)/93 dated 24 August 1993 and SRO 549(I)/2000 dated 8 August 2000). Section 16 allows an environmental protection order to be issued in cases where discharges and emissions are found to be causing or likely to cause "an adverse environmental effect". Section 12, which requires an initial environmental examination (IEE) or an environmental impact assessment (EIA) to be carried out for all projects, can be used to ensure that new development does not damage natural resources, including freshwater.

Mining & Petroleum

Act requires parties desiring to commence a project to submit an EIA or IEE to the Federal Agency (Section 12). A project is defined under Section 2(xxxv)(d) to include mining, prospecting and quarrying. At the same time, the Federal Agency may itself issue an environmental protection order in cases where extraction processes are causing or likely to cause an adverse environmental effect (Section 16).

The penalty for non-compliance with the provisions governing discharges and emissions (Section 11), and environmental protection orders (Section 16) is a fine that may extend to 1 million rupees for a first offence (Section 17(1)). For non-compliance with provisions governing the handling of hazardous substances (Section 14), fines may extend to 100,000 rupees (Section 17(2)). Penalties for repeat offenders may include closure or confiscation of the factory, machinery, equipment or substance involved in the offence; an order to restore the environment at the violator's own.

Industrial Production

Industrial activity is defined in PEPA as "any operation or process for manufacturing, making, formulating, synthesizing, altering, repairing, ornamenting, finishing, packing or otherwise treating any article or substance with a view to its use, sale, transport, delivery or disposal, or for mining, for oil and gas exploration and development, or for pumping water or sewage, or for generating, transforming or transmitting power or for any other industrial or commercial purposes" (Section 2(xxii)). The wide scope for regulating industrial activity, provided by the definition, is reflected in the operative provisions of the law, particularly the prohibition on certain emissions with provisions for levying pollution charges
(Section 11); IEE/EIA (Section 12); licensing (Sections 14 and 15); and environmental protection orders (Section 16).

A project is defined to include the construction, operation, alteration, expansion, repair, decommissioning or abandonment of factories or other installations (Sections 2(xxxv)(c) and 2(xxxv)(f)). PEPA requires parties desiring to commence a project to submit an EIA or IEE to the Federal Agency (Section 12). Meanwhile, the Federal Agency may issue an environmental protection order in cases where discharges, emissions, waste disposal or the handling of hazardous substances are causing or likely to cause an adverse environmental effect (Section 16).

The penalty for non-compliance with provisions governing discharges and emissions (Section 11), and environmental protection orders (Section 16) is a fine that may extend to 1 million rupees for a first offence (Section 17(1)). For non-compliance with provisions governing the handling of hazardous substances (Section 14), fines may extend to 100,000 rupees (Section 17(2)). In addition to imprisonment for up to two years, penalties for repeat offenders may include closure or confiscation of the factory, machinery and equipment involved in the offence; an order to restore the environment at the violator's own cost; and an order to pay compensation for any loss, bodily injury or damage to health or property caused by the violation (Section 17(5)).

Transport

PEPA 1997 prohibits the operation of motor vehicles that emit air pollutants or noise in excess of levels determined in the NEQS. For the purpose of this law, motor vehicles are defined to include land vehicles, chassis and trailers, but not vehicles running on fixed rails (Section 2(xxvii)). The provisions of PEPA apply only to land vehicles. The NEQS set limits on smoke, carbon monoxide and noise pollution from new and used vehicles. Limits for carbon monoxide are 4.5–6 per cent, exceeding international standards of 2–3 per cent. Nitrogen oxides, sulphur oxides, lead and benzene emissions are not mentioned. For noise emissions, the limit is 85 decibels 7.5 meters from

the source (SRO 742(I)/93 dated 24 August 1993, Annex III). Enforcement of the NEQS is the responsibility of the Federal Agency (Section 6(1) (f)).

The Federal Agency establishes standards for the quality of ambient air, water and land. While different standards may be set for emissions from various sources and for different areas and conditions, if such standards are less stringent than the NEQS, prior approval must be obtained from the Pakistan Environmental Protection Council (Section 6(1) (g)). Section 11 prohibits emissions of air pollutants or noise in excess of the NEQS or, where applicable, standards established under Section 6(1)(g), and allows the federal government to levy a pollution charge on parties violating these standards. With respect to motor vehicles, the Federal Agency may direct any motor vehicle or class of vehicles to install pollution control devices or other equipment, undergo testing or maintenance, or use particular fuels, and such vehicles will not be permitted to operate until these directions are complied with (Section 15).

Handling of Hazardous Substances
Section 14 prohibits the generation, collection, consignation, transportation, treatment, disposal, importation, storing or handling of any hazardous substance without a license issued by the Federal Agency; and in such manner as may be contradictory to the provisions of any other law for the time being in force, or any international treaty, convention, protocol, code, standard, agreement or other instrument to which Pakistan is a party.

4.3.2. National Environmental Quality Standards (Self-Monitoring and Reporting by Industry) Rules 2001

These Rules, framed under PEPA, place certain obligations on industry to monitor and report to the Federal Agency emissions, effluents discharged and other data sets.

4.3.3. Pollution Charge for Industry (Calculation and Collection) Rules 2001

These Rules, framed under PEPA, prescribe the method for calculating and collecting levies that may be imposed in the form of an industrial pollution charge. In the process of determining the pollution level of an industrial unit, inspection teams must include not more than two representatives each drawn from any two of the authorised non-government organisations listed in Schedule II (section 5).

4.3.4. National Environmental Quality Standards (Self-Monitoring and Reporting by Industry) Rules 2001

This Act is meant for self-monitoring and reporting by industry to ensure National Environmental Quality Standards, by reducing discharge of liquid effluents and gaseous emissions in order to control environmental pollution. Under Section 3 all industrial units are responsible for correct and timely submission of Environmental Monitoring Reports to the Federal Agency.

According to Section 9 (1) Environmental Monitoring Report comprises of a Liquid Effluents Monitoring Report, a Gaseous Emissions Monitoring Report and a Cover. Under sub-section (2) all measurements of priority parameters contained in the Environmental Monitoring Report

submitted by an industrial unit are to be based on test reports of a certified environmental laboratory.

The Gaseous Emissions Report covers the priority parameters listed in Schedule VII, and includes, every two years, metal analysis of all gaseous emissions from the industrial unit according to subsection (3). According to Section 10, sampling, testing and analysis of effluents, gaseous emissions and waste is to be carried out in accordance with the Environmental Samples Rules, 2001.

4.3.5. National Environmental Quality Standards (Certification of Environmental Laboratories) Regulation 2000

This Act is expedient to provide the regulations for the certification of a laboratory to function as an environmental laboratory. The purpose of an environmental laboratory is to ensure that all the provisions of National Environmental Quality Standards are being complied by.

According to Section 3, the functions of an environmental laboratory is to test and analyze samples of air, water, soil, effluents or wastes to determine whether such samples comply with the National Environmental Quality Standards; to measure noise being emitted at any place by any industrial or other activity or motor vehicle; to issue test reports containing the results of tests and analyses; to carry out such experiments, studies and investigations as may be required by the Federal Agency to monitor and enforce and where necessary to propose revision of the National Environmental Quality Standards; to send an annual report of its activities to the Federal Agency, including a list of all test reports issued by it; and to carry out such other functions as may be entrusted to it by the Federal Agency from time to time.

4.3.6. Environmental Samples Rules 2001

These Rules, framed under PEPA, allow authorised officers to enter and inspect premises (section 4) in order to take samples of effluents or emissions (section 7(1)). Procedures for taking, storing and transporting samples are described.

4.3.7. Provincial Sustainable Development Fund Board (Procedure) Rules 2001

These Rules, framed under section 31 of PEPA, provide procedures for the operation of a Sustainable Development Fund and the establishment of a Sustainable Development Board.

4.3.8. Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations 2000

These Regulations, issued under section 33 of PEPA 1997, are to be read with PEPA section 12. They contain detailed procedures that must be followed in the IEE/EIA process, such as conducting public hearings, issuing notices, recording decisions and accepting or rejecting an EIA/IEE. Section 5(a) requires that an EIA is carried out for any project likely to cause an "adverse environmental effect".

Schedule I to the Regulations sets out the types of small-scale projects that require an IEE. These include the designation of "environmentally sensitive areas"; urban development operations

including water supply and treatment installations, and waste disposal facilities; the establishment of specified types of farms; commercial mineral extraction projects; industries, and manufacturing and processing activities; highway construction projects; and hydel, water management and dams. Schedule II specifies the types of large-scale projects that require an EIA. These include urban development projects; mining, smelting and processing operations; industries, and manufacturing and processing activities; highway construction projects; airports and railway installations; hydel, water management and dams; and tourism development projects.

The Regulations provide for the monitoring of projects after completion. Section 18 requires owners to submit an annual report to the Federal Agency. This report must summarise operational performance with an emphasis on adequate maintenance and measures to mitigate adverse effects on the environment. The Federal Agency is authorised to cancel the approval of any project at any time on the basis of such reports or its own investigations, if it is found that conditions of approval have been violated or false information provided (section 19).

4.3.9. Environmental Tribunal Rules 1999

These Rules, issued under section 33 of PEPA 1997, allow for the establishment and functioning of environmental tribunals. The Rules provide for procedural and operational matters including the qualifications of tribunal members (section 4). Proceedings of the Tribunal are open to the public, except in certain specified matters (section 18). Tribunals are required to make "every effort" to dispose of cases with a 60-day period (section 16).

4.3.10. Pakistan Standards and Quality Control Authority Act, 1996

This Act provides for the establishment of Pakistan Standards and Quality Control Authority to provide for the standardization and quality control services; Chapter III, Sub-section (ii), (vi) and (x) of section 8 deals with the inspection and testing of products and services for their quality, specification and characteristics, during use and for import and export purposes; providing for the quality labelling standards which specify ingredients, performance, specification, usage, methods and other relevant quality control matters; and to stop manufacture, storage and sale of such products which do not conform to the Pakistan or any other country's standards recognized by the Authority respectively.

Sub-section (1) & (2) of Section (13) prohibit, restrict or control the taking out of Pakistan of articles which do not bear the Authority mark of regulate practices, including trade practice and procedure connected with the export of such articles, under section 16 of the Customs Act, 1969 (IV of 1969). Sub-section (1) of Section (14) prohibits the manufacture, storage and sale of any article which does not conform to the Pakistan standard.

Under sub-section (1) of section (20), the contravention of the provisions of section 10, 11 or 12 is punishable either with imprisonment which may extend to one year, or with fine not less than thirty thousand rupees, or with both. Under section (21), the contravention of the provisions of section 13 is liable under the provision of the Customs Act, 1969 (IV of 1969), either with imprisonment which may extend to one year, or with fine not less than fifty thousand rupees, or with both. Under section (22), the contravention of the provisions of section is punishable either

with imprisonment which may extend to one year, or with fine not less than fifty thousand rupees, or with both.

4.3.11. National Environmental Quality Standards 1993

This Order was issued under the Pakistan Environmental Protection Ordinance 1983. Although PEPA 1997 repeals the 1983 Ordinance, these standards remain in force. The NEQS specify maximum limits for municipal and liquid industrial effluent (section 2, with Annex I), industrial gaseous emissions (section 2, with Annex II), and exhaust and noise pollution from motor vehicles (section 2, read with Annex I). These standards have been revised and amended from time to time, and substantively so in the year 2000.

4.3.12. Health Care Waste Management Rules 2005

Between the previous decade and present situation, the legislative and regulatory framework has marginally improved. The Pakistan Environmental Protection Act 1997 (PEPA) has been the key statute that provides legal umbrella cover to activities of environmental management including HCWM. The law attaches significant importance towards the strict compliance with National Environmental Quality Standards (NEQS). In addition, the Federal Ministry of Health issued HCWM Guidelines in 1999 with an advice to all the facilities for compliance of the same.

The Ministry of Health has also issued Health Care Waste Management Rules 2005 which encompass the major domains of HCWM. It is disappointing to note that they are not followed by the health care establishments with very few exceptions. The ancillary laws and controlling authority towards HCWM include Pakistan Penal Code (PPC) 1960 where negligence towards poisonous, toxic and hazardous waste is an offence. At the provincial and district / city level, the Sindh Local Government Ordinance (SLGO) 2002 extends the responsibility of solid waste management to the district governments and its subordinate tiers. As discussed earlier, drastic changes in laws and applications are anticipated, this will have implications on the waste management services also.

4.3.13. The Dangerous Cargoes Act, 1953 Act

This Act is meant to make further provisions for the safety of ports in respect of the transit, working and storage of dangerous cargoes and incidental matters. Section **3:** The Central Government can make such rules as appear to be necessary or expedient for securing the safety of any port and preventing or dealing with explosions and fires on vessels carrying dangerous cargoes within the limits of any port, and generally for the transit working and storage of dangerous cargoes and matters incidental.

Section 9: Under subsection (1) & (2) the contravention of any provision of this Act, or the rules or order under this Act is punishable with imprisonment for a term which may extend to two years or with fine which may extend to five thousand rupees or with both.

4.3.14. The Carriage of Goods by Sea Act, 1925

This Act is expedient to amend the provisions of law made by the Carriage of Goods by Sea Act, 1924, with a view to establish the responsibilities, liabilities, rights and immunities attaching to

carriers under bills of lading. Chapter I, Section 5: Under this section Article VI of the Rules (the carriage of goods by sea act 1925) is related to the carriage of goods of any class instead of to particular goods by sea in ships from a port in Pakistan to a port in India or Ceylon.

Chapter II Article II: According to the provisions of Article VI, under every contract of carriage of goods by sea the carrier, in relation to the loading, handling, stowage, carriage, custody, care, and discharge of such goods, is subject to the responsibilities and liabilities, and entitled to the rights and immunities set in this act.

Chapter II Article III: Section (1), sub-clause (c) deals with the fitness and safety of the holds, refrigerating and cooling chambers, and all other parts of the ship in which goods are carried, for their reception, carriage and preservation. Section (2) deals with the proper and careful loading, handling, stowing, carrying, keeping, caring and discharging of the goods carried.

4.3.15. The Motor Vehicles Act, 1939
(As Updated up to 31st August, 1978)

4.3.16. The Railways Act, 1890
This Act consolidates amends and adds to the law relating to Railways. According to sub-section (1)(c) of Section 47, Chapter VI, general rules should be made by the railway company for declaring what are dangerous or offensive goods, and for regulating the carriage of such goods. The breach of sub-section (1) (c), under sub-section (2) is punishable by fine which may extend to any sum not exceeding fifty rupees. Section (59) of Chapter VI relates to rules for the carriage of goods of dangerous or explosive nature by railway.

The carriage of any dangerous or offensive goods is not allowed by railway until a prior notification of their nature is given to the station-master and their nature is distinctly marked on the outside of the package containing them. According to Section 107 of Chapter IX, if in contravention of section 59 a person takes with him any dangerous or offensive goods upon a railway, or tenders or delivers any such goods for carriage upon a railway, it is punished with fine which may extend to five hundred rupees, and is also responsible for any loss, injury or damage which may be caused by reason of such goods having been so brought upon the railway.

4.3.17. Pakistan Merchant Shipping Ordinance 2001
The law contains a full chapter on the prevention of pollution from ships (Chapter 43, Sections 552–575), based on the provisions of the International Convention for the Prevention of Pollution from Ships (1973), as modified by the Protocol of 1978. Tankers above a specified tonnage are required to carry an "international pollution prevention certificate" (Section 553). The discharge of sewage and garbage from ships into the sea is prohibited, except where permitted in accordance with the 1973 Convention (Section 554).

Similarly, the discharge of oil, "oily mixture or harmful substance [sic]" (Section 555) and noxious liquids (Section 556) is prohibited, except in accordance with the Convention. The ordinance prohibits the dumping of any waste into the sea, and violation of this provision is punishable with

imprisonment for a minimum term of two years and a maximum fine of 1 million US dollars (Section 567), as well as cleaning charges (Section 574). In order to ensure compliance, the ordinance provides for maintaining certain records and equipment, and empowers the federal government to conduct surveys of ships (Sections 559–562).

4.3.18. The Karachi Port Trust Act, 1886

It is expedient to vest the Port of Karachi in a trust and to provide for the management of the affairs of the said port by trustees. Section 32, 33, 34, 35 & 36 of Chapter V deals with the maintenance of wharves, quays, stages, jetties, piers, warehouses, sheds and appliances for the expeditious and convenient shipment and landing goods . Section 43 of Chapter V deals with the determination of scale of tolls and charges by the board for the use, services provided storage, and landing and shipment of the goods of the wharves, quay, stage, jetty & pier.

Under Chapter VII, Section 72, the infringement of the Section 33,34 or 36 is punishable by fine which extend to two hundred thousand rupees, and if the infringement be continuing, with a further fine which extend to twenty thousand rupees for every day such order or condition is infringed. Under Chapter VII, Section 75, the removal of any goods, vessel, animal or vehicles with the intention of evading payment of the tolls, dues, rates or charges lawfully payable is punished with fine which may extend to two hundred thousand rupees.

According to Chapter X, Section 90(1) & (2) port would be kept pollution free by the board and no discharge of solid and liquid wastes, oily naxious, radioactive and hazardous substance, bilge discharges from tankers and vessels, residues and mixtures containing noxious solid and liquid wastes, deballasting of unwashed cargo tanks and line washing garbage would be made within the Port limits. According to Chapter X, Section 90 (3), contravention of the provisions of sub-section (2) is liable to penalty not exceeding ten million rupees for each contravention in addition to the charges for cleaning of the Port and removal of pollution

4.3.19. Ports Act 1908

This act consolidates prior laws relating to the Karachi Port and Port Qasim, and extends to the navigational rivers and channels leading to these ports. It regulates the working of the ports and the maintenance of harbour facilities, containing detailed rules as well for the "conservation of ports" (Chapter IV). These provisions, such as those prescribing heavy penalties for discharging "rubbish" and ballast into port waters without permission (Section 21), are aimed at ensuring that the business of the port progresses smoothly. The law contains no provisions for the protection of marine resources within the harbour or in surrounding areas.

4.3.20. The Pakistan Science Foundation Act, 1973

It is expedient to provide for the establishment of the Pakistan Science Foundation. According to Section 3(1), the purpose of establishment of Pakistan Science Foundation is to promote and finance scientific activities having a bearing on the socio-economic needs of the country.

4.3.21. Agricultural Pesticides Ordinance (Extension to the Northern Areas Order), 1995
This is an order to extend the Agricultural Pesticides Ordinance, 1971 (II of 1971) to the Northern Areas. Under Section 2, the agricultural Pesticides Ordinance, 1971 (II of 1971), as in force in Pakistan immediately before the commencement of this Order, and all amendments which may be made after such commencement and all rules and orders which may have been, or may be, made or issued thereunder shall, as far as may be extend to the Northern Areas.

4.3.22. The Territorial Waters and Maritime Zones Act, 1976
This Act provides for the declaration of the territorial waters and maritime zones of Pakistan. Section 5 (2)(d), 4 (b)(iii) and 6 deals with the preservation and protection of the marine environment; and preventing and controlling marine pollution. According to sub-section (3) of Section (3) foreign super ankers, nuclear powered ships and ships carrying nuclear or other inherently dangerous or noxious sub-stances or materials may enter or pass through the territorial waters after giving prior notice to the Federal Government.

4.3.23. The Agricultural Pesticides Ordinance, 1971 & Rules 1973
This Ordinance regulates the import, manufacture, formulation, sale, distribution and use of pesticides. Its provisions are in addition to and not in derogation of the provisions of the Poisons Act, 1919, and any other law for the time being in force. Chapter II, Section 4: The import, manufacture, formulation, sale, offer for sale, hold in stock for sale or in any manner advertisement of any brand of pesticide is prohibited which has not been registered. Chapter IV Section 21**:** the contravention or failure to comply with the provisions of Section 4 in the manners as prescribed under sub-clauses (a), (b) & (c) **is** punishable, for the first offence, with fine which may extend to one thousand rupees and for every subsequent offence with fine not be less than two thousand rupees or more than three thousand rupees and in default of payment of any such fine with imprisonment for a term which may extend to one year.

Section 22: the act of giving false warranty to a dealer or purchaser in respect of a pesticide, that it complies in all respects with the provisions of this Ordinance, is punishable with fine which may extend to one thousand rupees. Section 23: the unlawful use of registration number lowering of pesticide value or hindering the Inspector from performing pesticide as prescribed under the sub-clauses (a), (b), (c) & (d) is punishable with fine not less than two thousand and five hundred rupees or more than five thousand rupees one with imprisonment for term not less than one year or more than two years.

Under Section 29, the Federal Government can, in consultation with the Agriculture Pesticide Technical Advisor /committee make rules for carrying the provision of this Ordinance into effect especially regarding the nomenclature of every form of plant and animal life; registration procedure and certificates; the function of the pesticides Laboratory; methods and the result of the analysis ; rules for taking samples by Inspectors; dangerous and injurious pesticides; poisonous pesticides; storage of pesticides; the quantities of pesticides which could be held; the protection of workers against risk of poisoning by pesticides; conditions for using pesticides especially in agriculture; precautions against poisoning by pesticides; and the measures for detecting and investigating cases in which poisoning by pesticides has occurred.

4.3.24. The Balochistan Local Government Ordinance, 2001

Under Section 195, the manufacturing, storing, trading or carrying fire crackers, fire balloons or detonators or any dangerous chemical, inflammable, hazardous or offensive article or material without license from relevant authority; discharging any dangerous chemical, inflammable, hazardous or offensive article in any drain, or public water course or public land that is likely to be dangerous are prohibited and local government shall take care of these matters.

Under Section 141(2), the offences in Part I of Fourth Schedule (the manufacturing, storing, trading or carrying fire crackers, fire balloons or detonators or any dangerous chemical, inflammable, hazardous or offensive article or material without license from relevant authority; discharging any dangerous chemical, inflammable, hazardous or offensive article in any drain, or public water course or public land that is likely to be dangerous; and failure of industrial or commercial concerns to provide adequate and safe disposal of affluent or prevention of their mixing up with the water supply or sewerage system) are punishable with imprisonment for a term which may extend to three years, or with fine which may extend to fifteen thousand rupees, or with both. If the accused persists in offence then the Court may impose a further fine which may extend to one thousand rupees for every day.

4.3.25. Drugs Act 1976

This Act regulates the import, export, manufacture and distribution of pharmaceutical drugs.
Although the law is federal, provincial governments are assigned specific responsibilities. Provincial governments are responsible for regulating the sale of drugs (section 6). They are required to set up a quality control board (section 11) and a drug testing laboratory (section 15). Provincial governments may appoint analysts (section 16) and inspectors (section 17), set up provincial drugs courts (section 31), and constitute a provincial appellate authority (section 9-A).
While the federal government is responsible for matters related to the registration of drugs, the provinces are to ensure compliance in such matters (section 7). (For the purposes of this law, drugs are defined to include substances used for the "destruction or repulsion" of vermin, insects, rodents and "other organisms" that cause, carry or transmit disease "in human beings or animals", as well as pesticides that may pose a public "health hazard" (section 3(g) (iii) and 3(g)(iv)).

4.3.26. Sindh Drugs Rules 1979

These provincial Rules, framed under the federal Drugs Act 1976, deal with procedural matters related to licences (sections 11–19). The Rules also specify procedures in cases where offences are to be prosecuted (section 3), and when drugs and other materials are seized by inspectors (section 6).

4.3.27. Sindh Local Government Ordinance 2001

Under the SLGO, district governments are responsible for environmental protection and the control of pollution. In city districts, the zila council approves plans for "environment control" and "ecological balances" and oversees the implementation of rules and by-laws on "environment" (sections 40(a) and 40(b)).

At the district level, the taluka administration is permitted to grant exemptions from local by-laws as long as these exemptions are not related to "matters concerning environmental protection" (section 54 (1)). Union nazims are required to submit to the relevant authorities reports on a number of matters including "environmental and health hazards" (section 80(f)(iii)). Local councils may frame by-laws governing the "prevention of air, water, noise, and soil pollution" and the "pollution of air, water or soil". The provincial government, for its part, may "provide guidelines and render advice" to district governments in order to promote "environmental security" (section 127(3)).

Indeed, the subject of "environment" has been decentralised and is to be administered by the district law office (sections 14 and 35, read with the First Schedule, parts A and C), which is responsible for assisting in the implementation of PEPA 1997 and the rules and regulations framed under the 1997 Act. In city districts, moreover, the provincial government may set up a district municipal office for "integrated development and management" of a number of sectors, one of which is environmental control and includes the "control of air, water, and soil pollution in accordance with federal and provincial laws and standards" (sections 14 and 35, read with the First Schedule, part D).

Discharging industrial, commercial or other waste, dangerous chemicals, and hazardous or "offensive" materials into drains and water bodies or onto public land is an offence punishable with a maximum penalty of three years' imprisonment and/or a fine of 15,000 rupees, in addition to a fine of 1,000 rupees for each day that the offence continues to be committed (section 141(2)(a), with the Fourth Schedule, part I, items 8, 9, 21 and 25). Similar penalties apply for the unauthorized manufacture and sale of explosive materials or "any dangerous chemical, inflammable, hazardous or offensive article or material" (Fourth Schedule, part I, item 19).

Other offences under the SLGO, which are subject to an immediate fine but may also incur imprisonment for up to six months and/or a fine of 5,000 rupees in the case of a repeated offence, cover a wide range of matters concerning public health and safety (section 141(2)(c), with the Eighth Schedule, items 5, 24, 25 and 29). "Damaging or polluting" the environment in a manner that endangers public health invites a fine of 2,000 rupees in the case of public premises and 500 rupees for private premises, with higher fines and/or imprisonment for repeat offenders (Eighth Schedule, item 26).

4.3.28. Sindh District Government (Conduct of Business) Rules 2001

These Rules, framed under section 31 of the SLGO, provide for the functioning of the district government. At the local level, the district law office is responsible for assisting the Sindh EPA in discharging its functions under PEPA 1997 (section 3(2), with schedule II, item 8(ii)(a)). The law office is required to ensure that "environmental protection and preservation measures" are implemented in "all development projects" throughout the district, and it assists those setting up new projects to submit EIAs (item 8(ii)(d)). It monitors projects financed through the provincial sustainable development fund (item 8(ii)(i)) and submits regular progress reports to the Sindh EPA.

Other responsibilities of the law office include monitoring motor vehicle emissions subject to the provisions of PEPA 1997 (item 8(ii)(c)), as well as advocacy (item 8(ii)(m)) and awareness raising (item 8(ii)(l)).

4.3.29. Provincial Sustainable Development Fund (Utilization) Rules 2003

These Rules, issued under section 31 of PEPA 1997, provide for matters related to the utilisation of moneys from the Provincial Sustainable Development Fund, to be established in each province according to section 9 of PEPA 1997. The Fund consists of grants or loans from the federal government, aid and donations from foreign governments and national or international donors, and contributions from private-sector organisations.

4.3.30. Port Qasim Authority Act 1973

This federal Act establishes an Authority responsible for the planning, development and management of Port Qasim. The Authority is charged with preparing a master plan for the port area (section 10), and may call upon government agencies and local bodies to prepare and execute schemes in the port area related to matters over which these agencies ordinarily hold authority (section 11(2)). Among other activities, such schemes may provide for the utilisation of "natural resources" (section 11(2)(f)), as well as environmental control and pollution prevention (section 11(2)(j)). Exploitation and utilization of natural resources as building materials within the port area, for purposes other than personal use, requires prior authorisation from the Authority (section 33). The Authority may seek the advice and assistance of government agencies and local bodies in the planning and execution of schemes, and bears the cost of any "additional expenditure" incurred in the process (section 13(2) (i)).

4.3.31. Sindh Smoke-Nuisances Act 1912 (No. VII)

This Act allows the government to prohibit the construction of furnaces and kilns in "any specified area" (section 7). It also allows the government to control "excessive emissions" by specifying the density and altitude of smoke that may be emitted, and the duration for which smoke may be emitted (section 9). These provisions apply to all types of furnaces, except for furnaces used to cremate the dead, and those used "in a private house for domestic purposes" (section 3).

4.3.32. Explosive Substances Act 1908 (No. VI)

This federal law regulates the possession and use of explosive substances, including materials for the manufacture of explosives as well as machinery, tools and materials that can be used to cause an explosion (section 2). Causing an explosion is punishable with a maximum sentence of life in prison, whether or not the event causes any injury to persons or damage to property (section 3). The same maximum penalty applies to making or possessing explosives with intent to cause an explosion (section 4). Although the law does not specify conditions under which it is legal to possess explosive materials, possession of such substances for a purpose that is not "lawful" is an offence (section 5), implying that some form of regulatory mechanism is to be put in place. Powers under this Act lie with provincial governments, which may restrict or allow the courts to proceed with the trial of suspected offenders (section 7). The 1908 law deals exclusively with causing explosions or intent to cause explosions.

4.3.33. Explosives Act 1884 (No. IV)

This federal law deals with the **manufacture, possession, sale, use and transport of explosives**. The government may prohibit the manufacture, possession or import of any explosive substance, except with a licence (section 5), or ban outright the manufacture, import or possession of any material deemed to be of "so dangerous [a] character that [...] it is expedient for the public safety" to impose such restrictions (section 6). Under this law, the maximum penalty for illegally manufacturing, possessing or importing explosives is 5,000 rupees.

The government may declare any substance deemed particularly dangerous to life or property, owing to its explosive properties, or any of the processes involved in its manufacture to be an explosive within the meaning of this Act (section 17). Such materials may include a wide range of chemical substances that are explosive in nature, although the term 'dangerous' itself has not been defined. No regulatory compliance measures are introduced for the handling of hazardous materials. All powers under this Act lie with the "appropriate government", defined as the federal government in relation to import and inter-provincial transport, and the provincial government in all other matters (section 4(7)).

4.3.34. Pollution of Environment Caused by Smoke, Emitting Vehicles, Traffic Muddle, 1996 SCMR 543

This interim order issued by the Supreme Court calls for measures to streamline the process of checking motor vehicles in Karachi, as a first step towards eliminating air and noise pollution in the city. The order is based on reports from mobile checking carried out in 1992–93, also at the order of the Supreme Court.

4.3.35. The Punjab Local Government Ordinance, 2001

It is expedient to devolve political power and decentralise administrative and financial authority to accountable local governments for good governance, effective delivery of services and transparent decision making through institutionalized participation of the people at grass-roots level.

The manufacturing, storing, trading, discharging or carrying fire crackers, fire balloons or detonators or any dangerous chemical, inflammable, hazardous or offensive article or material (given in the annex) without license from relevant authority is prohibited and local government shall take care of these matters (Chapter XIX Section 195, Sixth Schedule (paragraph 44)).

Under Section 141 & 145(1), the offences in Part I of Fourth Schedule (item 2, 3 & 9) are punishable with imprisonment for a term which may extend to three years, or with fine which may extend to fifteen thousand rupees, or with both. If the accused persists in offence then the Court may impose a further fine which may extend to one thousand rupees for every day as long as the offence continues. The drainage and sewerage of industrial and commercial waste and effluents are directed by local governments by formulations of schemes (Chapter XIX Section 195, Sixth Schedule (paragraph 45)).

The pollution of air by gases, dust or other substances exhausted or emitted by automobile engine, factories, brick or lime kilns, crushing machines for grain, stone, salt or other materials and such

other sources of air pollution is to be prevented by concerned local governments by formulating and implementing schemes as the bye-laws may provide (Chapter XIX Section 195, Sixth Schedule (paragraph 48)).

4.3.36. The NWFP Local Government Ordinance, 2001

It is expedient to devolve political power and decentralise administrative and financial authority to accountable local governments for good governance, effective delivery of services and transparent decision making through institutionalized participation of the people at grass-roots level.

The manufacturing, storing, trading, discharging or carrying fire crackers, fire balloons or detonators or any dangerous chemical, inflammable, hazardous or offensive article or material (given in the annex) without license from relevant authority is prohibited and local government shall take care of these matters(Chapter XIX Section 195, Sixth Schedule (paragraph 44)).

Under Section 141(1), the offences in Part I of Fourth Schedule (item 2, 3 & 9) are punishable with imprisonment for a term which may extend to three years, or with fine which may extend to fifteen thousand rupees, or with both. If the accused persists in offence then the Court may impose a further fine which may extend to one thousand rupees for every day as long as the offence continues.

The drainage and sewerage of industrial and commercial waste and effluents are directed by local governments by formulations of schemes (Chapter XIX Section 195, Sixth Schedule (paragraph 45)). The pollution of air by gases, dust or other substances exhausted or emitted by automobile engine, factories, brick or lime kilns, crushing machines for grain, stone, salt or other materials and such other sources of air pollution is to be prevented by concerned local governments by formulating and implementing schemes as the bye-laws may provide (Chapter XIX Section 195, Sixth Schedule (paragraph 48)).

4.3.37. The Islamabad Capital Territory Local Government Ordinance, 2002

It is expedient to provide for empowered local governments, devolve political power and decentralize administrative and financial authority thereto and regulate the administration of Federal Capital for effective delivery of services and transparent decision making through institutionalized participation of the people at grass root level.

Under Section 115 & 119, the offences in Part I of Fourth Schedule (item 2, 3 & 9) are punishable with imprisonment for a term which may extend to three years, or with fine which may extend to fifteen thousand rupees, or with both. If the accused persists in offence then the Court may impose a further fine which may extend to one thousand rupees for every day as long as the offence continues.

4.3.38. The Cantonments Ordinance, 2002

It is expedient to consolidate and amend the law relating to cantonments and to reconstruct and regulate local self-government in the cantonment areas.

The manufacturing, storing, trading, discharging or carrying of any dangerous or offensive articles (as mentioned in Second Schedule) is prohibited without taking a license from the concerned local authority (Chapter XII, Section 109).

Under Section 215 & 219(1), the offences in Part I of Second Schedule (item 2, 3 & 9) are punishable with imprisonment for a term which may extend to three years, or with fine which may extend to fifteen thousand rupees, or with both. If the accused persists in offence then the Court may impose a further fine which may extend to one thousand rupees for every day as long as the offence continues.

4.3.39. (Baluchistan) (N.W.F.P) (Punjab) (Sindh) Motor Vehicles Ordinance, 1965

It is expedient to amend and consolidated the law relating to Motor Vehicle in the Province of (Baluchistan) (N.W.F.P) (Punjab) and (Sindh).According to Section 74, Chapter VI, the Government may make rules regarding the emission of smoke, visible vapors, spooks, ashes, grit or oil; and the reduction of noise emitted by or caused by vehicles.Under Section 105, Chapter VIII, the sale of vehicle in or alteration of vehicle to a condition contravening Section 74 of Chapter VI is punishable with fine which may extend to two hundred rupees.

4.3.40. West Pakistan Motor Vehicle Ordinance, 1965

It is expedient to amend and consolidate that law relating to Motor Vehicles in the Province of West Pakistan. According to Section 74, Chapter VI, the Government may make rules regarding the emission of smoke, visible vapors, spooks, ashes, grit or oil; and the reduction of noise emitted by or caused by vehicles. Under Section 105, Chapter VIII, the sale of vehicle in or alteration of vehicle to a condition contravening Section 74 of Chapter VI is punishable with fine which may extend to two hundred rupees.

4.3.41. Pakistan Nuclear Regulatory Authority Ordinance 2001

This ordinance establishes the Pakistan Nuclear Regulatory Authority (Section 3), repeals the Pakistan Nuclear Safety and Radiation Protection Ordinance 1984, and dissolves the Pakistan Nuclear Regulatory Board and the Directorate of Nuclear Safety and Radiation Protection. The definition of the term "nuclear damage" in this ordinance encompasses loss of life, personal injury and damage to property, but does not cover damage to natural resources and the environment.

Although the IEE/EIA Regulations issued under PEPA 1997 require an EIA for nuclear power plants [sic], Section 19(3) of this ordinance leaves to the discretion of the Authority whether to require applicants for a license to undertake activities involving radioactive materials and/or which produce radiation to demonstrate that the activities would not be hazardous to the environment. Section 21 provides that the Authority must authorize all construction of nuclear installations, but makes no reference to the requirement of an EIA. Prior authorization from the Authority is, however, necessary before discharging radioactive waste into the environment (Section 22).

The Authority may inspect all measures and records pertaining to environmental monitoring and the disposal of radioactive waste (Section 29(d)) and must implement and coordinate a national programme of environmental surveillance to check the build-up of radioactivity in the

environment. The purpose of such surveillance is solely to safeguard human health. The ordinance does not acknowledge similar authority given to the Federal Agency under PEPA 1997 to license, monitor and inspect installations and activities involving radioactive substances, nor does it provide for coordination of these functions.

4.3.42. Kyoto Protocol

The Convention contains a non-legal binding by the industrialized countries for stabilizing their emissions at 1990 levels by 2000 in order to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner3.

CDM is the only instrument that is available for developing countries to assist them in achieving sustainable development and contributing to the ultimate objective of the Convention. It aims to assist Annex-I Parties (Developed countries) to implement project activities that reduce (or subject to constraints removes) GHG emissions in non-Annex-I Parties (i.e. most of the developing countries), in return for certified emission reductions (CERs). The CER generated by such project activities can be used by Annex-I Parties to meet their emissions targets under the Kyoto Protocol.

4.3.43. Hazardous Substances Rules, 2003

Production, storage, Disposal, Handling, Distribution, Marketing, Importation and Transportation According to Rule 4, an application for license to produce, store, dispose of, handle, distribute, market, treat, import and transport hazardous materials should filed in accordance with the provisions of Section 14. According to Rule 5 and 6, the application should be accompanied by EIA of project or industrial activity which should be prepared in accordance with PEPA (Review of IEE and EIA) Regulations 2000.

Rule 7 & 8 deals with the issuance and conditions of license respectively. Rules13, 14 & 15 deal with the validity, renewal and cancellation of license. Rule 17 deals with the provisions of the preparation of a safety plan as required under rule 5. Under Rule 18, if any major accident occurs in the premises of a licensee, he is required to report immediately to federal or provincial agency.
Rule 19 deals with the rules regarding preparation of Waste Management Plan as required under the Rule 5.

Packaging and Labelling

Rule 9, sub-rule 1, deals with the packing of the hazardous substances. The packaging should be in such size and design that it reduces the chances of any accident and could be transported easily and safely. Rule 9, sub-rule2 deals with the labeling of hazardous material. The name, net contents, lisence number, date of manufacture and expiry, warning statement, disposal method and precautionary measures should be labeled on the cans of hazardous substances.

Production, storage, Disposal, Handling

Under Rule 10, the premises where hazardous substances are generated, collected, consigned, stored, disposed of, handled and treated should comply by the provisions of Schedule IV and a warning notice should be placed on its door.

Handling
Rule 11 deals with the general safety precautions for the handling of hazardous substances to whom they are sold or delivered like wearing protective clothing, helmets, googles, etc. Rule 12 deals with the safety precautions for workers.

Import
Rule 20 deals with the import of hazardous substances. The license to import hazardous substances requires information in addition to information required under Form A of Schedule II i.e. information regarding port of entry, quantity to be imported, particulars of transport, precautionary measures and purpose for which it is going to be utilized.

Transportation
Rule 21 deals with the transport of hazardous substances. The license to transport hazardous substances requires information in addition to information required under Form A of Schedule II like information regarding the particulars of persons from whom hazardous substances is to be collected and delivered, quantity to be transported, mode of transport, route to be used and date of transportation.

4.3.44. Export Policy Order, 2008.
Under Section 4, sub-section 1 and Schedule I& II, export of chemicals except to those countries who have ratified the Chemical Weapons Convention; Intoxicants and intoxicating liquors except under the licenses from bonafide medicinal or other purposes issued under the Prohibition; urea subject to the approval of ECC of the Cabinet on case to case basis and DAP, NP and other fertilizers except re-export of fertilizer by UNDP and other UN agencies is prohibited.

Section 11 deals specifically with the export of chemicals. Under its sub-section 1 & 2 and Schedule I, II & III, those chemicals which have least commercial use or those which could be used for production of chemical weapons cannot be exported to countries which are not members of Chemical Weapons Convention while the chemicals which are widely used in commercial sector could be exported to non-member countries of Chemical Weapons Convention. According to Section 14, the restrictions imposed under the following acts are also relevant under this order.

4.3.45. Export Processing Zones Authority Ordinance 1980
This ordinance establishes the Export Processing Zones Authority (Section 4), which is responsible for setting up and managing export processing zones. The Authority develops the infrastructure in these areas, and may prepare and implement schemes for environmental control and the prevention of pollution (Section 10). The term "environmental control" is not defined in the law.

4.3.46. The Customs Act, 1969 (IV of 1969)
This act is meant to consolidate and amend the law relating to the levy and collection of customs-duties (fee and service charges) and other allied matters. Under section 28, a duty lowered than as prescribed by this act should be applied on any denatured spirit imported in Pakistan, and be tested and if necessary adequately denatured by officers of customs, at the expense of the person importing the spirit.

Section 110 of chapter XI deals with the allowance in case of volatile goods. According to this section no duty shall be charged on volatile good at the time of delivery from a warehouse if found to be deficient in quantity and the Collector of Customs is satisfied that such deficiency is on account of natural loss.

If any person contravenes the provisions of this act, such person is liable to a penalty not exceeding twenty-five thousand rupees (Section 156 (1i) of Chapter XVII). If any person contravenes the provisions of this act, such person is liable to a penalty not exceeding twenty-five thousand rupees (Section 156 (i) of Chapter XVII). Under section 156 (8ii) the smuggling of narcotics is prohibited and punishable according to the quantity of the smuggled narcotic drugs.

The appropriate officer could search any person, if he has reasons to believe that such person is carrying goods liable to confiscation or carrying radioactive platinum (Section 158 (1) & (2)). According to Section 160 of Chapter XVIII, the appropriate officer has power to screen or x-ray bodies of suspected persons for detecting secreted goods, if he has reasons to believe that such person is carrying goods liable to confiscation.

4.3.47. The Poisons Act, 1919 (XII of 1919)

This act is expedient to consolidate and amend the law regulating the importation, possession and sale of poisons. The State Government has the power to regulate the possession for sale and the sale, of any specified poison as well as to grant the liscence to possess or sale the poison(Section 2 (1) &(2)). The Central Government can also prohibit the importation of any poison except underlicence into the country (Section 3).

Under Section 4(1), the State Governmennt can put restriction on possessing poison in areas where the use of poison for the purpose of committing murder or mischief by poisoning cattle is common. The breach of this section is punishable with imprisonment for a term which may extend to one year, or with fine which may extend to one thousand rupees, or with both (Section 4(2)).

Under section 6, breach of section 2, imports without a licence of any poison restricted under section 3 or contravention of any condition of a licence is punishable by, on a first conviction, with imprisonment for a term which may extend to three months, or with fine which may extend to five hundred rupees, or with both,and on a second or subsequent conviction, with imprisonment for a term which may extend to six months, or with fine which may extend to one thousand rupees, or with both.

According to Section 7 (1) & (2), the District Magistrate, the Sub-divisional- magistrate and, in a presidency-town, the Commissioner of Police can issue a warrant for the search of any place in which he has reason to believe that any poison is possessed or sold, or any poison liable to confiscation in contravention of this Act is kept or concealed. And the person to whom the

warrant is directed may enter and search the place in accordance with the provisions of the Code of Criminal Procedure, 1898.

4.3.48. Import Policy Order, 2009

According to subsection (i) of Section 5A, import of certain chemicals (as specified in APPENDIX A, item 12-18, 20, and 21) is banned. According to subsection (i) of Section 5B, import of certain chemicals (as specified in Appendix-B, item 16, 17, 19-52) is restricted and is subject to certain conditions.

4.3.49. Labour Policy 2006

Working Environment

Labour protection in relation to the working environment embraces three main areas, namely, work safety and prevention of accidents, occupational health, and the impact of enterprise work processes and practices on the wider environment. Prime responsibility in all three areas rests with the employer, but with workers required to cooperate to the fullest extent to enable employers to meet their obligations.

The improvement of safety and health in the workplace requires the development of a 'safety and health culture' for the enterprise as a whole, based on a wider culture of safety and health in society at large – at home, in schools, in public places, and on the roads.

Work Safety

Employers have a responsibility to ensure that hazards in the workplace are eliminated, minimized, or controlled in such a way that work accidents are avoided. The Government is of the view that the provision of protective clothing and equipment to workers, although important, must not be used as a substitute for hazard elimination and reduction. At the same time, workers have a responsibility to fully cooperate with employers in creating and maintaining safe and healthy workplaces and must make every effort to participate in safety and health awareness and training activities.

Enterprises of all sizes and in all sectors must be encouraged to develop a safety and health culture and introduce policies and rules to ensure that intention is transformed into practice. The development of such a culture and related rules can be applied, albeit informally, to micro and small enterprises, and more formally to those of medium and large size.

Occupational Health

Occupational health interventions are concerned with the elimination and reduction of hazards that result in illness and diseases. As before, prime responsibility rests with the employer to make the workplace free from hazards impacting on the health of workers. This requires attention to temperature and humidity, ventilation, noise, dust, illumination, chemical usage and storage, and any other factors impinging on the health of workers and likely to cause short or long-term illness.

Enterprises are encouraged to have an occupational health policy and rules (usually combined with a safety policy and rules) and to train managers and workers to ensure that such rules are applied at all times.

In practice, work safety and occupational health should not be regarded as totally separate issues in that some hazards can cause both accidents and occupational diseases. They are closely related and, as indicated below, both areas should be addressed in an integrated safety and health policy, as should the issue of HIV/Aids in the workplace.

The wider environment
Enterprises have an obligation to ensure that their work processes and disposal of waste products do not impact negatively on the wider environment. This extends beyond the traditional boundaries of labour protection and falls outside the mandate of the Ministry of Labour, Manpower and Overseas Pakistanis. Clearly, however, the environmental pollution created by some enterprises has an impact on all workers in the concerned area, affecting both their working lives and living conditions.

ILO Convention 155
With a view to leading the way in the improvement of work safety and health in enterprises, the Government proposes to take the necessary steps to ratify ILO Convention No.155 on Occupational Safety and Health. This convention establishes the basic framework for Pakistan to address safety and health issues at national, industry and enterprise levels, and its ratification will provide the basis for the development of policies, laws, and implementation arrangements to improve the nation's overall performance in the area of work safety and health. ILO technical assistance will be requested to assist in the implementation of this convention, once ratified, drawing as appropriate on its expertise in the management of occupational safety and health systems.

Small and Medium Enterprises
Of particular concern is the situation of small and medium scale enterprises and informal sector workplaces that are frequently characterized by hazardous working environments. The proposed Labour Inspection Policy 2006 will address this issue through a labour extension approach, designed to ensure that basic safety and health information and advice is made available to, and acted upon by, informal economy workplaces and small and medium scale enterprises.

Safety and Health Policy
The Government will require that all enterprises over a certain size (yet to be determined) have a written safety and health policy that has been discussed and communicated to workers, and supported by practical rules to ensure that the policy is applied in practice. Such a policy document is a statement of intent and no more than an indication of preliminary commitment on the part of enterprises, but it is an important starting point.

Provincial Directorates of Labour and Manpower will be encouraged to assist enterprises in preparing such policy statements, based on the circumstances applying in individual enterprises and industries with a view to minimizing work hazards, preventing accidents, and promoting safe and healthy work processes and practices.

Safety and health policy statements will stress a commitment on behalf of enterprises to

- eliminate hazards wherever possible,
- isolate hazards from workers if elimination is not possible,
- isolate workers from hazards if elimination is not possible,
- encourage an environment that is free from HIV/Aids,
- provide workers with protective clothing and equipment if hazards cannot be isolated or eliminated,
- report work accidents and diseases,
- share information on safety and health with workers,
- discuss and consult with workers on safety and health issues,
- train workers on safety and health,
- develop and maintain an 'organization culture' in which safety and health figures prominently,
- improve, where reasonably practicable, on the minimum standards of safety and health provided under Pakistan legislation.

Occupational Safety and Health Council

The Government in consultation with other Ministries and agencies as appropriate proposes to establish a National Occupational Safety and Health Council to advise government on a wide range of policy and legislative matters concerning work safety and health. The purpose, functions, institutional and operational arrangements, finances, and membership of the Council, will be the subject of consultations between government, workers' organizations and employers and their organizations.

Occupational Safety and Health Institutes

In addition, the Government proposes the establishment of provincial Occupational Safety and Health Institutes, to provide a range of technical, information, training, research, and testing services. The National Occupational Safety and Health Council, although not having any control over the activities of the Provincial Institutes will play an important role as an information clearing house on safety and health matters by maintaining close contact with them and by membership on their Boards of Directors. It is suggested that two such provincial institutes could serve the nation's needs in the first instance but, essentially, this is a matter for provincial governments to decide.

4.3.50. The Boilers Act, 1923

It is expedient to consolidate and amend the law relating to steam-boilers; According to Section 3(1)(c), this act is not applicable to any boiler or steam-pipe appertaining to a sterilizer or disinfector of a type such as is commonly used in hospitals, if the boiler does not exceed twenty gallons in capacity. Section 4-11: application, procedure, approval, refusal and expiry of registration for operating a boiler. According to Section 12, no structural alteration, addition or renewal can be done in any boiler registered unless such renewals and alteration, has been sanctioned by the Chief Inspector. Section 18 deals with the reporting of any accident to the inspector. A report should be submitted to the inspector containing the details related to the details of the accident.

Penalties:
Section 23: the operation of a boiler without a certificate or above the maximum pressure limit is punishable by a fine up to five hundred rupees, and, in the case of a continuing offence, with an additional fine of up to one hundred rupees for each day. Section 24: the transfer of a boiler without registration from one province to other, the failure to mark registration number on the boiler, the alteration in the boiler without reporting, the failure to report accident and comply by the safety rules is punishable by fine up to five hundred rupees. Section 25(1): whoever removes, alters, defaces, and renders invisible or otherwise tampers with the register number marked on boiler is punishable with fine of up to five hundred rupees. (2)The fraudulent marking of registration number upon a boiler is punishable with imprisonment which may extend to two years, or with fine, or with both.

Power and authority:
According to Section 28, the Boilers Board can make regulations regarding the standard conditions necessary for boiler's registration; for prescribing maximum pressure at which the boiler can be operated; for regulating the registration, inspection and maintenance of boiler; and for safety of persons working inside a boiler.

Section 29 deals with the power of the provincial government in relation to this act. Provincial government can make rules related to powers and responsibilities of Chief Inspector and Inspector; regulation for the transfer of boiler; registration, certification, inspection and examination of boilers; and regulation of inquiries into accidents.

4.3.51. The Mines Act, 1923
It is expedient to amend and consolidate the law relating to the regulation and inspection of mines. Chapter II, Section 6 deals with the powers of Inspector of mines. Section 6(c): The inspector can examine into and make inquiry respecting, the state and condition of any mine, the ventilation of the mine, the enforcement of the bye-laws relating to the mine, and all matters and things connected with the safety health and welfare of the persons employed in the mine. Section 6(f): the Inspector is also authorized to take or remove, for the purpose of analysis samples of materials and substances used or handled in the mine.

Chapter IV, Section 14(1) requires the owner, agent or manager of a mine, to give a notice prior to the commencement of mining operations.

Chapter V, Section 18 and 18A requires that at every mine, medical appliances as well as first aid rooms shall also be provided. Section 19(1) & (2): If, in any respect it appears to the Chief Inspector or the Inspector that in any mine, thing or practice in is dangerous to human life health or safety, or defective so as to threaten, or tend to, the bodily injury of any person, he may give notice to the owner, agent or manager for the sealing off or isolation of the mine. He may also prohibit its functioning temporarily for specific time period. Section 20(1) requires the owner, agent or manager of the mine to give notice of the occurrence of accident to prescribed authorities.

Section 20(1A) & (1B) deals with the provisions of inquiry and inspection in case of a major accident. Section 20A(1) requires the owner, agent or manager of the mine to notify the inspector, if any person employed contracts or it believed to have contracted, an occupational disease peculiar to any mining operation. Section 20A (2)-(6) provides for the steps to be taken by the government and inspector, as well as facilities to be provided, in case a person contracts an occupational disease.

Penalties
Section 38(1): the contravention of the provisions of sub-section (1) of section 20, i.e. failure to give notice of any accidental occurrence is punishable with fine which may extend to one thousand rupees, or, if the occurrence results in loss of life, be punishable with imprisonment which may extend to three month or with fine which may extend to 3one thousand, rupees, or with bolt.

(2) The contravention of a direction made by the appropriate Government under sub-section (2) of section 20 i.e. failure to record in the prescribed register or to give notice of any accidental occurrence is to be punishable with fine which may extend to one thousand rupees.

4.3.52. Petroleum Act 1934
This act regulates the import, transport, storage, production, refining and blending of petroleum and other flammable substances. The federal government issues licenses and may make rules to regulate the import, transport and distribution of petroleum (Section 4). The law requires that all containers carrying "dangerous petroleum" (highly flammable) bear a warning (Section 6). The act also contains provisions regarding the testing and quality control of petroleum products (Section 14ff.). All powers remain with the federal government.

4.3.53. Regulation of Mines and Oil Fields and Mineral Development (Government Control) Act 1948
This act regulates the development of mines, oilfields and mineral deposits. The federal government makes rules related to the development of mines and nuclear substances, oilfields and gas fields, while provincial governments make rules related to other minerals and their extraction. Rule-making power includes exploration and prospecting licenses, payment of royalties and license fees, refining ores and mineral oil, and their storage and distribution (Section 2). All powers under this law have been delegated to the "appropriate" government—the federal government in the case of radioactive minerals, oil and gas, and the provincial governments for all other mines (Section 6).

4.3.54. Boilers and Pressure Vessels (Amendment) Act, 2009
It is expedient to amend the Boilers and Pressure Vessels Ordinance, 2002. The Act seeks to amend clause (e) of section 6 of the Boiler and Pressure Vessels Ordinance, 2002 to enable the Boiler Engineers who possess good health duly certified by a recognized Physician to renegotiate their contract with their employers for seeking fresh employment after attaining the age of sixty years.

4.3.55. The Fatal Accidents Act, 1855
Legislation:

The Act provides for compensation to families for loss occasioned by death of a person caused by actionable wrong. A person who, by his wrongful act, neglect or default may have caused the death of anther person has been made answerable in damages for the injury so caused by him

Complaints:
Section 1: Whenever the death of a person shall be caused by wrongful act, neglect or default, and the neglect or default is such as would (if death had not ensued) have entitled the party injured to maintain an action and recover damages in respect thereof, the party who would have been liable if death had not ensued shall be liable to an action of suit for damages, notwithstanding the death of the person injured, and although the death shall have been caused under such circumstance as amount in law to felony or other crime.

Every such action or suit shall be for the benefit of the wife, husband, parent and child, if any, of the person whose death shall have been to caused, and shall be brought by and in the name of the executor, administrator or representative or the person deceased.

Compensation:
Section 3**:** The plaint in any such action or suit shall give a full particular of the person or persons for whom, or on whose behalf, such action or suit shall be brought, and of the nature of the claim in respect of which damages shall be sought to be recovered. In every such action the Court may give such damages as it may think proportioned to the loss resulting from such death to the parties respectively, for whom and for whose benefit such action shall be brought; and the amount so recovered, after deduction all costs and expenses, including the cost not recovered from the defendant, shall be divided amongst the before mentioned parties, or any of them in such shares as the Court by its judgment or decree shall direct.

The Act covers deaths caused by negligence of other persons including public and corporate bodies like WAPDA, Municipal and local authorities and factories, etc. and covers the cases of death caused by electrocution, burns and other fatal accidents cause by negligence of any person. The Act does not prescribe any hard and fast rules for determining the amount of compensation. Rulings of superior Courts provide guidance in this matter. Expectancy of life of a deceased and his income is usually kept in view while determining quantum of compensation.

Table 4.2: Reference to Existing Legal Instruments Which Address the Management of Chemical

Legal Instrument (Type, Reference, Year)	Responsible Ministries or Bodies	Chemical Use Categories Covered	Objectives of Legislation	Relevant Articles/ Provision	Enforcement Ranking
1. Pakistan Environmental Protection Act (PEPA), 1997	Ministry of Environment/ Pak EPA/ Provincial EPAs	Production, Disposal, Handling, Import, Export & Use	Protection, conservation, rehabilitation and improvement of the environment,	Section 11(1): Not to allow emission or discharge in excess of prescribed Section 11(2): penalty for violation Section 6 subsection	Medium

			the prevention and control of pollution, and promotion of sustainable development	1g(i) & 2g(i): Standards for emission or discharge of environmental pollutants Section 12: carrying out initial environmental examination Section 13: import of hazardous wastes Section 14: Grant of license for handling hazardous wastes Section 15(1),(2)&(3): maintenance of motor vehicles Section 16(1), (2)&(3): procedures for punishment Section 17 (1) (2) (3), (4), (5), (6), (7) & (8): penalties & procedures	
2. National Environmental Quality Standards (Self-Monitoring and Reporting by Industry) Rules 2001	Pak EPA, Provincial EPAs	Disposal of industrial waste/ effluents/ emissions	self-monitoring and reporting by industry to ensure National Environmental Quality Standards, by reducing discharge of liquid effluents and gaseous emissions in order to control environmental pollution	Section 3: submission of Environmental Monitoring Reports Section9(1)(2)&(3): criteria for preparation of Environmental Monitoring Reports Section 10: sampling, testing and analysis	Low
3. Pollution Charge for Industry (Calculation and Collection) Rules 2001	Pak EPA, Provincial EPAs	Disposal	To provide the guidelines for the measurement of a pollution charge payable by an industrial unit	Section 5: determination of pollution level	
4. National Environmental Quality Standards (Certification of Environmental Laboratories) Regulation 2000	Pak EPA, Provincial EPAs	Production and Disposal	to provide the regulations for the certification of a laboratory to function as an environmental	Section 3: functions of environmental laboratory	

			laboratory		
5. Environmental Samples Rules 2001	Pak EPA, Provincial EPAs	Industrial effluents/ emissions	To provide the rules for environmental samples (i.e. taking, dispatching, testing, analysis of sample, filing of complain, trial against the sample, etc.)	Section 4: power of entry and inspection Section 7(1): procedures to take, store and transport samples	
6. Provincial Sustainable Development Fund Board (Procedure) Rules 2001	Provincial Governements		provides procedures for the operation of a Sustainable Development Fund and the establishment of a Sustainable Development Board		
7. Pakistan Environmental Protection Agency Review of IEE and EIA Regulations 2000	Pak EPA, Provincial EPAs	Production, Disposal, and Storage	to provide regulations for the review of IEE or EIA, that are specific assessment requirements for planning, construction and operation of projects relating to particular sector	Section 5(a): purpose of EIA Section 18: submission of annual report Section 19: cancellation of approval	
8. Environmental Tribunal Rules 1999	Ministry of Law & Justice		to provide regulations for the establishment and functioning of environmental tribunals	Section 4: formation of tribunal Section 16:disposal of cases Section 18: proceedings of tribunal	
9. Pakistan Standards and Quality Control Authority Act, 1996		Production, Use/ Handling, Import, Export, Marketing and Storage	the establishment of Pakistan Standards and Quality Control Authority to provide for the standardization and quality control services	Section 8(ii), (vi) & (x): power of inspection and testing Section (10), (11)&(12): standards for quality Section (13)(1) & (2): conditions under which items are prohibited to be taken out of Pakistan	

				Section 14(1), Section 20(1), (21) & (22): punishments	
10. National Environmental Quality Standards 1993	Pak EPA, Provincial EPAs	Disposal	To control emission of municipal and liquid industrial effluent, industrial gaseous emissions and exhaust and noise pollution from motor vehicles	Section 2: noise pollution and emissions from motor vehicles	
11. Health Care Waste Management Rules 2005	Ministry of Health	Disposal, Transport, Handling and Storage	Provides provisions for the proper and sound management of hospital wastes	Section 2: definition Section 3, 5, 8-14: management of different hospital wastes as responsibility of different people in hospital. Section 15: preparation of Waste Management Plan Section 16: Segregation of different Hospital wastes Section 17: Collection and handling of wastes Section 18: transportation of wastes Section 19: storage of waste Section 20(1): disposal of wastes Section 22(1)&(2): rules in case of accident or spillage Section 26: licence for handling hazardous substances	
12. The Dangerous Cargoes Act, 1953 Act	Ministry of Port & Shipping	Storage, Handling , Import and Export	Safety of ports in respect of the transit, working and storage of dangerous cargoes and incidental matters	Section 3: powers and functions of Central Government Section 9(1) & (2): punishments	
13. The Carriage of Goods	Ministry of Port & Shipping	Transport, Import, Export	to amend the provisions of	Chapter I Section 5: carriage of goods	

by Sea Act, 1925		Handling and Disposal	law made by the Carriage of Goods by Sea Act, 1924, with a view to establish the responsibilities, liabilities, rights and immunities attaching to carriers under bills of lading	Chapter II Article II: responsibilities of the carrier Article III, Section(1c): safety and fitness of ship carrying goods Section (2): standards for carriage of goods	
14. The Motor Vehicles Act, 1939	Ministry of Communication				
15. The Railways Act, 1890	Ministry of Railways	Transport	to consolidate, amend and add to the law relating to Railways	Chapter VI, Section 47(1c): preparation of general rules for carriage of dangerous goods Section 47(2): penalty Section 59: rules for carriage of dangerous or explosive goods Chapter IX, Section 90: notification for carriage of dangerous or explosive goods Section 107: penalty	
16. Pakistan Merchant Shipping Ordinance 2001	Ministry of Port & Shipping	Transport		Chapter 43, Sections 552–575, Prevention of pollution from ships	
17. The Karachi Port Trust Act, 1886	Ministry of Port & Shipping	Transport and Disposal	To vest the Port of Karachi in a trust.	Chapter V, Section 32, 33, 34, 35 & 36: rules for the safety of shipping and conservation of port Section 43: provisions for determination of scale of tolls and charges Chapter VII, Section 72 & 75: provisions with respect to penalties Chapter X, Section 90(1)&(2): cleanliness and maintenance of port Section 90(3): punishments	
18. Ports Act 1908	Ministry for Ports and	Working of the ports and the	To consolidate prior laws	Chapter IV, Conservation of ports,	

	Shipping	maintenance of harbour facilities	relating to the Karachi Port and Port Qasim, and extends to the navigational rivers and channels leading to these ports	Section 21, Penalties	
19. The Pakistan Science Foundation Act, 1973	Ministry of Science & Technology	Awareness/ trainings	the establishment of the Pakistan Science Foundation	Section 3(1): purpose of establishment of Pakistan Science Foundation	
20. Agricultural Pesticides Ordinance (Extension to the Northern Areas Order), 1995	Provincial Government of Gilgit Baltistan		to extend the Agricultural Pesticides Ordinance, 1971 (II of 1971) to the Northern Areas	Section 2: extension of Agricultural Pesticides Ordinance, 1971 to the Northern Areas	
21. The Territorial Waters and Maritime Zones Act, 1976	Ministry of Defence/ Respective Provincial Governments	Transport and Disposal	To provide the declaration of the territorial waters and maritime zones of Pakistan	Section 3(3): notification for carriage of nuclear material Section 4 (b)(iii), 5(2)(d), & 6: preservation and protection of marine environment	
22. The Agricultural Pesticides Ordinance, 1971 & Rules 1973	Ministry of Food, Agriculture and livestock	Production, Sale, Distribution, Marketing, Import, Export and Usage	regulates the import, manufacture, formulation, sale, distribution and use of pesticides	Chapter II, Section 4: registration of pesticides Chapter IV, Section 21, Section 22 & Section 23: punishments Section 29: powers of Federal Government	
23. The Balochistan Local Government Ordinance, 2001	Balochistan Government	Production, Storage, Transport, Import, Export, and Disposal	to devolve political power and decentralise administrative and financial authority to accountable local governments for good governance, effective delivery of	Section 195: grant of licence and responsibilities of local government Section 141(2): punishments	

			services and transparent decision making through institutionalized participation of the people at grass-roots level		
24. Drugs Act 1976	Ministry of Health	Import, Export, Production, Marketing and Distribution	To regulate the import, export, manufacture and distribution of pharmaceutical drugs	Section 3(g)(iii) and 3(g)(iv): definition Section 6, 7, 11,15, 16, 17 & 31: power and responsibilities of Provincial Government	
25. Sindh Drug Rules 1979	Provincial Agency	Production	To deal with procedural matters related to licences	Section 3 & 6: procedures for prosecution and punishment Section 11-19: procedures related to licenses	
26. Sindh Local Government Ordinance 2001	Sindh Government	Production, Storage, Transport, Import, Export, and Disposal	to devolve political power and decentralize administrative and financial authority to accountable local governments for good governance, effective delivery of services and transparent decision making through institutionalized participation of the people at grass-roots level	Section 40(a)&(b): powers of Zila Council Section 54(1): power of Taluka Administration Section 80(f)(iii): power of Union Nazims Section 127(3): power and responsibilities of Local Council Section 141(2)(a) & 141(2)(c): punishments	
27. Sindh District Government (Conduct of Business) Rules 2001	Sindh Government	Production and Disposal	provide for the functioning of the district government	Section 3(2): responsibility of District Law Office	
28. Provincial Sustainable Development Fund	Provincial Governments				

(Utilization) Rules 2003					
29. Port Qasim Authority Act 1973	Ministry for Ports and Shipping	Transport, Import, Export and Distribution	the establishment of an Authority for making all arrangements for the planning , development and management of Muhammad Bin Qasim Port at Phitti Creek, and associated facilities and industries	Section 10, 11(2) & 13(3b): preparation and implementation of Master Plan for port area Section 33: exploitation and utilization of natural resources	
30. Sindh Smoke-Nuisances Act 1912 (No. VII)	EPA Sindh	Disposal	To control smoke nuisances	Section 3: exceptions from rules Section 7: power to prohibit construction of furnaces or kilns Section 9: prohibition of excessive emissions	
31. Explosive Substances Act 1908 (No. VI)	Ministry of Interior & Narcotics	Production, Storage and Use	to further amend the law related to explosive substances	Section 2: definition Section 3, 4 (a), 4(b), 5 & 7: procedures for punishment	
32. Explosives Act 1884 (No. IV)	Ministry of Interior & Narcotics	Production, Distribution, Marketing, Use and Transport	deals with the manufacture, possession, sale, use and transport of explosives	Section 4(7): powers of appropriate government Section 5: grant of licenses Section 6: imposition of ban or restrictions Section 17: declaration of a substance to be explosive	
33. Pollution of Environment Caused by Smoke, Emitting Vehicles, Traffic Muddle,1996	Pak EPA, Provincial EPAs		calls for measures to streamline the process of checking motor vehicles in Karachi, as a first step towards eliminating air and noise pollution in the city		
34. The	Government of	Production,	to devolve	Chapter XIX Section	

Punjab Local Government Ordinance, 2001	Punjab	Storage, Transport, Import, Export, and Disposal	political power and decentralize administrative and financial authority to accountable local governments for good governance, effective delivery of services and transparent decision making through institutionalized participation of the people at grass-roots level	195: powers and responsibilities of Local Government Section 141 & 145(1): punishments	
35. The NWFP Local Government Ordinance, 2001	Government of NWFP	Production, Storage, Transport, Import, Export, and Disposal	to devolve political power and decentralise administrative and financial authority to accountable local governments for good governance, effective delivery of services and transparent decision making through institutionalized participation of the people at grass-roots level	Chapter XIX Section 195: powers and responsibilities of Local Government Section 141 & 145(1): punishments	
36. The Islamabad Capital Territory Local Government Ordinance, 2002	Ministry of Interior	Production, Storage, Transport, Import, Export, and Disposal	to empower local governments, devolve political power and decentralize administrative and financial authority thereto and regulate the administration	Section 115 & 119: punishments	

			of Federal Capital for effective delivery of services and transparent decision making through institutionalized participation of the people at grass root level		
37. The Cantonments Ordinance, 2002	Ministry of Defence	Production, Storage, Import, Export, Disposal, and Transport	to consolidate and amend the law relating to cantonments and to reconstruct and regulate local self-government in the cantonment areas	Chapter XII, Section 109: license for manufacturing, storing, etc of offensive articles Section 215 & 219(1): punishments	
38. Pakistan Nuclear Regulatory Authority Ordinance 2001	Ministry of Defense	Nuclear Substances and Waste management		Section 3, Establishment of Pakistan Nuclear Regulatory Authority, Section 19(3), Section 21, (Section 29(d)), Powers and responsilbilities of Authority, Section 22, Discharge of Nuclear waste	
39. (Balochistan) (N.W.F.P) (Punjab) (Sindh) Motor Vehicles Ordinance, 1965	Provincial Governments/Provincial EPAs/ Police Department	Emissions	to amend and consolidate the law relating to Motor Vehicles in the Province of West Pakistan	Chapter VI Section 74: rules regarding emission of pollutants by vehicles Chapter VIII Section 105: penalty	
40. West Pakistan Motor Vehicle Ordinance, 1965	Pak EPA/ Police Department	Emissions	to amend and consolidated the law relating to Motor Vehicle in the Provinces	Chapter VI Section 74: rules regarding emission of pollutants by vehicles Chapter VIII Section 105: penalty	
41. Hazardous Substances Rules, 2003	Ministry of Environment	Production, Storage, Disposal, Handling, Distribution, Marketing,	To provide rules for the production, storage, disposal, handling,	Rule 4, 5, 6, 7, 8, 13, 14 & 15: application, issuance, cancellation, etc of licenses Rule 9(1)&(2): packaging and labelling	

		Importation and Transportation	distribution, marketing, treatment, importation and transportation of hazardous substances	Rule 10: warning notice on the premises where hazardous substances are manufactured, stored, etc... Rule 11&12: safety precautions for workers Rule 17: preparation of safety plan Rule 18: notification of accidents Rule 19: preparation of Waste Management Plan Rule 20: licence for import Rule 21: licence for transport	
42. Export Policy Order, 2008.	Ministry of Trade & Commerce	Export	To provide provisions for the import of goods and services	Section 4(1): prohibition on export of certain chemicals to certain countries Section 11(1)&(2): export of chemicals Section 14: restrictions on export	
43. Export Processing Zones Authority Ordinance 1980	Ministry of Trade & Commerce	Export		Section 4, establishment of Export Processing Zones Authority, Section 10, Functions and responsibilities of Authority	
44. The Customs Act, 1969 (IV of 1969)	Federal Board of Revenue	Export & Import	To consolidate and amend the law relating to the levy and collection of customs-duties (fee and service charges) and other allied matters	Chapter XI Section 110: Allowance in case of volatile goods. Chapter XVII Section 156 (1i) & (8): Punishment for Contraventions Chapter XVIII Section 158 (1) & (2), Section 160: Powers of appropriate officers	
45. The Poison Act, 1919 (XII of 1919)	Ministry of Health & Narcotics	Import, Sale & Possession	To consolidate and amend the law regulating the importation, possession and sale of poisons	Section 2 (1) &(2): Power of the State Government Section 3L: Power to grant liscence Section 4(1) & (2): Power to regulate	

				possession of any poison in certain areas. Section 6: Penalty for unlawful importation, etc. Section 7 (1) & (2): Power to issue search warrants	
46. Import Policy Order, 2009	Ministry of Trade & Commerce	Import	To provide provisions for the import of goods and services	Section 5A(i): items banned for import & Section 5B(i): items restricted for import	
47. Pakistan Standards Conformity Assessment Rides, 2008.	Ministry of Science & Technology	Conformity Assessment of Quality Standards			
48. Inspection Agencies (Registration and Regulation) Rules, 1981.	Ministry of Commerce				
49. Pakistan Standards Rules, 2008.	Ministry of Science & Technology	Establishment of Pakistan standards	To establish Pakistan Standards in relation to any article or process and to amend, revise or cancel the Pakistan Standards already established, if necessary, through consultation with consumers, manufacturers, technologists, scientists and officials through duly constituted Committees.	Section 3, Establishment of standards Section 4, formulation of National standards committee. Section 5, Functions of committee Section 6, formulation of Technical committee Section 8, procedures for Pakistan Standards. Section 9, Revision of Pakistan Standards. Section 12 Status of Pakistan Standards. Section 13, Publication of Pakistan Standards.	Moderate
50. Petroleum Exploration and Production Rules, 2009	Ministry of Petroleum & Natural Resources	Oil & Gas exploration and production	To regulate oil & Gas exploration and production activities.	Part VI Standard of operations. Section 58, Avoidance of harmful methods of working in oil & gas fields.	
51. The	Ministry of	Health & Safety	-	Section 4-11:	

Boilers Act, 1923	Labour & Manpower	issues in factories		application, procedure, approval, refusal and expiry, Section 12, structural alteration, Section 23, 24, 25, Punishment, Section 28, 29 Powers & authority.	
52. The Mines Act, 1923	Ministry of Labour & Manpower	Health & Safety Issues in Mining Sector	-	Chapter ii, Section 6, Powers of inspector, Chapter iv, Section 14(1), Operation, Chapter v, Section 18, First aid at site, Section 19(1) & (2), Health and safety, Section 20(1), Reporting, Section 20(1a) & (1b), Inquiry of accidents, Section 20(1a) & (1b), reporting of occupational disease, Section 20a (2)-(6), Mitigation measures, Section 38(1) & (2), Penalties.	
53. Regulation of Mines and Oil Fields and Mineral Development (Government Control) Act 1948	Ministry of Petroleum and Natural Resources	Development of mines, oilfields and mineral deposits	Regulates the development of mines, oilfields and mineral deposits	Section 2, Section 6, Powers and responsibilities of Federal and Provincial Government	
54. Petroleum Act 1934	Ministry of Petroleum and Natural Resources	Import, transport, storage, production, refining and blending	To regulate import, transport, storage, production, refining and blending of petroleum and other flammable substances	Section 4, Duties and responsibilities of Federal Government, Section 6, Warning sign on containers, Section 14ff, Petroleum Products quality conterol	
55. Boilers And Pressure Vessels (Amendment) Act, 2009	Ministry of Labour & Manpower	Health & Safety Issues in Boilers operations	-	Emend clause e) of section 6 of the boiler and pressure vessels ordinance, 2002, certification of good health of boiler engineer	
56. The	Ministry of	Deaths caused		Section 1, Complaint	

Fatal Accidents Act, 1855	Labour & Manpower	due to faults during working hours		of accident, Section 3, Compensation,	

Table 4.3: Overview of Legal Instruments to Manage Chemicals by Use Category

Category of Chemicals	Import	Production	Storage	Transport	Distribution / Marketing	Use/ Handling	Disposal
Pesticides (agricultural, public health and consumer use)	√	√	X	X	√	X	X
Fertilizers	√	√	X	X	√	X	X
Ind. Chemicals	√	√	X	√	X	X	√
Petroleum Products	√	√	√	X	√	X	X
Consumer Chemicals	√	√	X	√	X	X	X
Chemical Wastes	√	√	√	X	X	√	√

Table4.4: List of Banned Pesticides/Pesticides Formulations in Pakistan

No.	**Banned Pesticides**		
1	B.H.C	14	Dieldrin
2	Binapacryl	15	Disulfoton
3	Bromophos ethyl	16	Endrin
4	Captafol	17	Ethylene dichloride +
5	Chlordimeform	18	Carbontenachloride
6	Chlorobenzilate	19	Leptophos
7	Chlorthiophos	20	Mercury Compound
8	Cyhexatin	21	Mevinphos
9	Dalapon	22	Toxaphene
10	DDT	23	Zineb
11	Dibromochloropropane +	24	Heptachlor
12	Dibromochloropropene	25	Methyl Parathion
13	Dicrotophos	26	Monocrotophos (all formulations)
27	Methamidophos (all formulations)		
Pesticides Formulations Banned			
1	Dichlorvos (above 500 g / l)	2	Phophamidon (above 500 g / l)

Pesticides not Registered			
1	Aldrin (POP/PIC)	5	Ethylene di bromide (PIC)
2	Mirex (POP)	6	Parathion (PIC)
3	Chlordane (POP/PIC)	7	Fluroacetate (PIC)
4	Dinoseb (PIC)		

Table 4.5: List of Banned Chemicals for Import

S. No.	PCT Codes	Commodity Description
14.	2620.1100 2620.1900 2620.2100 2620.2900 2620.3000 2620.4000 2620.6000 2620.9100 2620.9900 2621.1000 2621.9000 2621.1000 2710.9900 2713.9090 3825.1000 3825.2000 3825.3000 3825.4100 3825.4900 3825.5000 3825.6100 3825.6900 3825.9000 3915.1000 3915.9000 7902.0000 8110.2000 8112.1300 8548.1000 and other respective headings.	Hazardous wastes as defined and classified in the Basel Convention.
15.	2921.5900	Bbenzidine and its derivatives).
16.	2921.5900 2922.2900	Paraphence-tole carbamide and 5-Nitro-2 proxyaniline in both tablet and powder or crystalline forms.
17.	2930.9090	Allyl-isothio-cyanate.
18.	2939.3000	Caffeine citrate.
20.	3204.1100 3204.1200 3204.1300	Dyes containing benzidine.

	3204.1400 3204.1510 3204.1590 3204.1600 3204.1700 3204.1910 3204.1990 3204.2000 3204.9000 3212.9090	
28.	8414.3090 8418.1000 8418.2100 8418.2900 8418.3000 8418.4000 8418.5000 8418.6100 8418.6910 8418.6920 8418.6990 8418.9100 8418.9910 8418.9920 8418.9930 8418.9990	CFC gas based refrigerators, deep-freezers and other refrigerating cooling, chilling equipment and CFC based compressors of these equipment.

Source: Trade Policy 2009

Table 4.6: List of Restricted Chemicals for Import

Sr. No.	PCT Codes	Chemicals	Level of Restriction
1	2844.0000 2844.1000 2844.2000 2844.3000 2844.4000 2844.5000 8543.1000 8543.8900 9022.1200 9022.1300 9022.1400 9022.2100 9022.2900 9022.9000	Radioactive materials and Radiation apparatus	Import of Radioactive materials is subject to the prior approval of Pakistan Nuclear Regulatory Authority.
2	2524.1000 2524.9000	Asbestos	Only import of asbestos of chrysotile type with specifications of colour-white to grey & density 2.4 g/cm3 to 2.6 g/cm3 is allowed
3	2804.8000 2530.9090	Arsenic and Arsenic compound	Subject to valid licenses issued by the concerned Environment Protection Agency/

	2812.1000 2812.9000 2813.9000 2848.0000 2850.0000		Department under PEPA 1997
4	2849.1000	Calcium carbide, whether or not chemically defined	Subject to prior approval of the Department of Explosives
5	Respective Headings	Ozone Depleting Substances	Subject to the policy/quota allocations to be laid down by the Ministry of Environment.
6	2915.2400	Acetic anhydride	Subject to NOC from the Ministry of Narcotics and the quantity determined by FBR and the Ministry of Health.
7	2924.2300	N-Aceylanthranilic acid	-do-
8	2932.9100	Isosafrole	-do-
9	2939.4100	Ephedrine	-do-
10	2939.6100	Ergometrine	-do-
11	2939.6200	Ergotamine	-do-
12	2939.6300	Lysergic acid	-do-
13	2930.9090	3-4-Methylenedionyphenyl-2-propanone	-do-
14	2939.4900	Norephedrine	-do-
15	2914.3100	1-Phenyl-2-propanone	-do-
16	2932.9300	Piperonal	-do-
17	2939.4200	Pseudoephedrine	-do-
18	2932.9400	Safrole	-do-
19	2914.1100	Acetone	-do-
20	2922.4300	Anthranilic acid	-do-
21	2909.1100	Ethyl ether	-do-
22	2806.1000	Hydrochloric acid	-do-
23	2916.3400	Phenylacctic acid	-do-
24	2933.3200	Piperidine	-do-
24	2807.0000	Sulphuric acid	-do-
26	2841.6100	Potassium permanganate	
27	2902.3000	Toluene	-do-
28	2914.1200	Methyl ethyl ketone	-do-
29	2912.1100	Formaldehyde	Subject to valid license issued by the Environmental agency/dept concerned under the Pakistan Environmental Protection Act, 1997"
30	Respective headings	All narcotic drugs and psychotropic substances, except items on Banned List	Subject to license on the authorizations of Ministry of Health.
31	3204.1100 3204.1200 3204.1300	Dyes	Importable subject to certificate from the suppliers that the dyes are neither based on benzidine, nor contain any

	3204.1400 3204.1510 3204.1590 3204.1600 3204.1700 3204.1910 3204.1990 3204.2000 3204.9000 3212.1000 3212.9010 3212.9020 3212.9030 3212.9090		contents thereof

Source: Trade Policy 2009

4.4. Non-Regulatory Mechanisms for Managing Chemicals

4.4.1. (SMART) Self-Monitoring and Reporting System for Industry

EPAs in Pakistan require to measure, analyze and report the environmental performance of every industrial facility in the country, against no less than 48 environmental parameters-32 for liquid effluents and 16 for air emissions, which are in the NEQS.

In order to involve industries in the monitoring and evaluation of environmental performance, the Pakistan Environmental Standards Committee introduced a programme, "The Self-Monitoring and Reporting System" SMART. The programme has transferred the responsibility for examining and evaluating industry's environmental performance to individual industrial facilities. The reported data also enables government agencies to assist industrial units in controlling their pollution levels.

It classifies industry into three categories A, B and C each corresponding to a specified reporting frequency. Category A industry will report their emission levels after every month, category B industry quarterly and category C industry biannually. Industrial units get their effluent tested from a laboratory and enter the results in the electronic forms (software SMART – Self-Monitoring and Reporting Tool, provided with this package). The data so entered could be sent to respective Environmental Protection Agency via email or through floppy.

The sampling and analysis requirements and procedures, and the reporting format are also prescribed. Instruction Manual of software has been written in a simplified language, which assist operator on installation and usage of the software. Under the Self-Monitoring and Reporting System, industries in Pakistan are responsible for systematically monitoring their environmental performance and reporting the data to Environmental Protection Agencies.

4.4.2. Environmental Technology Programme for Industry (ETPI)

Environmental Technology Program for Industry (ETPI) was initiated by the Federation of Pakistan Chambers of Commerce and Industry (FPCCI) and the Government of Netherlands. NEC is the lead consulting firm, in consortium with four other consulting firms of HASKONING, KWT, MDF and Hagler Baily to implement this project. A five year project

initiated in 1996, ETPI aims to assist Pakistani industries and their associations in identifying the most economical pollution prevention and abatement technologies, and in implementing these solutions.

In alignment with the National Conservation Strategy (NCS) ETPI covers all priority industrial sub-sectors of textile, fertilizer, paper and paper board, leather, cement and sugar, etc. to promote use of environmentally safe technologies for environmentally safe production of Pakistan's manufacturing/industrial sector products. This process shall be achieved by promoting and adopting measures for pollution abatement, waste management and recycling, chemical recovery, efficient utilization of natural/economic resources, and production and installation of instrumentation and control systems for utilization of efficient and environmentally safe production technologies.

The Pakistan Society of Sugar Technologies (PSST) and Pakistan Sugar Mills Association (PSMA) organized environmental workshops in collaboration with ETPI. Korangi association of Trade and Industry (KATI) has started an environmental project titled the " Up-gradation of Korangi Industrial Area".

4.4.3. Pakistan Tanners Association

In an attempt to address environmental concerns,Pakistan Tanners Association is implementing ICTP (Introduction of Cleaner Technologies Programme) for tanneries clusters of Punjab, financed by The Royal Netherlands Embassy. "The Initial Environment Examination" of more than 260 tanneries has been completed. PTA has also established a private company, "Environmental Management Limited", for implementing Combined Effluent Treatment Plants, a Solid Waste Management Programme, an Occupational Health and Safety Programme, and a Drainage System, for about 160 Tanneries located at Korangi at a cost of more than 1 Billion.

The Combined Effluent Treatment Plant (CETP) for Kasur has been completed. PTA is supporting to establish a tannery zone for Sialkot. The treatment of effluent wastewater is a component of the project.

4.4.4. ISO 14001/ OHSAS/OHSMS

ISO 14001, established in 1996 and revised in 2004, is a voluntary international standard focussing on the systemic management of an organization's environmental impacts. By establishing environmental management system in an organization long term reduction in pollution can be made possible.

Occupational Health and Safety (OH&S) Management System provides a framework for an organization to identify and control its health and safety risks, reduce the potential for accidents, comply with legislation and improve operational performance.

OHSAS 18001 is the requirement standard for an OH&S Management Systems which was recently updated and adopted as OHSAS 18001:2007. The update reflects the learning achieved

from widespread use of the standard across the world and provides more emphasis on "Health" rather than just "Safety".

The specification has been designed to be compatible with the ISO 9001 and ISO 14001 management system standards.

OHSAS 18001 requires an organization to formally document the areas that are covered by their OH&S policy and to keep evidence that it is operating according to the requirements of the standard. It is relevant to any organization that wants to conform to legislation and demonstrate to staff and stakeholders that it has systems in place to minimize and eliminate risks.

These international standards for environmental management and occupational health and safety are being adopted by a majority of medium and large enterprises, including national as well as multinational organizations and production facilities in Pakistan. These are voluntary initiatives and commitments towards environment, health and safety. Under these programmes a large number of small medium and large enterprises have adopted these standards by certifying through accredited international certification bodies.

4.4.5. NGOs

Various NGO's in Pakistan are involved in identifying and addressing pollution problems and suggesting mitigation measures for the industrial sector as envisaged in the policy decision taken from time to time. NGOs in collaboration with the public sector organization focused on the textile industry for formulation of action plan for enforcement of National Environmental Quality Standards. NGOs also developed close liaison and working relationships among themselves and with Community Based Organizations (CBOs)

4.5. Comments/Analysis

- Legislation related to different aspects of life cycle of chemicals, especially with reference to import, export, production, use and disposal is very comprehensive. The legislation dealing with disposal, transportation and storage of chemicals is insufficient. These areas are required to be addressed urgently.
- There does not exist any law directly related to transport and storage of chemicals. Explosive act is present but that too does not cover all aspect of chemical handling and safety.
- Legislation related to consumer chemicals including food product is very poor. This is causing serious health hazards due to uncheck use of chemicals in consumer and food products.
- Most of the existing legislation was not enacted for the specific purpose of chemical life cycle management in particular e.g. Carriage of Goods by Sea Act, The Motor Vehicle Act, The Railways Act, Explosive Substances Act, Mines Act, fatal Accidents Act, dose not cover all aspects of chemical management. Therefore their environmental content is ancillary.
- Penalties for environmental offences are generally punitive rather than reformatory. The approach is counterproductive since punishment may induce future restraint but it does not rectify the damage committed;

- For any law to be successfully implemented the penalty must be stringent enough to deter the felon. A fine of Rs. 500 on an industrialist for discharging his units' industrial waste in the nearby stream may provide no deterrence.
- The cases of adulterations in chemicals, if any are dealt with under the pure food rules.
- Similarly, no specialized legislation exists to control the import, production, storage, transportation, distribution, use/handling of any kind of chemicals except that the disposal/handling of toxic and hazardous substances are dealt with under the Pakistan Penal Code and the Explosives Act, 1884 and Hazardous Substances Rules, 2006.
- The effectiveness and enforcement of regulatory framework the major drawbacks with the inspections, monitoring, vigilance and public awareness. There is a serious lack of trained technical human resource in every related department. This can be enhanced with the properly accredited NGOs for such purpose.
- Now new acts are proposed but few amendments in existing laws will be suffice.
- Various non regulatory mechanisms and voluntary programmes are only implemented effectively in larger industries that have better financial resources to implement and maintain them. These initiatives are important in reducing the risks but smaller industries cannot afford on long term basis.

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Chapter 5

5. Ministries Agencies and Other Instruments Managing Chemicals

5.1. Responsibilities of Different Government Ministries Agencies and Other Institutions

In chapter 4, regulatory mechanism for chemical management has been discussed and various legal instruments along with their responsible ministries/agencies have been identified. Chemical management in Pakistan is done through a well defined governmental structure where responsibilities and mandates of various ministries, agencies, and attached departments related to different aspects or categories of chemicals are defined through these legal instruments. By acts enacted by the parliament, specific institutions have been created and their authorities and powers have been defined to mange chemicals. The following section gives an overview of important ministries, agencies or institutions related to chemical management.

Table 5.1: Responsibilities of Government Ministries, Agencies and Other Institutions

Stages of Life Cycle / Ministry Concerned	Importation	Production	Storage	Transport	Distribution / Marketing	Use / handling	Disposal	Major Responsibilities
Environment (Pakistan Environmental protection Agency, Provincial EPAs)	X	X	X		X	X	X	Implementation of PEPA 1997, National Environmental Quality Standards (SMART) Rules 2001, Pollution Charge for Industry Rules 2001, National Environmental Quality Standards (Certification of Environmental Laboratories) Regulation 2000 Environmental Samples Rules 2001, Pakistan Environmental Protection Agency Review of IEE and EIA Regulations 2000, National Environmental Quality Standards 1993, Pollution of Environment Caused by Smoke, Emitting Vehicles, Traffic Muddle,1996, Hazardous Substances Rules, 2003
Health (National Institute of Health)	X	X			X			Drugs Act 1976, Health Care Waste Management Rules 2005, The Poisons Act, 1919
Food & Agriculture (Plant Protection Department)	X	X	X	X	X	X		The Agricultural Pesticides Ordinance, 1971 & Rules 1973
Labour & Manpower		X	X			X		Labour laws, Boiler and Pressure Vessels Ordinance, Dock labourers Act, Factories Act and Regulations & Rules, Fatal

								Accident act, Hazardous Occupation rules, Mines Act & Rules,
Commerce	X							Export Policy Order, 2008, Import Policy Order, 2009
Industry & Production		X			X			The Agricultural Pesticides Ordinance, 1971 & Rules 1973,Petroleum act & Rules, Boilers Act, Development of industries (federal control) (Repeal) Ordinance
Finance (Federal Board of Revenue, Customs Department)	X							The Customs Act, 1969
Petroleum & Natural Resources	X	X	X	X	X			Petroleum Exploration and Production Rules, 2009
Interior		X	X					The Motor Vehicles Act, 1939, Explosive Substances Act 1908 Explosives Act 1884
Science & Technology						X	X	Pakistan Standards and Quality Control Authority Act, 1996, Pakistan Standards Conformity Assessment Rides, 2008, Inspection Agencies (Registration and Regulation) Rules, 1981, Pakistan Standards Rules, 2008.
Communication				X				West Pakistan Motor Vehicle Ordinance, 1965, The Motor Vehicles Act, 1939
Railways				X				The Railways Act, 1890
Textile Industry							X	National Environmental Quality Standards (SMART) Rules 2001, Pollution Charge for Industry Rules 2001, National Environmental Quality Standards 1993,
Law & Justice	X	X	X	X	X	X	X	
Ports & Shipping				X		X		The Dangerous Cargoes Act, 1953 Act, The Carriage of Goods by Sea Act, 1925, The Karachi Port Trust Act, 1886, The Territorial Waters and Maritime Zones Act, 1976, Port Qasim Authority Act 1973
Defence Production		X	X			X		National Environmental Quality Standards (SMART) Rules 2001, Pollution Charge for Industry Rules 2001, National Environmental Quality Standards 1993, Explosive Substances Act 1908 Explosives Act 1884
Foreign Affairs							X	Signs and ratifies all international

								Conventions on behalf of Government of Pakistan
Local Governments & Rural Development							X	Provincial Local Government Ordinances, 2001

5.2. Description of Ministerial Authorities and Mandates

5.2.1. Ministry of Environment

Ministry of Environment is headed by a Federal Minister while the Federal Secretary holds the administrative charge. It comprises five wings namely Administration, Development, Environment, International Cooperation and Forestry. Each of the Wings is responsible for its respective functions. The environment Wing of the Ministry is headed by a Director General. The ministry is the focal point for National Policy, plans and programs regarding environmental planning, pollution and ecology, including physical planning and human settlements, urban water supply sewerage and drainage. The Division also deals with other countries and international organizations in the fields of Environment, housing, physical planning and Human Settlements.
The International Cooperation Wing headed by a Joint Secretary (International Cooperation) deals with the following subjects;

- United Nations Commission on Sustainable Development (UNCSD).
- United Nations Economic & Social Commission for Asia Pacific (UNESCAP),
- Economic & Social Commission (ECOSOC) and Convention on Persistent Organic Pollutants (POPs).
- Rotterdam Convention on procedures for certain hazardous wastes,
- Implementation of World Summit on Sustainable Development (WSSD).
- International Cooperation on Water, Energy, Health, Agriculture & Bio-diversity (WEHAB), and
- The matters relating to bilateral and multilateral cooperation, Join Ministerial Commissions, SAARC & ECO.

The Ministry of Environment with the help of Pak-EPA, is mainly responsible for the implementation of PEPA 1997, National Environmental Quality Standards (SMART) Rules 2001, Pollution Charge for Industry Rules 2001, National Environmental Quality Standards (Certification of Environmental Laboratories) Regulation 2000 Environmental Samples Rules 2001, Pakistan Environmental Protection Agency Review of IEE and EIA Regulations 2000, National Environmental Quality Standards 1993, Pollution of Environment Caused by Smoke, Emitting Vehicles, Traffic Muddle,1996, Hazardous Substances Rules, 2003.
Ministry is also responsible for implementation of National Conservation Strategy, and Environmental Policy.

5.2.2. Pakistan Environmental Protection Agency, Provincial EPAs

Pakistan Environmental Protection Agency has been established under action 5 of Pakistan Environmental protection Act, 1997. Basic functions of Pak EPA are to prepare or revise and establish the National Environmental Quality Standards with approval of the National Environmental Council; take measures to promote research and the development of Science & technology which may contribute to the prevention of pollution, protection of the environment, and sustainable development; identify the needs for, and initiate legislation in various sectors of

the environment, provide information and guidance to the public on the environmental matters; specify safeguards for the prevention of accidents and disasters which may cause pollution; and encourage the formation and working of non-governmental organizations, community organizations to prevent and control pollution and promote sustainable development.
Pak-EPA gas established the Central Laboratory for Environmental Analysis (CLEAN) Islamabad for research and investigation of the environmental issues regarding, water, wastewater, air and soil. The Central Laboratory is presently equipped with analytical equipments required for environmental analysis. It is also equipped with other equipments and chemicals for field sampling and analysis. In addition to that EPAs have been established in provincial capitals, capital of AJ & K and Northern Areas. In Punjab, Environmental Protection Department has been established where it is working at district level.

5.2.3. Ministry of Health

The Ministry of Health is responsible for controlling the health related chemicals. It is responsible for the importation of pharmaceutical products either directly or allows their import by the private sector. Generally, the Ministry of Health allows and then controls the import of pharmaceutical products in finished form or in components and raw materials for domestic production of medicines in the private sector. Therefore the overall responsibility for controlling the importation, production, storage, transport, distribution/marketing, use/handling of pharmaceutical products rests with the Ministry of Health.

5.2.4. National Institute of Health

The Ministry of Health is responsible for matters concerning National Planning and Coordination in the field of health, international liaison, legislation pertaining to the drugs and medicines and administration of drugs Act 1976.

5.2.5. Ministry of Food & Agriculture (MINFAL)

Ministry of Food & Agriculture is responsible for importation, production, storage, transport, distribution/marketing, use/handling of pesticides. This Ministry is also responsible for the import of fertilizer and the storage, transportation, distribution, use and handling of imported fertilizers. Monitoring the use of both local and imported fertilizers is also responsibility of the Ministry of Food and Agriculture.

5.2.6. Department of Plant Protection (MINFAL)

The Department of Plan Protection is responsible for registration and other regulatory aspects of pesticides. The Agricultural Technical Advisory Committee (APTA) advises the Ministry on technical matters arising out of the administration of the pesticide legislation.

5.2.7. Ministry of Industry & Production

Ministry of Industry & Production is responsible for domestic production, storage, transportation, distribution and handling of the locally produced fertilizer and all other chemicals. Monitoring the use of both local and imported fertilizers is the responsibility of the Ministry of Food and Agriculture.

5.2.8. Ministry of Finance

Import levies, if any, on the import of all chemicals is the responsibility of the Customs Department in the Ministry of Finance.

5.2.9. Ministry of Labour & Manpower

The ministry is mandated to perform the functions broadly related to policy formulation regarding labour administration manpower planning and employment promotion. As the subject of labour and employment under the Constitution of the Islamic Republic of Pakistan, 1973 is on the concurrent legislative list, the Ministry functions in close coordination with the Provincial Governments in these fields. The ministry is responsible for

- Formulation of a progressive and dynamic Labour and Manpower Policy
- Human Resource Development: Focus on education, training and skill development
- Respect for human rights, gender balance, eradication of child and bonded labour
- Coordination with the Provincial Governments, International Labour Organization (ILO) and other International Agencies

The main function of the ministry is to formulate national policy and legislation regarding: Industrial Relations, Labour Welfare, Elimination of Child and Bonded Labour, International Labour Standards/ Conventions, Gender balance, Human Resource Development, Vocational Training, education and training of workers, Manpower Planning, Export of Manpower and Welfare of Overseas Pakistanis and their dependents, Collection and dissemination of data regarding Labour & Manpower, Labour and Manpower related surveys, studies, research, seminars, symposia, workshops and conferences, Institutional Arrangements Pakistan Tripartite Labour Conference, Standing Labour Committee, Labour Advisory Board, National Committee on the Rights of the child, Minimum Wage Council and Inter-Provincial and Inter-Ministerial Coordination regarding formulation of policies, legislation and implementation.

5.2.10. Ministry of Commerce

Under the Rules of Business 1973, Ministry Commerce is responsible for the Imports and exports, across custom frontiers, formulation of Trade Policy in conjunction with other wings and implementation of import policy initiatives. Through trade policy the ministry regulates the import and export of chemicals and raw materials used for chemicals production. The ministry is also responsible for mmultilateral trade negotiations and compatibility of domestic laws with WTO laws.

5.2.11. Ministry of Petroleum & Natural Resources

The Ministry is responsible for dealing with all matter relating to petroleum, gas and mineral affairs. Its detailed functions are as under:-

- Policy, legislation, planning regarding exploration, development and productions Policy guidelines to regulatory bodies in oil and gas sectors.
- Policy guidelines and facilitation of import, export, refining, distribution, marketing, transportation and pricing of all kinds of petroleum and petroleum products;
- Matters bearing on international aspects;
- Federal agencies and institutions for promotion of special studies and development programmes.

- Facilitate the development of petroleum and mineral sectors.
- Attract the private investment.
- Administration of Regulation of Mines and oil fields and Mineral Development (Federal Control) Act, 1948, and rules made there under, in so far as the same relate to exploration and production of petroleum, transmission, distribution of natural gas, Compressed Natural Gas, Liquefied Natural Gas and liquefied petroleum gas, refining and marketing of oil;
- Petroleum concessions agreements for land, off-shore and deep sea areas;
- Facilitation of import of machinery equipment etc. for exploration and development of petroleum and minerals.
- Administration of Marketing of Petroleum Products (Federal Control) Act 1974 and the rules made there-under;
- Matters relating to Federal investments and undertakings wholly or partly owned by the Government in the field of oil, gas and minerals.
- Coordination of energy and mineral policies.
- Research, development, deployment and demonstration of hydrocarbon energy resources.

5.2.12. Ministry of Science & Technology

Technology Wing of MOST is responsible to initiate and monitor various programmes for technology development and industrialization in the country. This wing also acts as liaison between various ministries and national and international bodies for the development of technology-based project. The wing is headed by a Joint Technological Adviser (JTA), assisted by one Deputy Technological Adviser (DTA) and two Assistant Technological Advisers. The ministry is directly related to Chemical management in Pakistan through implementing Pakistan Standards and Quality Control Authority Act, 1996, Pakistan Standards Conformity Assessment Rides, 2008, Inspection Agencies (Registration and Regulation) Rules, 1981, Pakistan Standards Rules, 2008.

5.2.13. Science and Technology Section, Planning Commission

The Science & Technology Section was created on 1st November 1983. The section is responsible for looking after development projects of S&T sector, including Ministry of Science & Technology, Pakistan Atomic Energy Commission, SUPARCO, NESCOM, Pakistan Nuclear Regulatory Authority and Pakistan Meteorological Department and Higher Education Sector.

The main functions of S & T section are;

- To recommend policy measures to Planning Commission for development of Science and Technology in the country along scientific line.
- Prepare long term (perspective), medium term (Five Year Plan) and short term (Annual Plan) for integrated development for Science and Technology in the country.
- In collaboration with concerned technical sections of the Planning Commission appraise the Science and Technology Project and pilot them through CDWP and ECNEC.
- Collect and maintain all relevant statistics regarding Science & Technology Activities in the country.
- Initiate/carry out research for determining the critical factors for development of Science and Technology in the country.

- Maintain a close liaison with all national and international Science and Technology Institutions.
- Organize national and international Conferences, Seminars, Symposium, Workshops and training Courses, etc. to disseminate Science and Technology information to all concerned.
- To co-ordinate Science and Technology activities in the country.
- To carry out evaluation of existing programmes and institutions to determine the impediments in the way of smooth functioning of these institutions and recommended measures for their improvement.

5.2.14. Planning and Development Division

The Planning Commission is responsible to perform the functions such as, preparing the National Plan and review and evaluating its implementation; formulating annual plan and ADP; monitoring and evaluating implementation of major development projects and programmes; stimulating preparation of sound projects in regions and sectors lacking adequate portfolio; continuously evaluating the economic situation and coordinate economic policies; and organizing research and analytical studies for economic decision making.

The Planning Commission also assists in defining the national vision, and undertaking strategic planning; assessing the material, capital and human resources of the country and formulating proposals for augmenting such resources and facilitating capacity building of agencies involved in development.

The National Fertilizer Development Centre (NFDC)

The National Fertilizer Development Centre (NFDC) was set up by the Government of Pakistan (Planning and Development Division) in December 1977. NFDC is a multidisciplinary research and development organization at the federal level that integrates disciplines such as economic planning, pricing and subsidies, privatization and deregulation, production and imports, marketing and credit, agronomy and soil science, research, extension and training.

In co-operation with the various federal and provincial institutions, NFDC studies all fertilizer-related problems from the supply source to the farmers' fields, with a view to helping in the formulation of Government policies and their implementation and to give support to other institutions.

Objectives

The current broad objectives of NFDC are:

- To provide objective and comprehensive advice to all levels of Government, to the fertilizer industry and to other parties as may be relevant, on all matters related in any way to the fertilizer sector of Pakistan and its relations with the international fertilizer community.
- To conduct research studies on physical and economic returns on fertilizer use to farmers, impact of input prices on crop output, deregulation/privatization of fertilizer in order to facilitate policy decisions.
- To conduct fertilizer use surveys at farm level to monitor fertilizer use by crops, impact on crop productivity, crop responses to fertilizers and problems faced by farmers.

- To monitor the status of all aspects of fertilizer use development: production, imports, consumption, prices and evaluate situation critically for the information and action by the concerned organizations, so that timely actions can be taken to effect improvement.
- To promote efficient, balanced and environmental friendly integrated use of plant nutrients for sustainable agricultural growth.
- To help upgrade the capability of fertilizer research, extension and marketing personnel in the transfer of fertilizer technology.
- To provide a neutral common platform to resolve contentious issues in fertilizer sector.
- To launch new initiatives in soil fertility and plant nutrition management.

5.2.15. Ministry of Communication

Ministry of Communications functions as a central policy making and administrative authority on Communications and Transport Sector in the Country. In chemical life cycle the major role of the ministry is in transportation.

5.2.16. Ministry of Ports & Shipping

Ministry of Ports & Shipping functions as a central policy making and administrative authority on Ports and Shipping Sector in the country. The Ports and Shipping Wing of the ministry was established in 1961 to bring the decision making closer to the shipping industry which is mainly based in Karachi. The main functions involved are;

1. Shipping industry is to be provided with guidance and policy decisions based on international conventions and national rules & regulations. This Wing formulates such policies under the said rules for the industry.
2. Tackling of shipping related issues on the spot and to give timely decisions for overall benefit of the sector.
3. Registration of ships and crafts under Pakistan flag and conducting survey/inspection and issuing required trading certificates.
4. To act as safety administration and ensure seaworthiness of ships and crafts in accordance with national and international laws/conventions.
5. Pollution control from ships in harbour and territorial waters.
6. Seafaring is a specialized profession and requires proper training followed by examination and certification to be in line with acceptable international standards. The wing is entrusted to undertake this business to ensure compatibility with existing system of other maritime nation.
7. Seaman Service Book (SSB), formerly known as Continuous Discharge Certificate (CDC), is a pre-requisite document for ship-board employment. Its issuance is one of the functions undertaken by this Wing through its sub-ordinate office.
8. The Autonomous bodies and the field offices which deal with the shipping industry are placed under the administrative control of this Wing.
9. The Wing is also entrusted with responsibility to prepare developmental plans to affect improvement in maritime sector in consonance with the international requirement and technological changes in the field.
10. International conventions pertaining to ports and shipping are initially examined by this Wing and then recommended for ratification by the Government of Pakistan after reviewing the existing system in the country.

11. As a follow up to ratification of conventions, the Wing is responsible for formulation of maritime laws/regulations for implementation by shipping industry.
12. The Wing is also required to update and advise Government on technical matters related to maritime field.
13. Coordination and liaison with other ministries, agencies, national and international organizations on maritime affairs is also one of the functions, undertaken by this Wing.

5.2.17. Ministry of Foreign Affairs

Ministry of Foreign Affairs is involved in international negotiations, signing and ratification of international Conventions and Protocols.

5.3. Comments/Analysis

- The mandates of ministries and departments are clearly defined and there does not exist any overlapping. However if there any controversy arise, the matter can be sorted out in inter-ministerial committee for management of chemicals.
- There is no need for a new ministry dealing with chemical management.
- Under the PEPA the federal government has the authority to delegate any of its environmental management functions and powers to provincial governments, government agencies, or local authorities. Provincial governments in turn may delegate powers to any lower-tiered government agency. This provision establishes a framework for environmental federalism within which environmental movement responsibilities are shared among federal, provincial and local governments.
- Mandates of various ministries and institutions related to chemical management are well defined. No new ministry is required exclusively for chemicals management.
- There is a need for capacity building of existing institutions with reference to implementation of policies, rules, regulations and acts. The lack of human resource, awareness of existing regulatory framework within implementing agencies and meagre funds available are main bottlenecks to be removed.
- Most of the staff of ministries and related departments is overworked. There are very few financial/career incentives available to technical human resource. There also lack critical infrastructure required for monitoring.
- There is a need for enhanced coordination between Ministries of Food, Health, Agriculture & Live stock and Environment.
- Participation of Ministry of Health in the registration process, particularly in case of pesticides that are used in Public Health should be enhanced.
- Strengthening of agencies responsible for enforcement of laws, for formulation and repackaging, storage and transportation of pesticides is required. There should be a national monitoring and surveillance system.
- Ministry of Health should be involved in the national information exchange system and strong public health pesticide management awareness should be done, in collaboration of ministry of health.
- Institutional capacities are needed to be strengthened in terms of improved availability of information, filling gaps in the understanding of chemicals related health issues, risk

assessment methods, protection of vulnerable groups including children, workers and population in general, promotion of safe alternatives and needs for prevention.

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6. Relevant Activities of Industry, Public Interest Groups, and the Research Sector

6.1. Description of Organizations/Programs

6.1.1. Industry Associations

Industrial association includes various national level bodies, as well as regional level organizations representing group of industries. They also include sectoral organizations that represent a particular type of industry. These associations play a vital role in fiscal and government policies reforms, legal aspects, environmental, health and safety issues, trade (WTO and patient regimes) and other related issues of industry including chemical industry. They play an important role in capacity building through trainings building knowledge base.

The industrial associations in Pakistan have played an important role in initiatives such as ISO 9000, ISO 14000, OHSAS 18001, SMART Programme, joint treatment of industrial effluents and eco labeling. They also play an important role in raising member/public awareness by holding workshops, seminars on environmental issues. Following is the list of such industrial associations in major industrial cities of Pakistan.

Chambers of Commerce:

- Azad Jammu & Kashmir Chamber of Commerce & Industry,
- Faisalabad Chamber of Commerce & Industry,
- Gujranwala Chamber of Commerce & Industry,
- Gujranwala Chamber of Commerce & Industry,
- Hyderabad Chamber of Commerce & Industry,
- Karachi Chamber of Commerce & Industry,
- Lahore Chamber of Commerce & Industry,
- Multan Chamber of Commerce & Industry,
- Overseas Investors Chamber of Commerce & Industry,
- Quetta (Balochistan) Chamber of Commerce & Industry,
- Rawalpindi Chamber of Commerce & Industry,
- Sarhad Chamber of Commerce & Industry,
- Sukkur Chamber of Commerce & Industry,
- Sialkot Chamber of Commerce & Industry,
- Dera Ghazi Khan Chamber of Commerce & Industry,
- The American Business Council of Pakistan,
- Islamabad Chamber of Commerce & Industry,
- Sargodha Chamber of Commerce & Industry,
- Dadu Chamber of Commerce & Industry,
- The Dera Ismail Khan Chamber of Commerce & Industry,
- Gujrat Chamber of Commerce & Industry,
- Hazara Chamber of Commerce & Industry,

Faisalabad:

1. Pakistan Small Units Powerlooms Association
2. Pakistan Particle Boards Manufacturers Association
3. All Pakistan Textiles Processing Mills Association

Karachi:

1. Pakistan Carpet Manufacturers & Exporters Association
2. Pakistan Cement Manufacturers Association
3. Pakistan Chemists and Druggists Association
4. Pakistan Chemicals & Dyes Merchants Association
5. Cigarette Manufacturers Association of Pakistan
6. Karachi Cotton Association
7. Pakistan Cotton Ginners Associations
8. Pakistan Electronic Manufacturers Association
9. Pakistan Handicrafts Manufacturers & Exporters Association
10. Pakistan Hardware Merchants Association
11. Pakistan Hosiery Manufacturers Association
12. Pakistan Hotels Association
13. Insurance Association of Pakistan
14. Pakistan Jute Mills Association
15. Pakistan Metal Container Manufacturers Association
16. Pakistan Paint Manufacturers Association
17. Pakistan Pharmaceutical Manufacturers Association
18. Pakistan Pharmaceutical Importers Association
19. Pakistan Plastic Manufacturers Association
20. Pakistan Poultry Association
21. Pakistan Pulp Paper and Board Makers Association
22. Pakistan Readymade Garments Manufacturers & Exporters' Association
23. Pakistan Sanitary Merchants & Manufacturers Association
24. Pakistan Seafood Industries Association
25. Pakistan Ship Breakers Association
26. Pakistan Shipowners Association
27. Pakistan Silk & Rayon Mills Association
28. Pakistan Small Industries Association
29. Pakistan Soap Manufacturers Association
30. Pakistan Stationers Association
31. All Pakistan Solvent Extractors Association
32. Pakistan Tanners Association
33. Pakistan Tea Association
34. All Pakistan Textile Mills Association
35. Towels Manufacturers Association of Pakistan
36. Pakistan Vanaspati Manufacturers Association
37. Pakistan Waste Products Association
38. Pakistan Yarn Merchants Association

39. Pakistan Tyre Importers & Dealers Association
40. Pakistan Cotton Fashion Apparel Manufacturers & Exporters Association,
41. Pakistan Bedwear Exporters Association
42. All Pakistan Gem Merchants & Jewellers Association
43. The Pakistan Wool & Hair Exporters Association
44. Pakistan Agricultural Pesticides Association
45. Pakistan Restaurants & Caterers Association
46. Air Cargo Agents Association of Pakistan

Lahore

1. Pakistan Arms & Ammunition Merchants and Manufacturers Association
2. Pakistan Electrical Manufacturers Association
3. Pakistan Flour Mills Association
4. Pakistan Industrial Fasteners Manufacturers Association
5. Pakistan Association of Printing & Graphic Arts Industry
6. Pakistan Publishers & Booksellers Association
7. Pakistan Steel Melters Association
8. Pakistan Steel Re-rolling Mills Association
9. Pakistan Sugar Mills Association
10. Pakistan Woolen Mills Association
11. Pakistan Canvas & Tents Manufacturers & Exporters Association

Multan

1. Multan Cotton Association,
2. All Pakistan Bedsheets & Upholstery Manufacturers Association

Peshawar

1. Pakistan Agricultural Machinery & Implements Manufacturers Association,
2. All Pakistan Commercial Exporters Association of Rough and Unpolished Precious and Semi-precious Stones

Quetta

1. Pakistan Mine Owners Association

Sialkot

2. Pakistan Gloves Manufacturers and Exporters Association
3. Pakistan Sports Goods Manufacturers and Exporters Association
4. Surgical Instruments Manufacturers Association of Pakistan

Wazirabad

1. Pakistan Cutlery & Stainless Utensils Manufacturers and Exporters Association

6.1.2. Academia/Research Organizations

Universities and research organization play an important role in chemical testing, environmental monitoring, research on effluents and industrial wastes, and industrial processes. The role of academic institutions and research organizations will be discussed in detail in Chapter 9, for technical infrastructure.

6.1.3. NGOs and CBOs

These are community based groups which represent general public and they focus on issues at grass root level. They are involved in advocacy/lobbying, policy issues/debates, emergency, rehabilitation, and relief activities, implementation of developmental projects, and programmes. According an estimate of Planning and Development Division of Pakistan more than 8000 NGOs and CBOs are working for different sectors in Pakistan. These organizations are playing a vital role in managing, creating and disseminating information, ideas and solutions for environmental issues. They are serving as an active partner of government and international dinner agencies. A large number of NGOs and CBOs are working exclusively on environmental pollution issues.

Major NGOs and CBOs Working for Environmental/Chemical pollution in Pakistan

Sindh

2. Society for Conservation and Protection of Environment (SCOPE)
3. Health Oriented Preventive Education (HOPE)
4. Shehri-Citizen for Better Environment (SHERI)
5. Sindh agricultural and Forestry Workers Coordinating Organization (SAFWCO)
6. Health and Nutrition Development Society (HANDS)
7. Pakistan Institute of Labour Education and Research (PILER)
8. Orangi Pilot Project Research and training Institute (OPP-RTI)
9. Agha Khan Foundation Pakistan

Punjab

1. Pakistan Institute for environmental Development Action Research (PIEDAR)
2. Pattan development Organization
3. Development for education, Environment, Population Welfare and Poverty Alleviation Organization (DEEPP)
4. National Rural Support Programme

Balochistan

1. Water environment and Sanitation Society (WESS)
2. Participatory Integrated Development Society (PIDS)
3. Environment Foundation Balochistan (EFB)

NWFP

1. Environmental Protection Society (EPS)
2. National Research and Development Foundation (NRDF)

6.1.4. Trade Unions labour Organizations

Industry in Pakistan has a large and organised trade union base. In larger enterprises and organizations, there are more than one actively involved workers union. Some of the major trade unions include, All Pakistan Federation of Labour (APFL), All Pakistan Federation of Trade Unions (APFTU), All Pakistan Federation of United Trade Unions (APFUTU), All Pakistan Trade Union Congress (APTUC), Pakistan National Federation of Trade Unions (PNFTU), Pakistan Workers Federation (PFW) and All Pakistan Trade Union Federation (APTUF).

One of the basic objectives of these trade unions is the improvement of working conditions, health and safety standards for workers, the introduction, maintenance and extension of social security for all, and raising standards of living of factory workers.

The trade unions are also active in information dissemination to the workers and some policy analysis (related to workers). No initiatives have been taken by any of these trade unions for capacity building and to develop expertise for sampling, testing and research on environmental pollution caused by industrial processes which affect the health and safety of workers.

6.1.5. Professional Organisations

In implementing the policies and programmes initiated by government the role of professional societies is very important. There are numerous societies and professional organizations who are working in the various sectors of chemical life cycle in Pakistan.

6.1.6. Consumer Association of Pakistan

Consumers are more than ever interested in the origin, characteristics, quality and nutritional properties of the food they purchase. They know that food production, processing and breeding methods have become much more intensive, and that the use of pesticides, fertilizers and chemicals has increased. Recent developments such as BSE, dioxins, and other food scares have led many consumers to question the safety of their food.

Consumers are in contact with a vast range of everyday products containing chemicals. The existing legislation does not offer adequate consumer protection. There is extremely limited knowledge available on the majority of these chemicals. Consumer Association of Pakistan has proposed a new system to regulate chemicals called REACH (Registration, Evaluation, and Authorization of Chemicals). REACH proposal is an important step in the right direction, as it intends to phase out the most problematic substances and to gain more information about chemicals.

Consumers need more information on how to lead a more "sustainable" way of life. The Manufacturers should offer a guarantee to consumers that they buy products that fulfil the highest ecological criteria.

6.2. Summary of Expertise Available Outside of Government

Table 6.1: Summary of Expertise Available Outside of Government

Field of Expertise	Research Institutes	Universities	Industry	Environmental/ Consumer Groups	Labour Unions	Professional Organizations	Others (specify)
Data Collection	x	x					
Testing of Chemicals	x	x	x			x	
Risk Assessment	x	x	x	x		x	
Risk Reduction	x		x			x	
Policy Analysis	x		x		x		
Training & Education	x	x	x			x	
Research on Alternatives	x	x				x	
Monitoring	x	x	x	x		x	NGOs
Enforcement							
Information to Workers					x		x
Information to Public				x		x	x

6.3. Comments Analysis

- Participation of non-governmental organizations, trade associations, research institutions and community groups in policy making and policy implementation is very important for chemical management in the country. In Pakistan all these stakeholders are contributing well and taking effective measures.
- There is a need for a stronger coordinating and consultative mechanism among the NGOs and community at grass root level.
- These organizations have free access to data and information whatever is available a in the form or published data as well as through linkage with websites of governmental institutions. They fully participate in meetings, seminars, conferences and workshops. Some of the important NGOs, CBOs and trade associations are part of committees made for chemical management.
- These organizations are playing a vital role in implementation of international voluntary initiatives like ISO standards 9000, 14000 and OHSAS 18001. They are also cooperating in Pak-EPA's SMART programme for self monitoring and reporting.
- NGOs have direct linkage with local communities hence their role in dissemination of information and creating awareness among workers and local population is very effective. They arrange seminars, workshops, focal groups meetings and interact with common man.

There are is a large number of NGOs and CBOs working in Pakistan and many of them are involved in environmental issues.

- NGOs have right to access to environmental tribunals, labour courts and other similar institutions for any complaint related communities benefit.
- Although a good number of NGOs and CBOs are working for environmental issues but there is no NGO, CBO, working exclusively for chemical management in Pakistan. There role is indirect.
- NGOs require capacity building in chemical management exclusively. NGOs have the capacities for policy analysis, legislation, research on alternatives, trainings, education, data collection/dissemination and raising awareness. All NGOs does not have these capabilities collectively. The cross cutting capacities are very important to deal with the chemical management in the country.
- There is a need to create some mechanism of standardizing these organizations so that they can play some vital role in monitoring and inspections. Once some mechanism for accredit non-governmental organization is brought in they can play better role in dealing with environmental issues.

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7. Inter-Ministerial Commissions and Co-ordinating Mechanism

In chapters 5 the roles and responsibilities of various ministries and government organizations have been defined. Chemicals management encompasses a broad range of issues, each of which may be addressed by any or many of a number of governmental ministries, agencies or units, as well as parties outside of government. In order to achieve a more integrated national approach to chemicals management, a participatory decision making approach is highly imperative whereby various actors can exchange information, co-ordinate activities that are complementary or inter-related, and, in certain instances, make joint decisions or, in the longer-term, develop national chemicals management policy.

It can be difficult for persons who work within individual ministries/organizations, with finite mandates and responsibilities, to see the big picture with regard to an integrated national programme. Often the various governmental actors involved in chemicals management may operate on a sectoral basis (e.g. under their own, separate legislation) and thus may not be accustomed to working and sharing information with one another. Some may not see a clear link between their activities and sound chemicals management, an area which may be considered to be largely the domain of environmental and health authorities.

In addition, several orders of government, e.g. federal, provincial and local governments, also typically share responsibilities (though often without a formal collaboration) for the implementation of chemicals management programmes, laws and policies. In fact, much of the actual implementation of relevant programmes and enforcement of chemicals-related laws is carried out at provincial and the local level.

7.1. Description of Inter-Ministerial Commissions and Co-ordinating Mechanism

7.1.1. National Technical Advisory Committee on Chemicals (NTACC)

National Technical Advisory Committee on Chemicals (NTACC) has been established under the chairmanship of Additional Secretary, Ministry of Environment. The main objective of NTACC is to advise and facilitate the Government on Integrated Chemical Management (ICM) and allied issues. MEAs Secretariat is working as Secretariat of NTACC. The Project Manager, MEAs Secretariat the Convener/Secretary to the Secretariat of the Committee.

The committee's main factions include;

- Advice and consultation for meeting Pakistan's responsibilities and international obligations on chemicals management under various international Conventions.
- Identification of hazards of various chemicals, and preparation of recommendations for action for safe management such as banning, restriction on import, export, production and consumption, safe handling, disposal etc in the light of the importance the chemicals waste for business, industry, trade, health etc.
- Baseline data collection and capacity assessment.
- Immediate availability for advice in emergency situation due to chemical disasters etc.

- Review and deliberate upon National Policies and decisions for international community through various multilateral fora.
- Advice on formulation of National Chemical Management Policy.

Following table shows the members of NTACC

Table 7.1: Members of National Technical Advisory Committee on Chemicals (NTACC)

Sr. No	Name & Address	Designation	Chairperson /Member / Convener
1.	Mr. Ishtiak Ahmad Khan, Ministry of Environment, Islamabad.	Additional Secretary	Chairperson
2.	Syed Zaheer Ahmad Gillani National MEAs Secretariat, Ministry of Environment, Islamabad.	Project Manager	Convener / Secretary
3.	Mr. Khizar Hayat Khan, Ministry of Environment, Islamabad.	Joint Secretary	Member
4.	Pak-EPA, F-11/3, Main Margalla Road, Islamabad.	Director General	Member
5.	Environmental Protection Department, Punjab, Government of Punjab, National Hockey Stadium, Opposite LCCA Ground, Qazafi Stadium, Frozpur Road, Lahore.	D.G (EPA), Lahore	Member
6.	Environmental Protection Agency-Sindh, Government of Sindah, EPA-Complex Plot No. ST2/1, Sector 23, Korangi Industrial Area Karachi.	D.G (EPA)	Member
7.	Environment Protection Agency-N.W.F.P, 3rd Floor, Old Courts Building, Khyber Road, Peshawar.	Director General	Member
8.	Environmental Protection Agency (EPA), Balouchistan, Wood Cock Forests Spiny Nursery, Sammugli Road, Quetta.	Director General	Member
9.	EPA-Azad Jamu & Kashmir, Kahsmir Plan House, New Secretariat Chatter Dome, Muzaffarabad, Azad Kashmir.	D.G (EPA)	Member
10.	Environment Protection Agency of Northern Areas, Directorate of Tourism and Environment, Zulfiqar	D.G NAs EPA	Member

	Abad, Jutial,Gilgit.		
11.	Ministry of Commerce A-Block, Pak Secretariat, Islamabad.	Secretary	Member
12.	Ministry of Science & Technology Pakistan Council of Scientific and Industrial Research (PCSIR), Head Office, 1-Constitution Avenue, G-5/2, Islamabad.	Secretary	Member
13.	Ministry of Food & Agriculture (MINFAL), B-Block, Pak-Secretariat, Islamabad.	Secretary	Member
14.	Ministry of Health C-Block, Room No. 107, Pak-Secretariat, Islamabad.	Secretary	Member
15.	Ministry of Law, Justice & Human Rights S-Block, Room No. 308, Pak-Secretariat, Islamabad.	Secretary	Member
16.	Federal Board of Revenue (FBR), 3rd Floor, Constitution Avenue, FBR House, G-5/2, Islamabad.	Chairman	Member
17.	Ministry of Industries, Production and Special initiatives, Tech-2, Room No. 337, A-Block, Pak-Secretariat, Islamabad.	Secretary	Member
18.	Government of Punjab, Civil Secretariat, Old P & D Building, 2-Bank Road, Lahore.	Secretary (Industries)	Member
19.	Government of Sindh, Sindh Secretariat No.2, Karachi.	Secretary (Industries)	Member
20.	Government of N.W.F.P Civil Secretariat, Peshawar.	Secretary (Industries)	Member
21.	Government of Balochistan, Civil Secretariat, Block No.3, Quetta.	Secretary Industries & Commerce Department	Member
22.	Government of Punjab, Civil Secretariat, Lahore.	Secretary (Health)	Member
23.	Government of Sindh, 6th Floor, New Secretariat, Block No.1, Karachi.	Secretary (Health)	Member
24.	Government of N.W.F.P., HRP Building, Khyber Road.	Secretary (Health)	Member

	Peshawar.		
25.	Government of Balochistan, Block No. 5, Room No.1, Civil Secretariat, Quetta.	Secretary (Health)	Member
26.	Federation of Pakistan Chamber of Commerce and Industry, First Floor, Chamber House, G-8/1, Islamabad.	President (FPCCI)	Member
27.	Pakistan Council of Scientific and Industrial Research (PCSIR), Head Office, 1-Constitution Avenue, G-5/2, Islamabad.	Chairman	Member
28.	HEJ Institute of Chemistry, University of Karachi, Karachi.	Director	Member
29.	Mr. Tanveer Arif Society for Conservation and Protection of Environment (SCOPE), D-141, Annexe, Allama Iqbal Road, Near KMC Sports Complex, Block-2, P.E.C.H.S. Karachi, 75250.	Chief Executive	Member
30.	Pakistan Chemicals & Dyes Merchants Association, Chemical Dye House, Rambhast Street, Jodia Bazar, Karachi.	Chairman	Member
31.	Custom Laboratory, Custom House, Near MW Tower, Karachi.	Director	Member
32.	Dr. S. H. Niaz Rizvi National Institute of Oceanography, Plot No. ST 47, Block-1, Clifton, Karachi.	Project Director	Member
33.	Mr. Zaigham Abbas, Technical Officer (Chemicals), Ministry of Environment, Islamabad.	Technical Officer (Chemicals)	Member
34.	Dr. M.A. Khawaja, Sustainable Development Policy Institute (SDPI), Near Standard Charted Bank Diplomatic Enclave, Islamabad.	Senior Research Fellow	Member
35.	Dr. Ashiq, National Agriculture Research Centre (NARC), Park Road, Chak Shahzad, Islamabad.	Programme Leader, Eco-toxicology	Member
36.	Dr. Sami-uz-Zaman, Global Environmental Lab (Pvt) Ltd., 1st Floor, Aiwan-e-Sanat, Street No. 4/2, Sector 23, Korangi Industrial Area, Karachi.	Member	Member

37.	Dr. Rashid Karim Department of Environmental Sciences, International Islamic University, H-10, Islamabad.	Professor	Member
38.	Dr. Iffat Naseem, Associate Professor, Departement of Environmental Biology, Quaid-e-Azam, University, Islamabad.	Associate Professor	Member
39.	UNIDO-Pakistan, H. No. 35-B, Main Road, F-7/2, Islamabad.	Country Director-UNIDO	Member
40.	Food and Agriculture Organization (FAO), NARC Premises, Park Road, Chak Shahzad, Islamabad.	Senior UN Advisor - FAO	Member
41.	United Nations Development program Street No. 17, UN House, F-7/2, Islamabad.	ARR/Chief Energy & Environment Unit-UNDP	Member
42.	Mr. Noor-Ul-Hadi National MEAs Secretariat, Ministry of Environment, Islamabad.	Deputy Project Manager	Member
43.	Dr. Shujaat Ahmad Eminent Educator & Researcher, PIEAS, Pakistan Atomic Energy Commission (PAEC), Near (K-Block, Pak-Secretariat), Islamabad.	Ex-chief Chemist PINSTECH / Eminent Educator & Researcher	Member

The scientific sub-committee reviews the results of physical/chemical analysis and bioefficacy tests performed by the various research organisations for the control of pests attacking various crops. It makes recommendations for accepting/rejecting applications for registration submitted by the pesticide companies for marketing of a pesticide brand in Pakistan for review by APTAC. The committee so far has recommended registration of 202 pesticide active ingredients under different trade names and issued certificates of registration to the various pesticide marketing companies.

7.1.2. Agricultural Pesticides Technical Advisory Sub – Committee

In addition to NTACC an Agricultural Pesticides Technical Advisory Sub-Committee has been formed consisting of the following members for a period of three years, namely: -

1. Plant Protection Advisor and Director General,
2. Department of Plant Protection, Karachi — Convener
3. Director General, Agricultural Research Institute, Faisalabad — Member
4. Director General, (Ext.) Department of Agriculture, Hyderabad — Member
5. Director General, Agriculture Research Institute, Peshawar — Member
6. Director General, Agriculture Research Institute, Quetta — Member

7. Director of Research (Plant Protection), Pakistan Agricultural
8. Research Council, Islamabad. Member
9. Chairman, Department of Entomology University of
10. Agriculture, Faisalabad. Member
11. Chairman (Quality Control), Ministry of Health, Islamabad Member
12. Chairman, Pakistan Agricultural Pesticides Association, Karachi. Member
13. A Representative of the Generic Pesticides Importers Member
14. Director (Technical), Department of Plant Protection, Karachi. Member

7.1.3. Steering committee for elimination of adulteration in pesticides

A steering committee has been made for elimination of adulteration in pesticides consisting of the following members namely;

1. Federal Minister for Food & Agriculture
2. Provincial Minister for Agriculture
3. Chairman, Task Force on Agriculture, Punjab
4. Secretary, Minister of Food, Agriculture and Livestock
5. Provincial Secretaries, Department of Agriculture
6. A representative of the Pakistan Pesticides Association
7. A representative of the Generic Pesticides Importers.

Steering committee for elimination of adulteration in pesticides

A steering committee has been made for elimination of adulteration in pesticides consisting of the following members namely;

1. Federal Minister for Food & Agriculture
2. Provincial Minister for Agriculture
3. Chairman, Task Force on Agriculture, Punjab
4. Secretary, Minister of Food, Agriculture and Livestock
5. Provincial Secretaries, Department of Agriculture
6. A representative of the Pakistan Pesticides Association
7. A representative of the Generic Pesticides Importers.

Table 7.2: Overview of Inter-ministerial Commissions and Co-ordinating Mechanisms

Name of Mechanism	Responsibilities	Secretariat	Members	Legislative Mandate/ Objective	Info. Provided in Section 7.2 (yes/no)	Effectiveness
National Technical Advisory Committee on Chemicals (NTACC)	• Advice and consultation for implementation of international Conventions. • Identification of Chemical hazards,	MEAs Secretariat, Ministry of Environment	Table 7.1	To advise and facilitate the Government on Integrated Chemical Management (ICM) and		Moderate

	recommendations for safe management of chemicals • Baseline data collection and capacity assessment. • advice in chemical disasters • Review of National Policies and decisions for international community through various multilateral fora. • Advice on formulation of National Chemical Management Policy.			allied issues		
Agricultural Pesticides Technical Advisory Sub – Committee	• Reviews the results of physical/chemical analysis and bio-efficacy tests performed by the various research organisations for the control of pests attacking various crops. • recommend for accepting/rejecting applications for registration submitted by the pesticide companies for marketing of a pesticide brand in Pakistan for review by APTAC	Department of Plant Protection, Ministry of Food and Agriculture	Table7.1			
Steering committee for elimination of adulteration in pesticides						

7.2. Description of Mechanism for Obtaining Input from Non Governmental Bodies

Generally Non governmental bodies, especially industrial organizations are part of inter-ministerial committee and other sub-committees. There participation in consultative process makes it possible for sharing of information, reporting and inputs on key issues. They contribute towards policy making and implementation of programmes made by government for chemical management. The

participation of non-governmental institutions in chemical management has been discussed in detail in Chapter 6.

7.3. Comments/Analysis

- The existing coordinating mechanisms are working effectively, how ever there is a dire need of centralised database related to chemicals life cycle. In presence of comprehensive database, analysis can be made and gaps can be identified and easily addressed. This will improve functioning of coordinating mechanisms.
- The presence of some of very important sectors/ ministries/organizations have been neglected in the NTACC, e.g. representation of ministry for Petroleum & Natural Resources, Labour, Railway, Communication, Ports & Shipping, National Disaster Management Cell, Rescue 115 Service, is not there. To deal with issues related with the all segments of chemical life cycle there representation in this committee si very important. To enhance participation of academia, heads of departments of chemical technology, chemistry and environmental sciences of the major universities of the country may also be included in the committee.
- Due to cross – sectoral presence of stakeholders in these committees, their contributions are effective.
- After the addition of above mentioned ministries/departments, the existing mechanism will covers nearly all important aspects of chemical life cycle which require inter-ministerial cooperation and coordination.

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Chapter 8

8. Data Access and Use

8.1. Availability of Data for National Chemical Management

This chapter deals with the availability of reliable data with reference to production, import, export, transport, use and disposal of chemicals in the country. During the preparation of National Chemical Profile, it was observed that access to reliable data related to all aspects of chemical cycle, is really a difficult job. The data related to import and export of chemicals and raw materials for related industry is managed by Federal Board of Revenue (FBR), Chambers of Commerce and Industries and Trade Associations. The production data is collected from the individual industry by Federal Bureau of Statistics (FBS). The data related to import, production and use of pesticide is managed by Plant Protection Department (MINFAL). The production statistics related to fertilizers are managed by Ministry of Industry, and about use is available with MINFAL.

There is no mechanism for collection of data related to transport of chemicals, chemical accidents, injuries caused due to exposure to chemicals, chemical wastes produced, disposal, obsolete chemicals/pesticides and storage. Chemicals are transported to different parts of the country but no inventories are made about mode of transport, i.e. rail, road or air cargo. There is no record available/maintained about industrial accidents, injuries caused or deaths occurred, and mitigation measure taken to avoid such incidents in future.

The data related to various categories and amount of chemical wastes produced by industry is very limited. Only few individual studies were made during the past years by some agencies on industrial effluents, municipal waste and hospital waste but there is no comprehensive data base available on chemical wastes. Pak-EPA and provincial EPAs have established air monitoring centres in some major cities of the country to monitor air quality and they keep the records. Similarly the data related to storage facilities is also not available. There is no inventory system of such storage facilities. The highly toxic e.g. pesticides, flammable (spirit, thinners) and other hazardous industrial chemicals are often stored in thickly populated areas without any safety measures but there is no record of such facilities.

In general collection, compilation and dissemination of data on various socio-economic sectors is the primary function of Federal Bureau of Statistics FBS. These data are collected from primary and Secondary Sources. The primary data are collected through different surveys such as Labour Force Survey (LFS), Household Integrated Economic Survey (HIES), Pakistan Integrated Household Survey (PIHS), and Pakistan Demographic Survey (PDS) etc. Secondary data such as Foreign Trade Statistics, Industrial Statistics, Transport and Communication Statistics, Social Statistics, Agriculture Statistics, Environment statistics etc. are collected from the records of concerned Ministries/Departments. Demand for data is increasing tremendously and that too in computer readable form etc. Such demands are made mainly by

various Government/Semi-Govt., Non Government Organization (NGOs), Research Institutions, and Universities etc. within and outside the country.

Table 8.1: Quality and Quantity of Available Information

Data Needed for/to:	Pesticides (agricultural, public, health and consumer use)	Industrial Chemicals	Consumer Chemicals	Chemical Wastes
Priority Setting	low	low	low	low
Assess Chemicals Impact under Local Conditions	moderate	moderate	low	moderate
Risk Assessment (environment/health)	low	low	low	moderate
Classification/Labelling	moderate	moderate	low	moderate
Registration	high	high	low	-
Licensing	high	high	moderate	-
Permitting	high	high	low	-
Risk Reduction Decisions	low	low	low	low
Accident Preparedness/Response	low	low	low	low
Poisoning Control	low	low	low	low
Emissions Inventories	low	low	low	low
Inspections & Audits (environment/health)	low	low	low	low
Information to Workers	low	low	low	low
Information to Public	low	low	low	low
Others				

8.2. Location of National Data

Table 8.2: Location of National Data

Type of Data	Location (s)	Data Source	Who Has Access	How to Gain Access	Format
Production Statistics	Federal Bureau of Statistics/Ministry of Industries/Production/	Individual industries	Government ministries/ institutions/	Published monthly /annually ,	Reports/ Tabulated

	Textile		academia/ Research Organizations /NGOs	available on website/on written request	
Import Statistics	Federal Bureau of Statistics/Federal Board of Revenue/Customs Department/Chambers of Commerce and Industries/Trade Associations	Importers/ Exporters	Government ministries/ institutions/ academia/ Research Organizations /NGOs	Published monthly /annually , available on website/on written request	Reports/ Tabulated
Export Statistics	Federal Bureau of Statistics/Federal Board of Revenue/Customs Department/Chambers of Commerce and Industries/Trade Assocaition	Importers/ Exporters	Published monthly /annually , available on website/on written request	Published monthly /annually , available on website/on written request	Reports/ Tabulated
Use	Federal Bureau of Statistics/individual Industries,	Individual industries	Published monthly /annually , available on website/on written request	Published monthly /annually , available on website/on written request	Reports
Disposal	Not available	Not available	Not available	Not available	Not available

8.3. Procedure for Collecting and Disseminating National Local Data

Access to Relevant Data

The legal framework available for chemical management in Pakistan has made it mediatory through different instruments for the responsible stakeholders to provide relevant data to authority. There are different reporting systems for different legal instrument. Due limited human and financial resources available with the implementing authorities the reporting system is not functioning well.

There is no specific institution established in the country for collection of data related to various aspects of chemical life cycle in the country. Data relevant to chemical management is indirectly collected by various government agencies. The generation of such data is according to the specific requirement of ministries/organizations and agencies. The mechanism of data compilation and storage varies from agency to agency. Mostly the ministries and government departments have computerised their data storage system which makes easier access to it. Generally data is available to users within department and in some cases to the users of other departments. The data related

to common use is often published in the form of monthly as well annual reports by Federal bureau of Statistics which is available on price as well as on its websites. The restricted data generally require follow of official channel, a written request to the concerning authority mentioning the purpose for which data is required.

As per policy adopted by Federal Bureau of Statistics for data supply was that aggregate level data (tabulation) was provided to the users free of charges and this practice is continued. However special tabulation in the required computer readable format is supplied to users on demand, with charges to be deposited in the government treasury. In case of demand for the sensitive information /data, the same may be supplied with the prior approval of the Federal Statistics Authority i.e. Secretary, Statistics Division. In this age of information technology, the researchers/users are extending their demands for data at micro level. Consequently FBS has revised its data dissemination policy.

8.4. Availability of International Data

Data of various international organizations like, UNDP, WHO, UNITAR, FAO, UNEP, UNIDO, UNICEF, World Bank, Asian Development Bank, USAID etc. are readily available on internet unless it is classified.

National Information Exchange System

With the e-government initiative the ministries and government departments are interlinked through internet thus providing main source of Information Exchange System. Public has also access to information through the same system. The ministries and attached departments have their own websites which give detailed information about policies, activities, mandates, responsibilities, relevant laws, officers, and major projects implemented etc. In addition to this online registration downloading facilities for important forms are also available.

Ministries can interact with the relevant international institutions/organizations through internet. They have access to databases, general information and international literature. Specific or confidential information can be acquired through e-mail.

8.5. Comments/Analysis

- From table 8.1 it can be seen that there are many gaps in the data management for chemicals in Pakistan. The availability in many areas and quality of available data is not satisfactory. Without reliable data the chemical management is not possible and in this regard a serious effort is required.
- National Health Data Management System is present but the data for toxic exposures and the emergency services in relation to chemical incidents is missing. There is a dire need for capacity building of NHDMS, for improved data generation for decision making.

- Data related to chemical accidents, deaths caused due to industrial accidents, injuries, mitigation measures taken is nearly absent. Industries neither maintain such records nor do they report to authorities due to fear of reprisal.
- The national data is maintained by the relevant departments and agencies. There is no harmonization in available data for analytical purpose.
- Due to behavioural problems and lengthy procedures often it takes too much time to acquire data from government agencies.
- Access to international database is rather easy as every thing is available on internet.
- To harmonize the chemical data it is proposed that a separate delegated section may be established as part of National Environmental Information Management System (NIEMS) a project implemented by Ministry of Environment.

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9. Technical Infrastructure

9.1. Overview of Laboratory Infrastructure

For support of national legal instruments, policies and plans related to chemical management, numerous R & D organizations, institutes and laboratories have been established throughout the country over the last decades. The main objectives of these facilities are following;

- Quality control of chemicals
- Residue analysis
- Research on unknown substances
- Monitoring of harmful effects of chemicals

Table 9.1 gives a brief detail of these organizations, institutes and laboratories.

9.1.1. Pesticides Research Laboratories

Ecotoxicology Research Programme

The Ecotoxicology Research Programme was established in 1993, in an effort of PARC RENPAP (Regional Network on Pesticides in Asia and Pacific). The laboratories equipped with state-of-the art analytical facilities. The institute collaborates with Pak-EPA in POPs enabling activities in Pakistan.

9.1.2. Pesticide Research Institute, SARC Karachi

Southern zone Agriculture research Centre (SARC), Karachi is the second largest research organization of PARC. Pesticide Research Institute, SARC is the pioneer of pesticide residue analysis in the country. This lab is moderately equipped with analytical instruments and well trained manpower. Besides pesticide residues analysis in grains, PRI is also acting as Reference Lab for Quality Control of pesticide formulation.

9.1.3. Grain Quality Control and testing Labs (GQCTL)

Two labs Grain Quality Control and testing labs at NARC and SARC are fully equipped for physical, chemical, microbial and pathology testing of grains quality. The lab at NARC is providing services to public and private sectors in the grain producing areas while other is conducting final inspection of grains before shipment of import.

9.1.4. Pesticide Chemistry Lab. NIAB, Faisalabad

Pesticide Chemistry Lab, nuclear Institute for Agriculture and Biology (NIAB), Faisalabad is under administrative control of Pakistan Atomic Energy Agency (PAEA). This lab is conducting pesticides residue analysis by employing radio labelled techniques for elucidating fate of pesticides in different agro-ecological conditions.

9.1.5. National Institute of Health

The Nutrition Division of NIH, Islamabad is running programme for quality testing of food and feed. The pesticide residue was started in 1981 and a project on food contamination study and control in Asia and Far East was completed.

9.1.6. Pesticide Quality Control Lab, ARI, Tarnab, Peshawar

A Pesticide Quality Control Lab is working in Directorate of Soil and Plant Nutrition, Agriculture Research Institute, Tarnab since 1996. The lab is responsible for pesticide formulation analysis and is conducting physio-chemical tests. This is the only lab in NWFP providing services to farmers and other allied agencies.

9.1.7. Plant Protection Department (PPD)

The Plant Protection Department (PPD) has a network of laboratories throughout the country. PPD labs are dealing with pesticides formulations being marketed in the country.

Table 9.1: Pesticide Residues Research Facilities in Pakistan

Institute	Year of Establishment	Activity
Pesticide Research Laboratory, TARI, PARC, Karachi	1954	Pesticides quality control, pesticides residues in food, crops, water, soil, and human tissues.
Pesticide laboratory NIAB, Faisalabad.	1969	Pesticides residues in food and soil especially through radio-tracers techniques.
Nutrition Davison, NIH, Islamabad	1975	Pesticides residues in food and tissues.
Federal Pesticides Research Laboratory, PARC, Multan	1998	Pesticides quality control.
Ecotoxicology Research Institute, NARC, Islamabad	1994	Pesticides residues in food- chain and environmental compartments, impact of pesticides on non-target organisms.
Pesticide Laboratory, UAF, Faisalabad.	1982	Academic
Chemistry Department NWFP University of Agriculture, Peshawar.		Academic, dissipation pattern and half-life.
Chemistry Department, Peshawar University, Peshawar.		Academic
Pak-EPA, Islamabad	1993	Legislation, industrial and vehicular pollution
Pesticide Division, Faisalabad.	1971	Quality Control
Pesticide Quality Control Laboratory, Lahore.	1984	Quality Control
Pesticide Quality Control Laboratory, Tarnab, Peshawar.		Quality control and residues in crops
Grain Quality Testing Laboratory, PARC, Islamabad	2004	Grain quality testing including pesticides residues
Grain Quality Testing Laboratory,	2004	Grain quality testing including

PARC, Karachi.		pesticides residues
Pesticides Residue Laboratory, Kala Shah Kaku, Lahore	2007	Quality control and residues in crops

Most of the staff of above mentioned institutes conducts research on the efficacy trials of pesticides and developing pest management packages. Very little attention is paid to ecological studies. Whereas all the provincial institutes are mainly concerned with the quality of the pesticides, the institute of Ecotoxicology have gone beyond and are looking into the residues in crops and food products.

9.1.8. Fertilizer Monitoring and Research:

Like pesticides, no independent institute and /or non-governmental body/entity is in existence to carry out research on any aspect of fertilizer consumption. However, following federal and provincial institutes conduct research on all aspects of fertilizer production and formulating recommendations for improving crop productivity through balanced fertilizer application.

- National Fertilizer Development Centre (NDFC), Islamabad
- Pakistan Agricultural Research Council (PARC), Islamabad
- Soil Fertility Survey & Soil Testing Institute , Lahore
- Ayub Agrl. Research Institute, Faisalabad
- Agrl. Research Institute, Tanab, Peshawar
- Barani Agrl.Research Institute, Chakwal
- Agricultural Research Institute, Sariab
- Central Cotton Research Institute, Multan
- Soil Chemistry Section & Soil Physics Laboratory Tandojam

9.1.9. Laboratories Established under Pakistan Council for Scientific & Industrial Research (PCSIR)

9.1.9.1. Environmental / Analytical Laboratory PCSIR, Islamabad

Environmental/ Analytical Laboratory PCSIR, Islamabad is established in 2001, especially for investigation and R&D on water and air pollution. The laboratory has capabilities to analyze Organic, Inorganic and Microbiological contamination in water, wastewater, and foodstuff etc. The laboratory has also capabilities for the industrial emission, automobile emission and particulate matters analysis. Recently facilities have been upgraded for ambient air monitoring.
Laboratory has the following sections

- **Chemical Section**
  This section is equipped for the estimation and quantification, monitoring of Inorganic/ organic pollutants in different matrices.

- **Field Monitoring Section**
  This section is equipped with potable equipment required for automobile, industrial emission and particulate matters investigation. This section is being upgraded by a mobile air monitoring laboratory for ambient investigation.

9.1.9.2. PCSIR Laboratories Complex (R & D) Karachi

Pakistan Council of Scientific and Industrial Research Laboratories Complex Karachi is a multifunctional unit. The laboratory has highly educated, well trained and skilled personnel, having expertise in different scientific fields with broad vision especially in Pharmaceutical, Marine, Food Sciences, Applied Chemistry, Chemical Engineering, Physics, Computers, Instrumentation Design and Development etc. PCSIR Laboratories Complex, Karachi has been accredited in ISO 17025 from Pakistan National Accreditation Council (PNAC), Ministry of Science & Technology.

Analytical Facilities and Services

Analytical Centres having analytical and testing facilities in following four disciplines have been started, which are equipped with latest analytical equipment and are working under the strict compliance to ISO – 9001 standard.

i. Analytical Centre for Pharmaceutical Chemicals / Products.
ii. Analytical Centre for Food and Marine Products.
iii. Analytical Centre for Plastic and Polymers.
iv. Analytical Centre for Equipment Calibration and Standardization.

The PCSIR Laboratories Complex, Karachi, offers following services to various entrepreneurs/ industries and other organizations. Work is carried in strict compliance of ISO-9001 standard specification.

- Development of new products and technologies or improvement in existing products/technologies.
- Designing, fabrication, installation and commissioning of new plants and machinery.
- Development of processes for substitution of imported products.
- Identification, analysis and evaluation of raw materials, finished and semi-finished products.
- Standardization and calibration of various instruments/equipment.
- Trouble shooting of the problems relating to quality control, quality assurance and Production.

- **Food & Marine Resources Research Centre**

  Food & Marine Resources Research Centre has been working on various research and development projects of economic importance. The centre is engaged on various aspects of marine resources utilization, preservation and conversation into value added products. Another important area is the development of fish / shrimp culture. Food section is also involved in the development of processes / products referred by different food industries.

- **Material Science Research Centre**

  Material Science is an interdisciplinary subject having an impact on many aspects of the global economy. It involves the study and discovery of how materials work synthesis, analysis and utilization of new materials which include polymers; electronics, thin film materials, refectories & ceramics etc. Following are the activities of the Material Science Research Center, PCSIR Labs., Complex, Karachi.

- Process Know-how/Products development
- Testing and Analysis of Metallic/Non metallic and Polymeric Materials
- Design, development and fabrication of Low Cost Scientific Instruments repair, maintenance and calibration of instruments.

- **Pharmaceutical Research Centre**
  The centre provides services to R&D institutes, academics and industrial clients with innovative solutions of their technical and industrial problems and conducting technical training on sophisticated analytical equipment and Quality Management Systems.

- **Applied Chemistry Research Centre**
  This centre deals with diverse fields of process industry and has developed considerable capabilities in related technologies. Import substitution of organic and inorganic chemicals is a major area of interest in which the centre is presently involved. This includes industrial chemicals, chemical pesticides and fungicides, dyes and pigments, fertilizers, intermediate chemicals from BTX etc. Other activities include environmental studies and waste management.

9.1.9.3. Leather Research Centre (R & D)

PCSIR has established a Leather Research Centre (LRC) at SITE area in Karachi. Main divisions include following;

- **Leather Technology Division**
  This division actively pursues R & D activities in the following major areas:
  Improvement in tanning technology
  Reduction in cost of production.
  Utilization of indigenous raw materials.
  Meaningful use of tannery waste.
  Introduction of low pollution tanning processes.

- **Chemical Research Division**
  This division undertakes R & D activities in the following major areas:
  Development of know – how for the manufacture of leather chemicals locally.
  Environmental studies relating & tannery effluent treatment and their recycling.

- **Research Utilization & Extension Division**
  This division is engaged in activities in the following major areas:
  To make pilot plant studies on the processes developed at the Centre.
  Technical & job-work facilities to the leather industry.

- **Chemical Testing**
  At the centre there are facilities for chemical testing of water & wastewater, leather, allied chemicals, leather oils, chrome tanning materials, Sodium Sulphide and lime.

9.1.9.4. Fuel Research Centre

Fuel Research Centre (FRC) of the Pakistan Council of Scientific and Industrial Research (PCSIR) is a major research and development (R & D) institute for fuel research in Pakistan. Over the years, FRC has developed capability to undertake comprehensive analyses and testing of not only solid and liquid fuels like coal, coke diesel and gasoline but also liquid and gaseous products obtained from coal and petroleum industries. The centre is actively engaged in scientific and technological research work pertaining to coal, coke, bio-mass, liquid and gaseous fuels. The broad spectrum of the activities of FRC revolves around evaluating indigenous fuels and concentrating efforts on achieving self-reliance in the energy needs of the country. The Centre has achieved expertise to undertake research and offer technical assistance and services not only to Government departments but also to private and public sector organizations.

- **Analytical Facilities and Services**
  Analytical facilities and services include physical, chemical and mineralogical testing and analyses of fuels and fuel quality and adulteration testing services.

- **Environmental Studies and Testing**
  EIA / EIS national /international projects, monitoring of air, water & soil pollution; ambient air studies; stack emission studies; identification /testing of organic /inorganic pollutants.

- **Coal Conversion and Coal Combustion**
  The facilities include, beneficiation studies; desulphurization of coal; carbonization properties of coals; smokeless coal briquettes; gasification of coal; development of coal-oil and coal-water emulsions; studies on fluidized bed combustion; environmental effects of combustion.

- **Hydrogen and Alternate Fuels**
  Productions of hydrogen through cost-effective techniques; preparation of metallic hydrides and complexes; utilization in internal combustion engines, etc.

- **Common Service**s
  Pilot plant, workshop, stores, library and administration services.

9.1.9.5. PCSIR Laboratories, (R & D, Analysis) Peshawar

The PCSIR Laboratories, Peshawar are located at Jamrud road adjacent to University of Peshawar. The Peshawar Laboratories of the Pakistan Council of Scientific and Industrial Research were initiated in 1955 with a view to especially investigating raw material resources of the region and assisting in its industrial development.

The laboratories main objectives were the development of processes of industrial importance, directed to assisting in import substitution. This led to a more active interaction with the industry resulting in the development of several processes of industrial importance. About two dozen such process has already been leased out for commercial exploitation.

9.1.9.6. PCSIR Laboratories Quetta

PCSIR Quetta was initially established with the main objective of the project is to establish a bi-functional laboratory with a view to provide technical assistance and expertise to the mineral and fruit sectors of the province.

Analytical Facilities and Services:

Following are the facilities and services which are provide by laboratories:

- Complete facilities are available for chemical characterization and analysis of ores and minerals.
- In addition to microbiological analysis facilities for chemical evaluation of various fruits and fruit products are also available.
- Facilities are also available for analysis of drinking water for wide range of tests including microbiological analysis. In addition testing and analytical assignments are also carried out pertaining to industrial effluents.
- Facilities are available for physico-chemical characterization of irrigation water and soil.

The laboratories have also the capabilities of undertaking complete testing of manures and fertilizers analyses.

9.1.9.7. PCSIR Laboratories Complex Lahore

The PCSIR Laboratories Complex Lahore, formerly known as the West Regional Laboratories started functioning with a nucleus staff in a wing of the Punjab University's Institute of Chemistry in 1953. This nucleus set up was shifted in 1956 to the present permanent site. The complex is consisted of following research centres;

- **Applied Chemistry Research Centre**
  The Centre has its origin in the former Oils, Fats & Waxes Division Created in 1955 in the PCSIR Laboratories, Lahore. The Divisions after passing through various evolutionary phases, in order to meet the demands of time, was elevated to the Applied Chemistry Research Centre in 1989, also taking into its folds the former Pharmaceutical Division, Agro-industrial Division, and the Industrial liaison Cell. Objective and goals of the Centre are:
    - Identification and evaluation of indigenous raw materials;
    - Development of industrial processes for the utilization of locally available raw materials;
    - Indigenous development of imported chemicals and industrial materials such as agricultural chemicals, pharmaceuticals, catalysts, textile auxiliaries, detergents, dyes, lubricants, greases, in addition to utilization of industrial wastes and bye-products, oils and fats, essential oils, and hydrocarbons;
    - Advisory and analytical services to the industry;
    - And R&D work in various applied fields of chemistry.

- **Biotechnology and Food Research Centre**
  The merger of two separate Divisions of the Laboratories of PCSIR namely, Biological Evaluation & Fermentation and Food Technology & Nutrition in 1977 has evolved into

the present set-up of this centre. Through wide and varied in the scope of R&D areas being pursed by the professionals of the centre, the strength in microbiology and analytical facilities have been instrumental in keeping these activities inter-linked. The major objectives are assistance in the establishment / development of food and biotechnology industry in the country through value-added output from low-priced raw materials, bio-resource development and utilization, quality assurance of finished products, industrial trouble-shooting and attracting small and medium entrepreneurs to the establishment of industry.

- **Minerals and Metallurgy Research Centre**
  The Minerals and Metallurgy Research Centre is engaged in R&D activities in areas related to mineralogy and geochemistry, mineral processing, physical metallurgy, cast metals technology, chemical evaluation, corrosion protection, product development, technological promotion, and industrial relations. The Centre has a well oriented multipurpose ore beneficiation pilot plant, which is a centralized facility capable of beneficiation studies on different types of metallic and non-metallic minerals. The major objective of the creation of the centre is to provide assistance in the establishment / development of mineral based industry through value added output, mineral development and utilization, quality assurance of finished products, resolution of industrial trouble shooting, and attracting small and medium level entrepreneurs to the establishment of industry.

- **Applied Physics, Computers and Instrumentation Centre**
  The centre was established basically to cater the equipment maintenance services to serve PCSIR itself and industries, educational institutions, and R&D organizations situated in and around Lahore. In-house R&D activities were also initiated to design, develop and fabricate commonly used scientific laboratory instruments as import substitutes. This centre is also providing services for calibration and standardization of scientific instruments to industries as per requirement of the ISO 9001/9002. One of the activities of this centre is to design, develop and fabricate clean energy devices.

- **Glass and Ceramics Research Centre**
  Glass and ceramics research centre was established for advancing material science and technology in Pakistan. The centre is engaged in research and development of conventional as well as innovative functional glass and ceramic material and their products for industrial use.

- **Centre for Environmental Protection Studies:**
  The Centre for Environment Protection Studies previously existed in the form of a section and due to its important role it was given the status of Centre in 1991. Among its major functions are included development of technologies for industrial wastes treatment and designing of treatment plants, preparation of environmental impact assessment, carrying out environmental impact assessment, evaluation / characterization of materials and wastes, carrying out environment related surveys, provision of technical expert guidance on environment related problems and issues in national and international perspective and

help in chalking out action plans on environmental management as desired by Government of Pakistan, public and private sectors, preparation of environmental management relates documents, waste management, and monitoring of environment pollution.

- **Engineering Research Centre:**
  The Engineering Research Centre has been established by the merger of General Services Division and Electrical Measurement & Test Laboratory. Main objectives of the Centre are:
  - Design, fabrication, installation and operation of pilot plants and equipment;
  - Computer aided design, engineering & development activities;
  - Test and performance evaluation of electrical products;
  - Quality control and quality assurance through R & D standardization activities; training of manpower to uplift their technical knowledge in the relevant field;
  - Handling civil construction repair and building maintenance and utilities services; technical advisory services to public and private sectors.

9.1.10. Attock Refinery Limited (ARL) Quality Control Laboratory (QCL)

ARL is the first laboratory in the oil-refining sector of the country to achieve the coveted ISO 9002 accreditation. Quality Control Laboratory of ARL has been awarded ISO/IEC 17025:2005 Accreditation by the Pakistan National Accreditation Council (PNAC), Ministry of Science and Technology, Government of Pakistan on October 4, 2007, thereby becoming the first and the only laboratory in the oil & gas sector of Pakistan to achieve this distinction.

ISO/IEC 17025:2005 Laboratory Accreditation is the criteria for laboratories to demonstrate the technical competence to carry out specific test methods, generate valid internationally traceable calibration data, test results, and operate an effective quality system. This accreditation, thus, gives ARL's Laboratory an international standing equivalent to any of the international laboratories of repute.

9.1.11. Pak-EPA - Central Labs for Environmental Analysis and Networking (CLEAN), Islamabad

Pakistan Environmental Protection Agency has established Central Laboratory for Environmental Analysis (CLEAN) in its premises at Islamabad. The Laboratory comprises of three sections i.e. analytical, field measurement and sampling.

It is equipped with state of art computerized analytical equipment. The Laboratory has facilities for analyzing pollutants in air, water and soil beside toxicity levels in food stuffs and other products.
It has its regular environmental investigation programmes for air, water and soil pollution. Pak-EPA has conducted a latest research study with the assistant of JICA experts on air pollution with emphasis on suspended particulate matters in three major cities of the country. It has also conducted regular monitoring of air in Islamabad. Study on development of inventory of chemical used in industries has been carried out. It has the capabilities of carrying out field activities using

portable equipments viz. high volume samplers, DO, PH and Turbidity Meter along with other relevant equipments for compliance of National Environmental Quality Standards (NEQS).

CLEAN Works in the following Areas:

- Analysis of municipal, industrial effluent and other environmental related samples Research/Investigation to identify different pollutant affecting public health
- Establish national procedures and methodologies for testing NEQS parameters
- Training to provincial Environmental Protection Agencies, Industrial sector and non-government organizations (NGOs)
- Propose amendments in the NEWS, if and where required based on the technical investigation
- Provides research facilities to different universities Institutions

9.1.12. Pakistan Institute of Science and Technology (PINSTECH), Nilor, Islamabad

PINSTECH has a variety of analytical equipment with advanced and powerful instrumental techniques, which can be compared, to the most modern laboratories in the developed countries. Separation and pre-concentration procedures have been developed for a variety of elements based on their solvent extraction, ion exchange and adsorption studies with wide applications in radiochemistry and in waste management technologies. Services include the analysis of biological, environmental, geological and industrial samples, alloys, reactor grade water samples, etc.
Following analysis are available at PINSTECH:

- Trace element analyses of industrial as well as environmental materials
- Quantitative analysis of metals at trace and ultra trace levels
- Elemental analysis
- Quantitative analysis of metals at trace and ultra trace levels
- Gas analysis
- Neutron Activation Analysis
- Analysis of gases and organic constituents
- Analysis of anions and cations in water samples at trace level
- Analysis of organic compounds such as steroids, and polyaromatic hydrocarbons
- Determination of actinides and radio nuclide
- Services analysis in the fields of agriculture, hydrology, geology, environment and medicine
- Measuring tritium and radiocarbon of water samples determination of the purity of various ligands, radioactive products and TC-kits, etc.

9.1.13. Industrial Analytical Centre, IAC, (HEJ), Karachi

IAC currently offers a wide range of services from chemical analysis, microbiological testing, food science, biotechnology, pharmacology, and material testing. Their researchers and technicians use the latest techniques (methodology) and the modern analytical instrumentations to provide accurate results. The range of services offered by IAC is

- Analysis of chemicals, organic & inorganic samples
- Analysis of Food items and agriculture products for chemical & nutritional profiles.
- Industrial materials like polymers, dyes, and solvents.
- Pharmaceutical & Herbal Products

- Microbiological & Toxicological analysis
- All type of Petroleum Products
- Calorific Value in Coal, Food Items, oils etc.
- Aflatoxin in food items
- Pesticide Analysis
- Ghee and Oil Analysis
- Analysis of fertilizers and raw material testing
- Analysis of different types of salts

9.1.14. SGS Chemical and Environmental Laboratory, Karachi (Analysis)

SGS laboratories are doing the analysis of raw materials and the testing of products in following areas;

- Air samples (gas bags and adsorption tubes)
- Soil (soil, sludges and water bottoms)
- Waste (hazardous waste, industrial waste)
- Water (waste water, groundwater, process water, drinking water)
- Organic Micro Pollutants service
- Asbestos identification by
  - In situ sampling
  - Leachates examination
  - Microbiology and parasitology

- **The Environment and Food**
  Certain organic substances have an extremely high toxicity, or are persistent and can be accumulated in our environment. These can be dioxins in flue gases, acrylamide in deep-fried products or pesticide residues in vegetables and fruit. Even a suspected presence of these micro pollutants in the product can jeopardize the continuity of the enterprise. SGS has founded the Institute for Applied Chromatography (I.A.C.). It is a unique laboratory able to quickly detect the slightest contamination by organic micro pollutants.

9.1.15. Global Environmental Labs (Pvt), (GEL)

Global Environmental Lab (Private) Limited (GEL), was established in 1996, is the first dedicated environmental lab of Pakistan that is owned and managed by the private sector. After more than a decade, the lab has grown from initial operations being limited to the effluent analysis of certain parameters of NEQS to the additions of specialized and highly skilled services. Today GEL has established its network of laboratories all over Pakistan. GEL has been certified for Quality Management System (QMS). It is also working on ISO 17025 accreditation and will soon be one of the accredited laboratories. It is providing services to various sectors including:

- Oil and Gas Exploration and Production
- Textiles Industries
- Pharmaceuticals
- Tanneries
- Food Industries
- Chemical Industries

- Government Agencies (which includes Federal and Provincial EPAs)
- Non Government Organizations

Testing and monitoring services presently offered by the company include the following:

- Liquid Effluent Analysis
- Drinking Water Analysis
- Soil & Sludge Analysis
- Microbiological Analysis
- Gaseous Emissions and Particulate Matter Analysis
- Ambient Air Monitoring
- Noise Level Measurements
- Light Intensity Measurement
- Complete Monitoring as per NEQS
- Waste Management

GEL owns two commercial incineration facilities, one in Karachi and the other in Lahore. Both the facilities are approved by the relevant EPA and have handled over 400,000 kgs. of various types of industrial hazardous and non-hazardous wastes. The waste includes production line waste, damaged and spoiled raw materials, expired finished goods and sludge from treatment plants, oil contaminated soils etc. The services provided by GEL in waste disposal/ treatment are in following areas;

- Water Disposal
- Incineration
- Bio-remediation
- Research and Development facility for disposal
- Waste Minimization through good housekeeping
- Waste recycling

9.1.16. Department of Plant Protection MINFAL

The Department of Plant Protection emanated from the nucleus staff that opted for Pakistan at the time of independence. Soon after its establishment the department had to fight the locust menace that posed a serious threat to the national plant wealth. By the passage of time, awareness, modernization, pollution and priorities on agricultural policy against the use of pesticides, have consequently reduced the activities of aerial sprays to a large extent. The department now headed by the Plant Protection Adviser and Director General, is mainly responsible for the following activities:

- Registration of Pesticides under the Agricultural Pesticides Ordinance, 1971;
- Regulation of Import, manufacture, formulation, refilling/ repacking, sale, use & advertisement of pesticides;
- Convening meetings of Agricultural Pesticides Technical advisory Committee & Sub-committees;
- Coordination with Federal and Provincial Governments, Private sector and International Organization
- Quality check of pesticides

International obligations

- Rotterdam Convention on Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides (signatory since 1992) Director General – DNA (Designated National Authority)
- Stockholm Convention on Persistent Organic Pollutant (POPs) (signatory since 2001)
- Basel Convention on the Control of Tranboundary Movement of Hazardous Wastes and their Disposal (signatory since 1994)
- Montreal Protocol on Substances Depleting Ozone Layer (ratified on 18.12.1992)

Federal Pesticides Testing and Reference Labs

For testing and quality control of pesticides, the Plant Protection Department has established Federal Pesticides Testing and Reference Labs in Karachi, Hyderabad, Rohri, Multan, Lahore, Faisalabad and Tarnab. The main functions of these labs are;

- Testing samples for registration, quality control, import and officially purchased chemicals.
- Entertain appeals against analysis reports of the Provincial Government labs.
- Provide training to chemists of provincial departments.

9.1.17. Bureau Veritas Consumer Product Services

Founded in 1828, Bureau Veritas is a worldwide leader in certification, conformity assessment, training and consultancy services. Its mission is to assist customers in QHSE and SA management (Quality, Health, Safety, Environment and Social Accountability) of their assets, products or services, systems and employees. Through its services portfolio, Bureau Veritas contributes to risk prevention and performance improvement in order to help companies create long-term value. Bureau Veritas is a recognized leader in interpreting the global regulatory environment.

BVCPS, Pakistan is committed to leveraging the technical expertise of the Network to deliver added value services to its customers from Pakistan. It conducts tests according to the Standards and regulations of the American Association of Textile Chemists and Colorists (AATCC), American Society for Testing and Materials (ASTM), the International Organization for Standardization (ISO), British Standards Institute (BSI) etc. as well as buyer specified standards. A Comprehensive Range of Services include;

- **Textile Testing**
  - Product evaluation at development, pre-production and production stage.
  - Testing to national and international standards
  - Product regulatory and safety compliance assessments
  - Product evaluation for appearance, quality and performance
  - Reporting data in user friendly test reports
  - Technical support network to answer questions, interpret results, and help manage our quality assurance program
  - Customized or standard testing program development and implementation
  - Defect Analysis of customer complaint items or manufacturing defects

- Comparative analysis of own brand products to the competition Re-testing after corrective actions have been put in place, to assure on-going product quality

9.1.18. National Water Quality Laboratory (NWQL), PCRWR

The National Water Quality Laboratory (NWQL), of Pakistan Council for Research in Water and Resources at PCRWR Headquarters Islamabad, is a premier laboratory of water quality in Pakistan. In a short span of time, it has established itself as a centre of excellence in water quality management by upgrading its infrastructure and improving the quality of scientific manpower. It has the capacity to analyze more than 116 water quality parameters (drinking, irrigation and waste water) and is fully capable to support industry, research institutes and universities in this area. The NWQL has three main sections i.e. Microbiology Section, Chemical Analysis Section and Wastewater Analysis Section.

The PCRWR has established other National Water Quality Laboratories in its centers at Lahore, Bahawalpur, Tando Jam, Quetta, Peshawar, and Abbottabad.

9.1.19. Hydrocarbon Development Institute of Pakistan (HDIP)

The Hydrocarbon Development Institute of Pakistan (HDIP) is the national petroleum Research & Development (R&D) organization which provides consultancy, advisory and laboratory services, expertise and facilities, public and private sector organizations and companies and renders technical services to the government.

HDIP has established state of the art Petroleum Testing Labs for checking of quality, standards and specifications of hydrocarbons including crude petroleum, petroleum products, liquefied petroleum gas and natural gas in downstream petroleum sector and geochemical labs in upstream petroleum sector.

- **Geochemical Labs**

  The Geochemical labs are providing services for Bitumen Classification, Source Rock Typing, Gas Analysis by Chromatography, TOC and Rock Eval (S_1, S_2, S_3 and Tmax), Gas Chromatography of Saturated Hydrocarbons, Biological Marker Analysis by Gas Chromatography/Mass Spectrometry, Natural Gas Analysis by Gas Analyser, Calorific Value and Gravity Estimation of Gas by Calculation Method, Compositional Analysis of LPG, Density Estimation by Calculation Method, Light Hydrocarbon Analysis by Head Space Gas Analyser.

  Hydrocarbon Characterization is done for, Total Hydrocarbon by Infrared Spectro-photometer, Semi Volatile Hydrocarbons (C9-C30) and Total Hydrocarbon (>C30). Geochemical Labs are also Formation Water Analysis, for pH, Total Suspended Solid (TSS), Density, Alkalinity m/P-val, Conductivity, Metal Analysis, Non-metal Analysis, Hardness (Carbonate, Bicarbonate, Nitrate Sulphate and Chloride), Total Dissolved Solids (TDS). Inorganic Soil Analysis are offered for, Trace Metals (AAS) e.g. Al, Ba, Mg, Cr, Fe, Pb, Ca, Ni, Si, Ag, Mn, Zn and for Non-Metals e.g. Sulphate, Nitrate, Chloride, Phosphate

- **Petroleum Testing Labs**
  In downstream sector testing and evaluation of petroleum products like Condensate, Gasoline, Ethanol, Light Diesel Oil (LDO) and Allied Products, High Speed Diesel, (HSD), Kerosene, Furnace Oil, Asphalt (residual oil), Brake Fluid, Grease, Transformer Oil, Lubricating Oil, LPG, Natural Gas, Other POL compounds is done as per internationally accepted ASTM/ IP Methods. In addition to that sampling & inspection of POL products, sampling & testing of POL import products and Inspection of Lube Plants and fuel oil storage and terminals.

- **Combustion Engineering Labs**
  The Combustion Engineering Labs are providing facilities for study of environmental pollution for the CO2, CO, Soots, Nitrogen and Sulphur, in ppm level, Exhaust Emission Study, Energy Conservation Study for the Industries, Study for the Substitute Fuel Performance in I.C. Engine, Efficiency Monitoring of Domestic Heating Appliances.

The following pilot plants are also available to undertake various process studies.

- Thermal Cracking
- Liquid-Liquid Extraction
- Organic Chemistry Chemicals Formulation and Polymerization-catalytic conversion process.

- **Compressed Natural Gas (CNG)**
  HDIP, being pioneer in introducing and establishing Compressed Natural Gas as an alternate fuel for cars and busses in Pakistan offers following expertise in this sector;
- Establishment of CNG stations on turnkey basis or through technical support.
- Testing and certification of compressed natural gas (CNG) cylinders.
- Dynamometer based tuning of vehicles.
- Technical evaluation of imported and locally manufactured CNG equipment.
- Safety Inspection of CNG station as per Pakistan CNG Rules 1992.
- Safety inspection related documents and technical details:

- **Environmental Analysis**

Environmental analysis are done for Water Portability (Dissolved), Alkalinity, Conductivity, pH, Chloride, Iron, Bicarbonate, Nitrate, Sulphate, Carbonate, Sodium, Hydrocarbons, TDS Hardness, Calcium and Magnesium, Water Salinity (Dissolved), Calcium, Chloride, Magnesium, pH, Potassium, Sulphate, Sodium and Conductivity. Studies for Trace Elements in Salt/Sediments/Water, Trace Metal Analysis by Atomic Absorption (15 Elements) are also done.

9.2. Overview of Technical Training and Education Programmes

For the development of technical expertise for chemical management and environmental management in general the, academia, public sector research organizations and NGOs (local as well as foreign) are involved. The expertise required for chemical management in the country is required in two main areas;

- Implementing government policies

- Chemical management, covering education in chemistry, environmental sciences and management, environmental engineering, Ecotoxicology, health and safety issues etc.

The courses related to implementation of government policies are lacking in curricula of Pakistani universities. The major courses available in the universities are in public administration/management, human resources management, environmental management, environmental sciences, chemistry, chemical engineering, biochemistry, public health, toxicology, and some other related directly or indirectly with the chemical management. All major universities of Pakistan have well established chemistry departments. Engineering universities are teaching in chemical technology or chemical engineering. Environmental management and environmental sciences are taught in many universities of public as well as private sector. These universities are recognised by Higher Education Commission (HEC) of Pakistan.

Apart from degree courses offered by universities, they are also involved in industrial research with the collaboration of chemical industry and other related industries. The focus of their research is mainly in industrial processes development and environmental issues. The subject chemistry is taught at school level as compulsory subject all over the country.

In addition to the academia, public as well as private research organizations are also involved in trainings related to chemical management. The training programmes are designed specially for the needs of capacity building of government officials and staff with national as well as international technical and financial assistance.

Pakistan National Accreditation Council is developing the Quality Culture in the country through awareness and training programs in the field of quality and accreditation. For this purpose a series of courses have been designed by internationally trained staff of PNAC. These courses are based on internally harmonized system and are based on the body of knowledge of different foreign bodies in the field of accreditation and quality. It is worth to mention that for effective implementation of international standards a well documented quality management system and validated technical procedures are required through well-trained and competent staff. The major courses include;

- Laboratory Accreditation Courses based on the requirement of ISO/IEC 17025
- Awareness and implementation of ISO/IEC 17025
- Traceability and Uncertainty in Measurement for Testing and Calibration Laboratories (ISO/IEC 17025)
- Method Validation (ISO/IEC 17025)
- Quality Assurance (Proficiency Testing/ ILC) (ISO/IEC 17025)
- Medical Laboratory Accreditation Courses (ISO 15189:2007)
- Laboratory Quality Management Course (ISO 15189:2007)
- Inspection Bodies Accreditation Courses ISO/IEC 17020:1998/ APLAC TR001
- Inspection Bodies Management Course based on ISO/IEC 17020
- Certified Manager of Quality

To promote quality improvement practices in the country, Pakistan National Accreditation Council (PNAC), under the administrative control of the Ministry of Science and Technology has launched a project "Awareness Raising and Training on Conformity Assessment, Quality and Productivity" (ARTCAQP) in the year 2007. The project envisages mass awareness raising for all the stakeholders and general public through seminars / courses and media campaign to improve the quality of our goods and services for achieving the following objectives: -

- To create awareness among the industry, industrial policymakers, academia, service providers, exporters and consumers etc about the benefit of adopting quality improvement practices.
- To arrange special seminars, workshops and training courses for all the stakeholders for improving skills in the field of quality, environment, product certification, test and calibration and accreditation, etc.
- To educate/train consumers on environment, social and economic impact of consumers choice.
- To assist consumer associations to start a quality awareness campaign amongst consumers through publication of material, articles in newspapers and holding of seminars/workshops etc.
- To launch a publicity campaign in print and electronic media in order to create awareness and facilitate our exporters, industry and other stakeholders about importance of international standards, conformity assessment procedures and benefits of improving the quality of our goods and services.
- Development of know how, resource information and compilation of information through conduct of surveys included but not limited to cost of non-conformance in manufacturing, services and agriculture sector etc.
- To disseminate information collected through surveys to facilitate both public and private sector organizations for enhancing the quality and productivity to become competitive in local and international markets.
- To create awareness among the manufactures, producers and exporters to know more about the threats and opportunities arising from the WTO regime.
- To conduct sectoral studies through professional organizations on losses due to poor quality in different sectors, information on technical requirements of major importing countries and dissemination of such information to stakeholders in order to reduce technical barriers to trade.

Under the ARTCAQP project seminars and courses are held on the following topics in different cities with close collaboration of Chambers of Commerce & Industry, Industrial Associations, Consumer Associations, Academic Institutions or any other stakeholder organizations both in public and private sectors.

Global Environmental Labs, private organization is provides training to various industries, educational institutions, NGOs etc. Trainings are provided in the following fields:

- Environmental Management Systems (EMS)
- Environmental Awareness
- Self Monitoring and Reporting Tool (SMART)

- National Environmental Quality Standards (NEQS)
- Health and Safety
- Bio-Diversity

Pakistan Council for Scientific and Industrial Research (PCSIR) arranges seminars, workshops and training programmes in the specialized fields for the senior technical staff of the industry in order to update the knowledge of industrial workers and to teach the modern techniques, skills and latest methods for improving the quality and standards of their industrial products. PCSIR has a network of training centers across the country in major cities, related to industrial electronics engineering, precision mechanics and instrumentation and processing systems

Training courses in Water Quality Monitoring on Capacity Building under the project provision of Safe Drinking Water–Khushal Pakistan Programme , were organised by PCRWR which were completed in 2008. More than 500 managers, operators and technicians have qualified these courses.

9.3. Overview of Environmental Health, Occupational Health & Chemical Safety

a. Environmental Health

Lack of access to safe drinking water, inadequate sanitation facilities, improper solid waste management including healthcare waste are the major environmental health problems identified in Pakistan. The government of Pakistan has recently launched "Clean Drinking Water Program" (Ministry of Environment) for all, which includes provision of drinking water treatment plants at the tehsil level. Pakistan Council for Research in Water Resources (PCRWR) has planned to build a network of drinking water testing laboratories in major cities of the country.

The Ministry of Health in its Prevention and Control of Hepatitis Project has allocated resources for up-gradation of NIH and provincial laboratories, model water filtration plants and household water treatment methods in particular. There is a need to guide the hospitals on making waste management plan for hospitals in light of approved hospital waste rules.

Achievements

- Preparation of PC-1s for the federal and provincial Environmental Health Units (EHU)
- Formulation of National Drinking Water Standards
- Development of National Strategy for Healthy Environments for Children
- Development of the proposal for Environmental Health Awareness Program

Objectives

- Strengthen the network among the Federal and Provincial Environmental Health Units
- Update and adopt National Drinking Water Quality Standards
- Provide guidelines for household water treatment methods and low cost sanitation options
- Prepare draft Safe Drinking Water Act (SDWA)
- Develop guidelines for health care waste management to be implemented in the hospitals

b. Chemical Safety

The major priority areas out lined are:

- Registry of mortality and morbidity data throughout the country in all age groups and both genders and measures to reduce it.
- Networking of Poison Control centers through out the country with national and International links. These centers are pivotal in the registry, investigation, treatment, research & training of health professionals of health related chemicals along with public awareness programmes.
- Urgent establishment of Poison Information Services through out the country, minimum of all tertiary care centers with trained staff, and IT facilities.
- Urgent need for collaboration & coordination amongst the various ministries, institutions and departments (stakeholders), to reduce the cost of programmes and to develop effective evidence based data of all issues related to harmful effect of chemicals on human health.
- Incorporation of all data/ reports in the training programmes of health professionals, medical students and general public awareness.

Achievements

- Trained doctors and nurses for other centers at National Poison Control Center Karachi.
- Data of National Poison Center ready and compiled and pear reviewed by International University to be used as reference data.
- Established Provincial Poison Control Center at Faisalabad.
- Provincial Poison Control Centers ready for official inaugural at Hyderabad, Multan and Peshawar.
- Module of Poison Information Services along with the resources in the form of electronic media and hard copy ready to start the training of doctors, nurses and pharmacists at major tertiary health care centers of all four provinces in the country.

Constrains

- Inadequate coordination and collaboration amongst various stake holders at federal and provincial levels involved in chemical handling.
- Lack of available data for research.
- Lack of laboratories to perform research.

Objectives

- Networking of nationwide poison control centers to be the center of excellence for registry, treatment, investigations and research.
- Source of public awareness campaigns and training of health professionals.
- Prevention and long-term surveillance programmes.
- Establish Poison Information Services throughout the country.
- Bring the different stakeholders on one platform to address issues related to chemical safety.

c. Occupational Health

The great industrial growth in the country has resulted in high rates of accidents, occupational diseases and unhealthy working environments in Pakistan. A large proportion of the workforce is illiterate and employed in the informal and unregulated sectors of economy. The women and children are even more vulnerable as they are largely employed in the informal and unregulated sectors, with little or no basic occupational health and safety services.

Most of the workforce is not even prepared to cope with the hazards posed by the modern technologies and processes. Legislation concerning occupational safety and health needs to be drafted in line with the Labour Policy 2001, which encompasses the decision for bringing the new law called as "Occupational Health & Safety Act" (OSHA). This law will replace all the existing laws related to inspection of workplaces.

There is a dire need to institutionalize the Occupational Safety and Health in this country. The guiding legal framework for establishment of supervisory and enforcement institutions is provided by the laws enacted by the federal government. A comprehensive situational analysis of occupational health related issues should be done so that the gaps identified can be addressed.

Objectives

- Prepare Occupational Safety & Health Act (OSHA)
- Improve multidisciplinary networking among the various stakeholders
- Build capacity in occupational health

9.4. Overview of Government Information System

The first IT Policy and Action Plan of Pakistan was approved by the Federal Cabinet in the year 2000. The IT Policy paid particular attention to the use of IT in Government. Prior to the formation of the IT Division an IT Commission was working. As a concrete follow-up step to the IT Policy, in October 2002, the Federal Cabinet approved the conversion of the IT Commission into the E-Government Directorate (EGD). EGD was set up as a cell within the Ministry of IT to focus specifically on E-Government. The E-government Directorate has the primary responsibility for bringing about the e-government transformation within the Federal Government, with strong cooperation and commitment, necessarily, from the various Federal Government organizations.

EGD has provided Personal Computers or equivalent computing resource, office productivity suite, including word processing, spreadsheet and presentation software, Email, system management and security clients, departmental servers for print sharing, local area networking to enable electronic communication between users of the Ministry as well as directory services to ensure authentication and authorization for users and the networking between the Divisions for inter-ministerial communications.

The e-governments system consists of common applications that are common to many or all Divisions of the Federal Government. They were implemented once and replicated across multiple Divisions. The second part is agency-specific applications are all applications that e-enable agency-specific services and processes. These applications have very limited or no potential for replication in other organizations. E-Services includes the use of electronic means for all interaction between

citizens and government agencies, including availing services from the government, understanding the status of work in progress and accessing results of the process.

E-Government in the context of the Federal Government of Pakistan is defined as a combination of internal e-enablement and the external provision of e-Services to stakeholders of the Federal Government. Government-to-Government includes Federal, Provincial, Local, as well as Governments of other countries and international agencies. To allow for process and IT system integration as well as the provision of services that support significant administrative savings and improve service delivery to citizens.

Government-to-Business includes all Suppliers as well as Businesses procuring services from GOP. Reduce the government's burden on businesses by accelerating government processes vis-à-vis businesses, providing services, eliminating redundant collection of data and better leveraging E-business technologies for communication.

Government-to-Citizen includes all Citizens of Pakistan. Provide easy to find, easy to use, points-of-service while providing higher speed, higher quality, and greater accessibility. Government-to-Employee includes all Government Employees. Provide easy to find, easy to use, points-of-service while providing higher speed, higher quality, and greater accessibility. The first phase includes the provision of information alone. The quality, usability and currency of the content determine the value of this phase of e-government.

In the second interactive phase, E-Government provides some degree of online interaction. For instance, citizens can enter complaints or job applications online. This phase does not include secure transactions such as financial or other transactions that require a high degree of authorization and audit.

In the collaborative phase citizens and businesses collaborate with the government on processes, projects, etc. This is especially important for businesses working together with the government on projects, for public-private partnerships, NGOs, citizen forums, etc. This phase requires a collaboration infrastructure, which brings together suppliers, consumers and the government in a network with the object of increasing value creation.

The automation of Government offices carried out by EGD has resulted in a substantial transformation of decision making process from usual typing oriented methods to hi-tech word processing and with improved productivity of staff. It has provided a fast pace communication system within the government as well as for public to government.

All Ministries/government departments and related organizations have ensure that their websites contain essential content as per guidelines provided by the Ministry of IT and are updated regularly. Ministry of IT reviews the quality of content of the websites and prepares a monthly report which is submitted to the PM Secretariat/Cabinet Division.

The officers and staff of all Ministries and attached departments have been provided with the personal computers with Microsoft window operating system and MS Office tools. The computers are maintained and upgraded time to time. The computers have been connected with the high speed internet. Through this network the individual ministries are maintaining and regularly upgrading their data bases. National and international data and information access from the World Wide Web is available. The systems have similar operating systems therefore are compatible for exchange of data and information with the country and outside the country.

9.5. Comments/Analysis

- As far as the technical infrastructure is concerned, a large number of laboratories have been established throughout the country related to chemical analysis.
- A large number of laboratories have been accredited through National Accreditation Council of Pakistan, where the laboratory quality standards are being maintained. But still there are other laboratories which still require certification.
- The Standard Reference chemicals are very expensive and there availability in the country is insufficient.
- The laboratory grade chemicals required for lab analysis are although available in the country on demand but their quality standards are required to be monitored as the practices of adulteration is common.
- Although education in chemistry, chemical engineering, environmental management and environmental studies is available in the country but there are no specific course available for chemical management. The additional modules are required in the curricula of the universities with reference to the chemical management, waste management, waste treatment etc.
- With reference to public health Pesticides Management in Pakistan using WHO Guidelines, the following should be considered
    - Need for enhanced coordination between Ministries of Food, Health, Agriculture & Live stock and Environment.
    - Need for enhanced participation of Ministry of Health in the registration process, particularly in case of pesticides that are used in Public Health.
    - Strengthening of agencies responsible for enforcement of laws, for formulation and repackaging, storage and transportation of pesticides. There should be a national monitoring and surveillance system.
    - Surveillance of pesticide poisoning is through National Poisoning Control Center Karachi at Jinnah Post Graduate Medical Centre Karachi. This center is acting as a registry, information investigation, treatment and research center at Federal level. The provincial centers at different hospitals are only acting as treatment centres for pesticides cases. The existing poison control centers are insufficient for catering the needs of the large population. There is an urgent need to increase such facilities with required technical human resource and infrastructure. The capacity building of existing poison control centers in terms of trained persons and technical support is also required.
    - The inter-linkage of National Poison Control Center and Provincial Centers is also very important. There is a need for coordination mechanism between these centers,

registration authority at Plant Protection Department, and Ministries of Health and Environment.
    - There is a need for strong National Public Health Pesticides Resistance Monitoring System.
    - Public health authorities need to be involved in the licensing process of public health pesticides.
    - Ministry of Health should be involved in the national information exchange system and strong public health pesticide management awareness should be done, in collaboration of ministry of health.
    - To address the poisoning due to different agents, whether acute or chronic, the integrated and collaborative approach of government, non governmental organizations along with industries and private sector representatives is required.
    - Institutional capacities are needed to be strengthened in terms of improved availability of information, filling gaps in the understanding of chemicals related health issues, risk assessment methods, protection of vulnerable groups including children, workers and population in general, promotion of safe alternatives and needs for prevention.
- There is a dire need for development of emergency response infrastructures in the country for chemical disaster management. The National Disaster Management Plan does not include chemical accidents response and management plan in it.

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10. Chemical Emergency Preparedness, Response, and Follow-up

10.1. Chemical Emergency Planning

The need for strong institutional and policy arrangements was fulfilled with the promulgation of the National Disaster Management Ordinance, 2006, and as a consequence establishment of the National Disaster Management Commission (NDMC) headed by the Prime Minister and the National Disaster Management Authority (NDMA). In line with Pakistan's commitment under the HFA and global best practices, a paradigm shift has been made from reactionary emergency oriented approach to pro-active prevention, mitigation and preparedness approach. The NDMA, being the lead agency of Pakistan at the federal level has under taken several key initiatives aimed at establishing a comprehensive disaster management system in the Country. Some of them were;

- Establishment of DRR institutions at the federal, provincial and district levels.
- Formulation of the National Disaster Risk Management Framework to guide the work of entire system in the area of disaster risk management. Nine priority areas have been identified within this framework to establish and strengthen policies, institutions and capacities over the next five years.
- Establishment of National Disaster Management Fund to make available dedicated resources for disaster risk reduction activities.
- Initiation of National Institute of Disaster Management Project with the purpose of establishing a Centre of Excellence in the field of disaster management, catering for the domestic as well as regional training and research needs.
- The National Capacity Building for Disaster Risk Management Project which is in progress and several development projects are being implemented in the priority areas identified in the National Framework. Some of which include:
    - Human Resource Development (HRD) for Disaster Risk Management (DRM).
    - Disaster Risk Management (DRM) Planning.
    - Disaster Risk Reduction (DRR) Mainstreaming.
    - Community Based Disaster Risk Management Activities.
    - Establishment of state of the art Urban Search and Rescue Teams.

- Initiation of Composite Risk Assessment and National Emergency Response System Project. The detailed activities under the project include mapping of hazard risks in Pakistan, develop guidelines and standards for response, equip national and provincial Emergency Operation Centres with essential IT equipment, prepare National Disaster Response Plan, develop departmental SOPs for disaster response, develop an information management system for disaster response, and capacity building activities on risk assessment and response.
- In order to ensure integrated national response for anticipated hazards in the country, contingency planning exercise has been under taken which include the following:
    - Winter Contingency Plan.
    - Cyclone Contingency Plan (for Karachi City),
    - Monsoon Contingency Plan.

- Industrial/Chemical Accidents Contingency Plan.
- Marine Oil/Chemical Spill Contingency Plan.
- Technical Contingency Plan.
- Contingency Plans for Drought, Tsunami, Mass Casualty Management and Earthquakes are being prepared.

Table 10.1: Organizations Working on National Disaster Management

Phase	Agency
Mitigation/Prevention	Federal Flood Commission
	Provincial Irrigation Departments
	Pakistan Nuclear Regulatory Authority
	Water and Power Development Authority (WAPDA)/ Dams safety council
Preparedness and Response	Armed Forces
	Civil Defence
	Emergency Relief Cell
	Fire Services
	National Crisis Management Cell (NCMC)
	Pakistan Meteorological Department
	Police
	Provincial Communication and Works
	Provincial Food Departments
	Provincial Health Departments
	Provincial Relief Commissioners
	Provincial Agriculture and Livestock Departments
	Space and Upper Atmospheric Research Commission (SUPARCO)
Recovery & Reconstruction	Earthquake Reconstruction and Rehabilitation Authority (ERRA)
	Provincial Irrigation Departments

10.1.1. Policies & Protocols with Links to Disaster Risk Management

Being a cross-cutting theme, disaster risk management has close links with all development sectors. Given below is a list of national sectoral policies and international protocols that have implications for disaster risk management and vice-a-versa. The NDMA would strive to build linkages with these policies and protocols for the implementation of the Framework.

Table 10.2: Policies & Protocols with Links to Disaster Risk Management

Sector/Agency	Legislation/Document
Agriculture	Agriculture perspective and policy
Bio-diversity	Convention on Biodiversity (UNCBD)
Climate Change	Framework Convention on Climate Change (UNFCCC)

Desertification	Convention on Combating Desertification (UNCCD)
Development	Medium Term Development Framework (MTDF), 2006-2010, Planning Commission
Development	Ten Year Perspective Development Plan, 2001-2011, Planning Commission
Development	Millennium Development Goals (MDGs), 2000
Disaster Management	SAARC Disaster Management Plan (under development phase)
Disaster Management	ASEAN Regional Forum (Draft plan for mutual cooperation)
Disaster Risk Management	HYOGO Framework of Action, 2005-2115
Environment	National Conservation Strategy, 1992
Environment	National Environment Action Plan (NEAP) 2001
Environment	National Environmental Policy 2005
Environment	Stockholm Convention on Persistent Organic Pollutants, 2001
Hazardous Waste	Basel Convention on the Control of Trans-Boundary Movement of hazardous Wastes and Their Disposal, 1994
Ozone Layer	Vienna Convention on Protection for Ozone Layer, and the Montreal Protocol, 1992
Poverty Reduction	Poverty Reduction Strategy Paper
Water Resources	National Water Policy, 2006

10.1.2. Technical Committees for National Disaster Management

The NDMA, PDMA and DDMAs may establish Technical Committees in order to facilitate coordination and enable optimum use of available skills and resources. Technical Committees will focus on specific disaster threats and issues, which may not have been covered as part of National Disaster Risk Management Framework for Pakistan the stakeholder responsibilities in the Framework. Technical Committees will assist local, provincial or national authorities in identifying issues and problems and devising solutions. The specific areas that are covered through the establishment of TCs are:

- Cyclones, storms, winds
- Disaster risk communication
- Drought
- Early warning systems
- Earthquakes
- Epidemics
- Floods
- Industrial and mines accidents
- Landslides, earth slides and avalanches
- Laws, procedures and standards
- Locust/pest infestation
- Major transportation accidents
- Marine disasters, including oil spills
- Nuclear, chemical, biological and radiological accidents

- Refugees/displaced persons
- Tsunamis
- Urban and forest fires
- Any other future calamity

10.1.3. Roles and Responsibilities of Key Stakeholders in NDMF

Disaster Risk Management is a multi sectoral, multi discipline and timely response undertaking. National Disaster Management Authority (NDMA) has been established in order to serve as the focal point and coordinating body to facilitate implementation of disaster risk management strategies. This necessitates NDMA to directly interact/ communicate with all stakeholders, including Ministries, Divisions, and Departments in relaxation to normal communication channel. All ministries , divisions and agencies which are likely to participate in disaster risk management shall procure all relevant items, stock them if necessary and supply them as directed by the NDMA for meeting any calamity or disaster. Roles and responsibilities described in this part refer to functions that are expected to be performed by concerned stakeholders with relation to disaster risk reduction, preparedness, response and recovery after disasters.

For Ministry of Environment

- Develop disaster risk management plan for risk reduction and response with relation to Ministry's mandate;
- Incorporate Natural Disaster Risk Assessment in the Environmental Impact Assessment guidelines;
- Develop technical capacities of the staff of ministry to undertake disaster risk assessment and disaster risk reduction activities in the environment sector;
- Undertake assessment of vulnerability of natural resources (forest, lakes, streams, mangroves, coral reefs, protected areas, coastal areas) to natural and human induced hazards;
- Implement programmes for conservation and rehabilitation of natural resources in order to reduce risks of natural hazards; e.g. reforestation, mangrove plantation, combating desertification, conservation of special natural resources; e.g. wetlands, lakes, reefs, mangroves, and coastal areas;
- Allocate resources for implementation of programmes to conserve and rehabilitate the natural resource base, particularly in up-stream areas of the Indus River basin;
- Develop mechanisms for assessment of environmental losses and damages in the aftermath of disasters and their rehabilitation;

Ministry of Industries, Production and Special Initiatives

- Develop disaster risk management plan with regards to the mandate of the Ministry;
- Develop guidelines for industrial sector to ensure safety of industry and its production processes in hazard-prone areas;
- Establish systems to monitor implementation of guidelines by industrial sector;
- Develop system of incentives and disincentives for industry to promote application of disaster safety;

- Implement awareness raising programmes for industrial sector including Chambers of Commerce and Industry (CCI) on integrating disaster risk assessment and vulnerability reduction in project planning and implementation stages;
- Prepare inventories of industries based upon the type of chemicals and raw materials used in their products and the dangers posed by various types of industries;
- Initiate demonstration programmes on industrial disaster preparedness;
- Develop safety codes for all industries to reduce risks of industrial and chemical hazards and to ensure vulnerability reduction from natural hazards;
- Develop SOPs for emergency response to industrial disasters;
- Develop physical capability to manage all types of likely industrial disasters including chemical disasters;
- Monitor and encourage implementation of safety codes in industry;

Ministry of Petroleum and Natural Resources

- Develop disaster risk management plan with regards to the mandate of the Ministry;
- Develop guidelines for safety in oil/gas, fire and mining sectors;
- Integrate risk assessment and risk reduction in planning and implementation of projects in the above sectors;
- Implement awareness raising programmes for staff in the oil, gas, fire and mining sectors;
- Develop SOPs for emergency response to disasters in the above sectors;
- Through the Geological Survey of Pakistan (GSP) conduct research on hazard mapping and produce user friendly maps;

10.2. Chemical Incident Response

Describe some of the more significant chemical incidents that have occurred recently in the country with the outcomes, observations and possible lesson learned.

Table 10.3: Examples of Chemical Incidents in the Country

Date of incident	Location	Type of Incident	Chemicals involved	Number of deaths I: Number of Injuries E: Number of evacuated	Environmental contamination and damage
Data not provided					

10.3. Chemical Incident follow-up and Evaluation

- There is no formal or informal mechanism in place to investigate a chemical incident and its outcome in the country, a standardized format for collecting the information about the incident should be developed by the Pak-EPA.
- Investigations leading to a formal enquiry about the causes and responsibilities of various parties involved are often made these investigations never lead to a follow-up activity, in general.

- The record for chemicals incidents and disasters is never kept in organized manners at any agency.
- The do not exist any follow-up surveillance and rehabilitation mechanism in the health service for exposed persons who may suffer long term disabilities and sequelae and Government level. Generally some NGOs are involved in such surveys and rehabilitation activities.

10.4. Comments/Analysis

- Disaster management in Pakistan basically revolves around flood disasters with a primary focus on rescue and relief. After each disaster episode the government incurs considerable expenditure directed at rescue, relief and rehabilitation. The Disaster management related to chemical accidents though part of framework but still not implemented.
- There does not exist any mechanism for inventories of installations and transport routes at risk of chemical incidents.
- Fire, police and other emergency services does not have specific equipment, including protective clothing, to deal with chemical incidents and staffs are not specifically trained for such incidents.
- There are no chemical hazard identification systems both in the transport and industrial/commercial sectors except in very few large enterprises.
- There are no dedicated chemical emergency services in the country.
- Only few hospitals have proper patient decontamination facilities and stocks of antidotes, medicines, and appropriate equipment for chemical emergencies. But in small towns and agricultural rural areas there are no such facilities to meet the emergency situation like pesticides poisoning.
- Health or emergency services are not properly trained and equipped for transportation of chemically exposed persons.
- There is no special training programme to prepare the emergency services (e.g. fire, police, civil defence) personnel in dealing with a chemical incident, as well as medical and paramedical staff in handling and treating chemically exposed persons
- Only in major cities veterinarians are available and not all of them have enough knowledge/trainings concerning treatment of exposed animals to toxic substances.
- Disaster management, development planning and environmental management institutions operate in isolation and integrated planning between these sectors is almost lacking.
- Within disaster management bodies in Pakistan, there is a dearth of knowledge and information about hazard identification, risk assessment & management, and linkages between livelihoods and disaster preparedness. Disaster management policy responses are not generally influenced by methods and tools for cost effective and sustainable interventions.

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Chapter 11

11. Awareness /Understanding of Workers and the Public; and Training and Education of Target Groups and Professionals

11.1 Overview

Under PEPA 1997, Federal Agency, EPA is required to Provide information and guidance to the public on environmental matters; recommend environmental courses, topics, literature and books for incorporation in the curricula and syllabi of educational institutions; promote public education and awareness of environmental issues through mass media and other means, including seminars and workshops; specify safeguards for the prevention of accidents and disasters which may cause pollution, collaborate with the concerned person in the preparation of contingency plans for control of such accidents and disasters, and co-ordinate implementation of such plans; encourage the formation and working of non-governmental organizations, community organizations and village organizations to prevent and control pollution and promote sustainable development;

The mandate of Pakistan Science Foundation includes;

a) The Foundation shall function as a financing agency for –

- the establishment of comprehensive scientific and technological information and dissemination centres;
- the promotion of basic and fundamental research in the universities and other institutions on scientific problems relevant to the socio-economic development of the country;
- the utilization of the results of scientific and technological research including pilot plant studies to prove the technical and economic feasibility of process found to be promising on a laboratory scale;
- the establishment of science centres, clubs, museums, herbaria and planetaria;
- promotion of scientific Scotties, associations and academies engaged in spreading the cause of scientific knowledge in general or in the pursuit of a specific scientific discipline or technology in particular;
- the organization of periodical science conferences, symposia and seminars;
- the exchange of visits of scientists and technologists with other countries;
- the grant of awards, prizes and fellowships to individuals engaged in developing processes, products and inventions of consequence to the economy of the country; and
- special scientific surveys not undertaken by any other organization and collection of scientific statistics related to the scientific effort of the country.

b) The Foundations shall also –

- review the progress of scientific research sponsored by it and evaluate the results of such research;

- maintain a National Register of highly qualified and talented scientists of Pakistan, including engineers and doctors, in or outside the country and to assist them, in collaboration with the concerned agencies in finding appropriate employment; and
- establish liaison with similar bodies in other countries.

Under the Hospital Waste Management Rules 2005, the duties of waste management team, hospital superintendent, heads of departments, infection control officer, chief pharmacist, radiology officer, senior matron, are clearly defined with respect to awareness, education and necessary training of their staff which include;

- Hospital waste management team – to ensure adequate training and refresher courses for the concerned hospital staff.
- Heads of departments – Ensure that all doctors, nurses, clinical and staff in their respective departments, is aware of, and where required properly trained, in waste management procedures.
- Infection control officer – giving advice regarding the control of infection, and the standards of the waste disposal system, identify training requirements for each category of staff and organization of training and refreshers courses on safe waste management procedures.
- Chief Pharmacist – ensure concerned hospital staff members receive adequate training in pharmaceutical waste management procedures.
- Radiology officer – ensure that the concerned hospital staff members receive adequate training in radioactive waste management procedures.
- Senior matron – shall be responsible for ensuring training of nursing staff, laboratory staff, medical assistants and sanitary staff and sweepers in waste management procedures and basic personal hygiene.
- Waste management officer – Liaise with the heads of departments, head of administration, senior matron to ensure all doctors, clinical staff, nursing staff, laboratory staff and medical assistants are fully aware of their duties and responsibilities under the waste management plan.

Similarly other others laws, acts and ordinances have similar provisions for awareness /understanding programmes of workers and the public; and training and education of target groups and professionals. The ministries, research organizations, NGOs, Trade associations, chambers of commerce and trade, international organizations all are involved in such programmes.

11.2 Comments and Analysis

- In general these efforts seem to be inadequate. Normally the factory workers are not fully aware of risks to the environment, health, and safety from chemicals, and measures which should be taken in order to protect themselves from chronic or acute exposure to hazardous chemicals in everyday life, as well as at the time of a chemical of a chemical emergency.
- NGOs especially are playing very important role in raising awareness and educating the public for effective participation in national environmental management initiatives (e.g. as

stated in agenda 21 or the implementation of Stockholm Convention) as well as access to justice in environmental matters.

- There is a dire need to Raise the awareness of decision-makers and legislatures concerning chemical safety and encourage them to take timely action to implement sound management measures.
- There is a need to improve the understanding of communicators and the media concerning chemical safety issues and encourage them to better communicate these issues to the public in order to improve understanding and promote chemical safety actions by the public and civil society in general.
- To boost the efforts for safe handling of chemicals in country at all levels following are recommended;
    - Develop chemical safety education in school and university curricular;
    - Promote the necessary skills for administrators concerned with risk assessment and regulations in the use of available data and evidence base approaches;
    - Promote skills trainings for a range of professional workers concerned with aspects of sound management of chemicals, from customs workers to those handling and transporting chemicals to the users of chemicals, such as agricultural and industrial workers and those in SMEs;
    - Promote the training of health and other professionals in diagnosis and management of exposed persons;
    - Promote the training of chemical emergency response professionals; and promote the training of staff at technical facilities such as laboratories, recycling, and disposal facilities.

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Chapter 12

12. International Linkages

12.1. Co-operation and Involvement with International Organizations, Bodies and Agreements

Pakistan is also playing an active role internationally by supporting and establishing new global partnerships to protect the environment at national, regional and global level. The country has become a signatory to many international Conventions/Protocols/Agreements like Agenda-21, UN Framework Convention on Climate Change (UNFCCC), Montreal Protocol on Ozone Depleting Substances, Global Environment Facility (GEF), Commission on sustainable Development (CSD) and Convention on the Control of Trans boundary Movement of Hazardous Waste and their Disposal. The following section summarizes the initiatives taken by Pakistan for international cooperation.

12.1.1. Strategic Approach to International Chemicals Management (SAICM)

Pakistan is signatory to the "Strategic Approach to International Chemicals Management" (SAICM). The Implementation of SAICM in Pakistan will affect a large number of stakeholders belonging to public, private sectors and civil society along with interest groups like labour organizations. The IC Wing Ministry of Environment is the focal point for implementation of SAICM in Pakistan which is striving to carve out a way forward in consultation with major stakeholders.

First consultation with civil society organizations was held on 14th November 2008. First meeting for establishment of Inter-Ministerial Coordination Mechanism was held on 3rd January 2009. International Coordination has been established through UNITAR (United Nations Institute for Training and Research). A UNITAR Mission arrived in Pakistan from 19-27 January 2009 which held discussions with the Federal Minister, Secretary, Additional Secretary and Joint Secretary Ministry of Environment as well as with some other stakeholders such as Pak EPA and FBR etc. The Mission discussed in detail the possible course of action and possible pitfalls with the National SAICM Coordinator /National Project Manager MEAs Secretariat. Meeting of National Technical Advisory Committee on Chemicals (NTACC) was held on 21st April 2009 which made decisions on regulating manufacture, import, export and use of various chemicals falling under international conventions.

The initial consultations built consensus that following actions need to be taken a priori to development of an action Plan for integrated chemicals management in Pakistan:

1. Development of a National Chemicals profile.
2. Capacity Assessment for Implementation of SAICM
3. Mass Awareness through Civil Society organizations about harmful effects of chemicals on daily life of citizens with special reference to labor working in industries and agriculture.

Table 12.1: List of Conventions/ Protocols Singed/ Ratified by Pakistan

Convention			Pakistan	
Sr.#	**Name of Convention**	**City / Country**	**Signing Date**	Date of Ratification
	Ramsar Convention on Wetland	Ramsar (Iran)	1971	**July, 1976**
	Convention on the International Trade in Endangered Species of Wil Fauna and Flora (CITES)	Washington D.C United States of America	1973	**April, 1976**
	Vienna Convention	Vienna (Austria)		**December, 1992**
	Montreal Protocol on Ozor Depleting Substances	Montreal (Canada)	January, 1989	**December, 1992**
	Basal Convention on Transboundary Movement of Hazardous Wastes & Their Disposal	Basal (Switzerland)	May, 1992	**October, 1994**
	Convention on Biological Diversity (CBD)	Rio. De Janeiro (Bazil)	June, 1992	**July, 1994**
	United Nations Frame Wo Convention on Climate Change UNFCCC	New York (United State of America)	June, 1992	**June, 1994**
	Kyoto Protocol to UNFCC	Kyoto (Japan)	Decembe r, 1997	**January, 2005**
	United Nations Conventio to Combat Desertification (UNCCD)		October, 1994	**February, 1997**
	Rotterdam Convention on Prior Informed Consent (PIC) for certain Hazardous Chemicals and Pesticides	Rotterdam (Nether Land)	Septembe r, 1999	**July, 2005**
	Stockholm Convention on Persistent Organic Pollutan (POPs)	Stockholm (Sweden)	Decembe r, 2001	**April, 2008**
	Cartagena Protocol on Bio-safety to the CBD	Cartagena (Spain)	June, 2001	**Not yet ratified**
	Convention on Law of Sea		Decembe r, 1982	**February, 1997**
	Convention of Migratory Species (CMS)	**Bonn (Germany)**	**1981**	**December, 1987**

12.1.2. Basel Convention on the Control of Trans-Boundary Movement of Hazardous Waste

The Government of Pakistan signed the Convention in May, 1992 and ratified in July, 1994. The major implementation measures include following;

i. National Definition of Waste

National definition of "waste" and "hazardous waste" has been provided in the "Pakistan Environmental Protection Act-1997", "waste" means any substance or object which has been, is being or is intended to be, discarded or disposed of, and includes liquid waste, solid waste, waste gases, suspended waste, industrial waste, agricultural waste, nuclear waste, municipal waste, hospital waste, used polyethylene bags and residues from the incineration of all types of waste.

Pakistan Environmental Protection Act 1997 defines Hazardous waste as "waste which is or which contains a hazardous substance, and includes hospital waste and nuclear waste".

Pakistan Environmental Protection Act 1997 defines "Hazardous Substance" as

(a) a substance or mixture of substance, other than a pesticide as defined in the Agricultural Pesticide Ordinance, 1971 (II of 1971), which, by reason of its chemical activity is toxic, explosive, flammable, corrosive, radioactive or other characteristics causes, or is likely to cause, directly or in combination with other matters, an adverse environmental effect; and

(b) any substance which may be prescribed as a hazardous substance.

ii. Restrictions on Tranboundary Movement

a. Restrictions on export for final disposal

Pakistan restricts export of hazardous wastes and other wastes for final disposal under Section 14 (Handling of Hazardous Substances) of Pakistan Environmental Protection Act-1997, which reads "subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle or import any hazardous substance except; (a) under a license issued by the Federal Agency and in such manner as may be prescribed; or (b) in accordance with the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or other instrument to which Pakistan is a party."

The restriction covers all countries.

b. Restrictions on export for recovery

Pakistan restricts the export of hazardous wastes and other wastes for recovery under Section 14 of Pakistan Environmental Protection Act-1997 as mentioned earlier. The restriction covers all countries.

c. Restrictions on Import for Final Disposal

Pakistan restricts the import of hazardous wastes and other wastes for final disposal as per Pakistan Environmental Protection Act-1997 and Import Policy Order, 2007 issued by Ministry of Commerce. The restriction covers all countries. Under Section 13 (Prohibition of Import of Hazardous Waste) of Pakistan Environmental Protection Act-1997, "No person shall import hazardous waste into Pakistan and its territorial waters, Exclusive Economic Zone and historic water."

Import Trade and Procedure Order 2000, inter-alia, also bans import of hazardous wastes as defined and classified in Basel Convention except where import is specifically authorized by the

Government of Pakistan. Government of Pakistan has also prepared a national Profile on Chemical Management in Pakistan in the year 2000 to provide information on registered hazardous chemicals being imported or produced locally.

d. Restrictions on Import for Recovery

Pakistan restricts the import of hazardous wastes and other wastes for recovery under Section 13 of Pakistan Environmental Protection Act-1997 and Import Policy Order 2007 issued by Ministry of Commerce. The restriction covers all countries. Pakistan has also prepared a national Profile on Chemical Management in Pakistan in the year 2000 (being upgraded now) to provide information on registered hazardous chemicals being imported or produced locally.

e. Restrictions on Transit

Pakistan restricts the transit of hazardous wastes and other wastes as mentioned in Section 14 of Pakistan Environmental Protection Act, 1997.
The restriction covers all countries.

iii. Reduction and/or Elimination of Hazardous Waste Generation

a. National Strategies/policies

Formulation and implementation of National Conservation Strategy and National Environmental Action Plan, and National Cleaner Production Center.

b. Legislation, Regulations and Guidelines

Following legislation covers chemical and hazardous wastes:

- Pakistan Environmental Protection Act, 1997;
- Import Policy Order – 2006 and 2007 issued by Ministry of Commerce;
- Self Monitoring and Reporting Rules-1998;
- Draft Hazardous Substances Rules-2007;
- Revised National Environmental Quality Standards-2000;
- Draft Hospital Waste Management Rules-2005; and
- Industrial Pollution charge (Calculations and Collection Rules)-1998;

Table 12.2: Implementation Status of Basel Conventions Signed by Pakistan

Sr.#	Convention Requirements	Implementation Status	Responsibility	Remarks/ Suggestions
1	Ratification of Convention	Government of Pakistan ratified the Basel Convention on 26th July 1994.	Government of Pakistan	Pakistan is party to the Basel Convention and has to comply with all the provisions of the Convention and major obligations in Annex-1.
2	Designated National Authorities (Article-	Government of Pakistan has	Ministry of Environment	The DNA is looking after Hazardous

	5)	already designated Director General Pak-EPA (Ministry of Environment) as Designated National Authority for Basel Convention		Wastes under the Basel Convention.
3	National Definition of Hazardous Waste (Article-3)	Hazardous Waste has already been defined in Pakistan Environmental Protection Act 1997 by Government of Pakistan	Ministry of Environment, Government of Pakistan	1. According to PEPA-1997, Hazardous waste means; waste which is or which contains a hazardous substance or which may be prescribed as hazardous waste, and includes hospital waste and nuclear waste. 2. Pak-EPA has also drafted Hazardous Substance Rules to deal with hazardous waste. These Rules are under the process of approval from competent authority.
4	Article 4, paragraph 1 (a) Parties exercising their right to prohibit the import of hazardous wastes or other wastes for disposal shall inform the other Parties of their decision pursuant to Article 13.	Under Section-13 of Pakistan Environmental Protection Act 1997 the import of hazardous waste is prohibited in Pakistan. (Section 13 of PEPA-1997 states that, "No person shall import hazardous waste into Pakistan and its	Pak-EPA, Ministry of Environment, Government of Pakistan	The approval process of Hazardous Substance Rules drafted by Pak-EPA should be accelerated.

		territorial waters, Exclusive Economic Zone and historic waters".)		
	Article 4, paragraph 1 (b) Parties shall prohibit or shall not permit the export of hazardous wastes and other wastes to the Parties which have prohibited the import of such wastes, when notified pursuant to subparagraph (a) above.	Although Pakistan is not the exporter of hazardous waste, however waste / stockpiles of out dated pesticides exported from NWFP for disposal were according to the provisions and compliance of Basel Convention.	Ministry of Environment.	DNA for Basel Convention should expedite the disposal of waste identified as hazardous waste and stockpiles of outdated pesticides.
	Article 4, paragraph 1 (c) Parties shall prohibit or shall not permit the export of hazardous wastes and other wastes if the State of import does not consent in writing to the specific import, in the case where that State of import has not prohibited the import of such wastes.	Pakistan is not regular exporter of hazardous waste.	DG Pak-EPA, Ministry of Environment.	PIC procedures under Rotterdam Convention and import policy of government should be strictly followed.
5	Article 4, paragraph 2 (a) Each Party shall ensure that the generation of hazardous wastes and other wastes within it is reduced to a minimum, taking	Government of Pakistan is implementing National Environmental Quality Standards (NEQS) for industrial sector, which aims to	All provincial and federal EPAs, Ministry of Environment.	Efficient implementation of NEQS should be ensured and special attention should be paid to solid waste generation industries.

	into account social, technological and economic aspects;	reduce the production of waste in either form of wastes i.e. solid waste, effluent and emissions.		
	Article 4, paragraph 2 (g) Each Party shall prevent the import of hazardous wastes and other wastes if it has reason to believe that the wastes in question will not be managed in an environmentally sound manner	Under Section-13 of Pakistan Environmental Protection Act 1997 the import of hazardous waste is prohibited in Pakistan.	Pak-EPA, Ministry of Environment, Custom Department.	Implementation of Section -13 of PEPA 1997 and Import Policy of Pakistan should be ensured.
	Article 4, paragraph 8 Each Party that intends to export hazardous or other waste shall ensure that the waste will be managed in an environmentally sound manner at the place of its destination.	Pakistan is not the exporter of hazardous waste however hazardous waste is only exported for safe disposal and only to those countries having its safe disposal capabilities.	Pak-EPA, Ministry of Environment, Custom Department.	DNA /DG Pak-EPA should develop plan/strategy for disposal of out dated pesticides stockpiles with the assistance of international donor agencies.
6	Article 4, paragraph 5 and Article 11, paragraph 1. Each Party shall not permit hazardous wastes or other wastes to be imported from a non-Party unless there is a bilateral, multilateral or regional agreement allowing this import.	Under the PEPA 1997, import of hazardous waste from any country either party to Basel Convention or non party is prohibited. However under special condition the waste can be imported can be exempted.	Pak-EPA, Ministry of Environment, Custom Department.	Facilities for disposal of hazardous waste in the country should be developed, so that local hazardous waste can be disposed off and it will also serve for region.

7	Article 4, paragraph 5 and Article 11, paragraph 1 Each Party shall not permit hazardous wastes or other wastes to be exported to a non-Party unless there is a bilateral, multilateral or regional agreement allowing this import.	Hazardous waste is not usually exported from Pakistan, however for safe disposal hazardous waste can be exported to those countries who are capable for its safe disposal.	Pak-EPA, Ministry of Environment, Custom Department.	1. DNA /DG Pak-EPA should develop plan/strategy for disposal of out dated pesticides stockpiles. 2. Donors for assisting the development of hazardous waste disposal should be arranged.
8	Article 4, paragraph 2 (c) Each Party shall ensure that persons involved in the management of hazardous wastes or other wastes shall prevent pollution and minimize potential impacts on human health and the environment.	**1.** In this regards Pak-EPA has drafted Hazardous Substance Rules which addresses handling of hazardous waste. These Rules are under the process of approval from competent authority. **2.** Federal and Provincial EPAs are implementing National Environmental Quality Standards (NEQS) for control of pollution at source in industrial sector.	Federal and Provincial EPAs and Ministry of Environment.	1. Health and safety related activities should be initiated by MOE in collaboration with Ministry of Industries, Ministry of Health and CBR for handling of hazardous wastes. 2. A data base on wastes profiles, their uses and its health and environmental impacts needs to be developed and made public. 3. Chemicals disaster Management Cells needs to be established throughout the country. 4. Chemicals Zones may be earmarked for wastes / chemicals related industry.
9	Article 4, paragraph	Under section 12	Federal and	A data base of all

	7 (a) Each Party shall prohibit all persons under its national jurisdiction from transporting or disposing of hazardous wastes or other wastes unless such persons are authorized to do so.	of PEPA 1997, EIA/IEE is mandatory for all kind of developmental activities and construction work cannot be commissioned without the conditional NOC of either Federal EPA or Provincial EPAs. The Environmental Management Plan (EMP) of EIA/IEE for industrial sector interventions clearly suggests the ways and means for the disposal of its wastes either hazardous or non hazardous.	Provincial EPAs and Ministry of Environment.	waste either imported or exported needs to be developed for future actions. A Basel Convention Center needs to be established to look into the technical as well as Strategic/Commercial issues related to trade in waste. Funding from Basel Convention Secretariat and other International donor Organizations may be explored by Pak-EPA.
10	Article 2, paragraph 13 Each Party shall require that any person who takes charge of a transport of hazardous wastes or other wastes that pass through (transits) another country to inform the transit country in writing.	In this regard the office of DNA for Basel Convention issue NOC for transit of waste with certain conditions complying with the convention obligations.	DG Pak-EPA and Ministry of Environment.	A data base for NOCs of transit and Import should be developed, as the record of previous NOCs issued for transit and waste import is not readily available. Copies of previous record should be made available for future activities.
11	Each Party which potentially could be an importer of hazardous or other wastes may write to	Waste is imported in the country and there are waste based industries. However its	DG Pak-EPA, Ministry of Environment and CBR.	PIC procedures under Rotterdam Convention and import policy of government should

	the exporter and: • consent to the import with or without conditions, • deny permission for the import, or • request additional information (Article 6, paragraph 2)	import or transit is permitted with the information as the importer or Government deemed necessary.		be strictly followed.

12.1.3. Rotterdam Convention on Prior Informed Consent (PIC) For Certain Hazardous Chemicals and Pesticides

The Government of Pakistan signed the Convention in September, 1997 and ratified in July, 2005. The major implementation measures taken so far are as following;

- Pakistan ratified The Rotterdam Convention on 14th July 2005.
- The entire twenty-eight pesticides subject to PIC procedure under Rotterdam Convention (RC) are either banned or deregistered/never registered in Pakistan.
- The import response from Pakistan for all 28 pesticides has been communicated to RC Secretariat.
- MINFAL has established an Agricultural Pesticides Technical Advisory Committee (APTAC) for appropriate decision-making on the information and recommendations of APTAC-Sub-committee.
- The APTAC-Sub-Committee reviews and evaluates all concerns of pesticides in Pakistan.
- The APTAC set up by the MINFAL evaluates all pesticides to avoid formulation of severely hazardous pesticides. Various research laboratories conduct eco-toxicological tests. No Severely Hazardous Pesticides Formulation (SHPF) is recommended unless reported by eco-toxicological labs.
- Ministry of Environment, Government of Pakistan has constituted a National Technical Advisory Committee on Chemicals (NTACC) under the chairmanship of DNA (Chemicals-RC) Ministry of Environment, to advice on the use of industrial chemicals under Rotterdam Convention.
- The National Technical Advisory Committee on Chemicals (NTACC) will review and evaluate the concerns about industrial chemicals in the country and will submit its report as and when required.
- The committee will also develop mechanisms for inter-ministerial interaction, communication among public and private sectors, academic researchers and decision makers.
- The import response about eleven industrial chemicals will be communicated to Rotterdam Convention Secretariat this year as soon as the NTACC submit its report.

12.1.4. Stockholm Convention on Persistent Organic Pollutants (Pops)

The Government of Pakistan signed the Convention in December, 2001 and ratified in April, 2008.

- POPs stands for Persistent Organic Pollutants called Dirty Dozen. POPs are Chemicals that resist their decay, travel long distances and accumulate in human and animal tissues. POPs are extremely dangerous for human health and environment.
- Pakistan signed the convention on 6th December, 2001
- Pakistan Ratified the Stockholm Convention 17th April 2008

Table 12.3: Implementation Status of Stockholm Convention on Persistent Organic Pollutants (Pops) In Pakistan

Sr. #	Convention Requirements	Implementation Status	Responsibility	Remarks / Suggestions
A	**Administrative Obligations**			
1	Ratification/Signing of Convention	Government of Pakistan signed Stockholm Convention on 6th December 2001 and ratified it on 17th April 2008	Government of Pakistan	Pakistan is now party to the Stockholm Convention and has to comply with all the provisions of the Convention and major obligations in Annex-1.
2	National Focal Point (Paragraph 3 of Article 9 on information exchange, requires that "Each Party shall designate a national focal point for the exchange of such information")	Government of Pakistan has already designated National Focal Point.	Ministry of Environment.	Currently Joint Secretary (Admn) Ministry of Environment is National Focal Point for POPs Convention.
3	Article-7, National Implementation Plan (NIP)	NIP has already been prepared by Pak-EPA. Ministry of Environment has forwarded the NIP to UNDP.	Pak-EPA and UNDP	The submission of NIP to Stockholm Convention Secretariat has been delayed due to delayed ratification of the Convention. 1. Pak-EPA should ensure

				that NIP is forwarded to Stockholm Convention Secretariat urgently. 2. Ministry of Environment and Pak-EPA should consult UNDP, UNIDO and other International Organizations for seeking funding from Stockholm Convention Secretariat.
B	**Chemicals Related Obligations**			
1	Category 1: Pesticides			
	1). The Stockholm Convention bans immediately all production and use of Pesticides Endrine and Toxaphene.	Endrine: De-registered since 1985 Toxaphene: De-registered since 1992	Ministry of Food, Agriculture and Livestock (MINFAL)	The entire nine POPs pesticides are either banned or deregistered/never registered in Pakistan. However the out dated stockpiles of these pesticides is a threat which needs to be identified throughout the country and disposed off through environmentally safe and sound practices. Although these pesticides are banned/deregistered or never registered in Pakistan,
	2). It requires (a) all parties to stop producing the Pesticides Aldrin, Dieldrin, Heptachlor and (b) Requires those wishing to use remaining supplies to register for exemptions.	Aldrin: Never registered Dieldrin: Deregistered since 1983 Heptachlor: Deregistered since 1997	MINFAL	
	3). It limits the production and use of Chlordane, Hexachlorobenzene and Mirex to	Chlordance: Never registered Hexachlorobenzene: Deregistered since 1997 Mirex: Never registered	MINFAL	

	narrowly prescribed purposes.			however most of these pesticides are available in the market illegally with different brand names. Its elimination should be ensured through strict implementation of Provincial Agriculture Departments and Customs Department.
	4). The Convention limits the production and use of DDT to controlling disease vectors such as malarial mosquitoes	DDT: Deregistered since 1992	MINFAL	Although DDT as pesticides is deregistered in Pakistan, however DDT is still used for control of Malaria Vector in the developing world. The Convention also have some built in exemptions for DDT use for health purposes subject it has been sought after the ratification of Convention.
2	**Category 2: PCBs**			
	1). The convention bans production of PCBs immediately.	(a) No production industry identified in Pakistan.	MOE/Ministry of Commerce with consultation of WAPDA	PCBs were never produced in Pakistan and were mainly imported by WAPDA for usage in transformer. However they claim that since 1974 the transformer oil imported are PCB free. But the sampling
	2). The convention gives the countries until 2025 to phase out the use of equipment containing PCBs.	(b) New type of transformers and capacitors do not use PCBs, hence there is no need to import PCBs.		

	3). The recovered PCBs must be treated and eliminated by 2028.	(c) At present we do not have adequate technology to destroy PCBs but we may be able to develop this capacity by 2028.	MOE and WAPDA	analysis carried out during POPs enabling Activity Project show that at least 50 % of WAPDA transformers are PCB contaminated. Furthermore a Technical Advisory Committee on Chemicals (TACC) is being established by MOE to evaluate the status of industrial chemicals including PCBs either to officially ban it or not. Identification of PCB containing equipment should be carried out for future action to meet Convention of its elimination by 2028.
	Category 3: UPOPs (Dioxins & Furans)			
	The convention requires the parties to develop an action plan (within 2 years after ratification) to identify, characterize and address the release of UPOPs.	**(a)** Not produced intentionally for any industrial, agricultural or domestic use. (b) Best Available Techniques (BATs) and Best Environmental Practices (BEPs) are required for minimization of emission of these POPs which Pakistan need to acquire as soon as possible. (c) At present Pakistan	MOE for policy decision. Control of UPOPs emissions by Federal and Provincial EPAs.	Unintended by products of combustions and industrial processes. In Pakistan there is no facility available either its qualitative or quantitative analysis. However the estimates made during POPs Enabling Activity Project and studies carried out by SDPI shows huge quantity

		does not have adequate laboratory facilities to measure emission of Dioxins and Furans.		of UPOPs production.

Pakistan has been a member country of International Labour Organization (ILO) since its establishment in 1947. Pakistan's tripartite delegation consisting of representatives of its government through Ministry of Labour & Manpower, Employers Association and Workers federations have been participating in the International Labour Conference of ILO in its headquarter in Geneva. In the following table the International Labour Convention, Pakistan has signed and enforced are listed.

Table 12.4: List of Ratification of International Labour Conventions

No.		
C. 1	Hours of Work (Industry) Convention, 1919 (No. 1)	14.07.1921
C. 4	Night Work (Women) Convention, 1919 (No. 4)	14.07.1921
C. 6	Night Work of Young Persons (Industry) Convention, 1919 (No. 6)	14.07.1921
C. 11	Right of Association (Agriculture) Convention, 1921 (No. 11)	11.05.1923
C. 14	Weekly Rest (Industry) Convention, 1921 (No. 14)	11.05.1923
C. 16	Medical Examination of Young Persons (Sea) Convention, 1921 (No. 16)	20.11.1922
C. 18	Workmen's Compensation (Occupational Diseases) Convention, 1925 (No. 18)	30.09.1927
C. 19	Equality of Treatment (Accident Compensation) Convention, 1925 (No. 19)	30.09.1927
C. 21	Inspection of Emigrants Convention, 1926 (No. 21)	14.01.1928
C. 22	Seamen's Articles of Agreement Convention, 1926 (No. 22)	31.10.1932
C. 27	Marking of Weight (Packages Transported by Vessels) Convention, 1929 (No. 27)	7.09.1931
C. 29	Forced Labour Convention, 1930 (No. 29)	23.12.1957
C. 32	Protection against Accidents (Dockers) Convention (Revised), 1932 (No. 32)	10.02.1947
C. 45	Underground Work (Women) Convention, 1935 (No. 45)	25.03.1938
C. 59	Minimum Age (Industry) Convention (Revised), 1937 (No. 59)	26.05.1955
C. 80	Final Articles Revision Convention, 1946 (No. 80)	25.03.1948
C. 81	Labour Inspection Convention, 1947 (No. 81)	10.10.1953
C. 87	Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)	14.02.1951

C. 89	Night Work (Women) Convention (Revised), 1948 (No. 89)	14.02.1951
C. 90	Night Work of Young Persons (Industry) Convention (Revised), 1948 (No. 90)	14.02.1951
C. 96	Fee-Charging Employment Agencies Convention (Revised), 1949 (No. 96) Has accepted the provisions of Part II	26.05.1952
C. 98	Right to Organise and Collective Bargaining Convention, 1949 (No. 98)	26.05.1952
C. 100	Equal Remuneration Convention, 1951 (No. 100)	11.10.2001
C. 105	Abolition of Forced Labour Convention, 1957 (No. 105)	15.02.1960
C. 106	Weekly Rest (Commerce and Offices) Convention, 1957 (No. 106) The Government has declared that the Convention also applies to persons employed in the establishments specified in Article 3, paragraph 1(c).	15.02.1960
C. 107	Indigenous and Tribal Populations Convention, 1957 (No. 107)	15.02.1960
C. 111	Discrimination (Employment and Occupation) Convention, 1958 (No. 111)	24.01.1961
C. 116	Final Articles Revision Convention, 1961 (No. 116)	17.11.1967
C. 118	Equality of Treatment (Social Security) Convention, 1962 (No. 118) Has accepted Branches (c) and (g)	27.03.1969
C. 138	Minimum Age Convention, 1973 (No. 138) Minimum age specified: 14 years	6.07.2006
C. 144	Tripartite Consultation (International Labour Standards) Convention, 1976 (No. 144)	25.10.1994
C. 159	Vocational Rehabilitation and Employment (Disabled Persons) Convention, 1983 (No. 159)	25.10.1994
C. 182	Worst Forms of Child Labour Convention, 1999 (No. 182)	11.10.2001
C. 185	Seafarers' Identity Documents Convention (Revised), 2003 (No. 185)	21.12.2006
Denunciation (as a result of the ratification of Convention No. 89)		
C. 41	Night Work (Women) Convention (Revised), 1934 (No. 41) Denounced on 14.02.1951	22.11.1935
Denunciation (as a result of the ratification of Convention No. 138)		
C. 15	Minimum Age (Trimmers and Stokers) Convention, 1921 (No. 15) Denounced on 6.07.2006	
Total Conventions Ratified: 36		**In force: 34**

12.2. Participation in Relevant Technical Assistance Project

UNITAR

Pakistan is a member of many international agreements as mentioned earlier in this chapter. For accomplishing the implementation of these international agreements (e.g. SAICM, Stockholm Convention, Rotterdam Convention, GHS) Pakistan is collaborating with UNITAR for institutional, technical, and legal support. UNITAR is one of the seven Participating Organisations (and two observers) of the Inter-Organisation Programme for the Sound Management of Chemicals (IOMC). The United Nations Institute for Training and Research (UNITAR) has initiated a programme in 1995 to assist countries to prepare National Profiles to assess the national infrastructures. Present National Profile on Chemical Management in Pakistan has been prepared in line with the Guidance Document of the UNITAR/IOMC, in order to help the member countries develop national programmes for the sound management of chemicals on the lines envisaged in Chapter 19 of "Agenda 21". UNITAR is providing a variety of services to assist Pakistan in National profile development & priority-setting; Action plan development; National implementation plan (NIP) project assistance; Risk management decision making training; PCB elimination; Legislation and policy development, including enforcement; and other institutional strengthening (GHS, pollutant release and transfer registers). UNITAR is providing assistance to Pakistan for skills-building on many aspects of NIP development, inventory compilation, and capacity gap assessment. Beside this, UNITAR provides support to developing countries and countries with economies in transition to take measures to eliminate or reduce the release of POPs into the environment. Pakistan has launched POPs Enabling Activity Project of Pak-EPA, in collaboration with UNDP and GEF. UNITAR is providing technical assistance and international coordination for the project.

12.3. Comments/Analysis

- The overall progress in implementation of international agreements is generally good. Pakistan has incorporated Basel Convention, Montreal Protocol, and Rotterdam Convention in the environmental laws and has been implemented in full strength.
- SAICM Polite project is under implementation and this document is an outcome of it.
- Pakistan still needs to implement Globally Harmonized System of Classification and Labelling of Chemicals (GHG).
- For the implementation of International Chemical Management Programme the focal points are well defined, their duties laid down and implementations are at various stages.
- The major grey area in implementation of international agreements is the poorly managed national data system related to chemical life cycle.

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13. Resources Available and Needed for Chemicals Management

Due to the cross-sectoral nature of chemical management, several ministries, agencies and institutions in both public and private sectors need to be involved in the process of sound management of chemicals. There is lack of information due to absence of centralized database that could have played an important role to assess the extent of resources available such as professional, technical and financial resources within these ministries, agencies and institutions and also assess the resource needed for effective management of chemicals.

The ministries and other public institutions do not have enough financial, technical and human resource as well as infrastructure required for the chemical management throughout their life cycle. The technical infrastructure for recycling and recovery as well as for disposal of chemicals in the country is at a very low profile. A large number of laboratories have been accredited through National Accreditation Council of Pakistan, where the laboratory quality standards are being maintained. But still there are other laboratories which still require certification. There is also lack critical infrastructure required for monitoring. Moreover, there is a serious lack of trained technical human resource in every related department.

The effectiveness and enforcement of regulatory framework is the major drawback, with the inspections, monitoring, vigilance and public awareness. There is a need for capacity building of existing institutions with reference to implementation of policies, rules, regulations and acts. Most of the staff of ministries and related departments is overworked and there are very few financial/career incentives available to technical human resource. The lack of human resource, awareness of existing regulatory framework within implementing agencies and meagre funds available are main bottlenecks to be removed. There is also a dire need to raise the awareness of decision-makers and legislatures concerning chemical safety and encourage them to take timely action to implement sound management measures.

There are no dedicated financial resources for the chemical management in the country. In the public sector, the budgetary process in the country does not allocate resources directly to the chemical management. The budgetary provisions appear either as development expenditure for public sector industrial units or majority of it is to provide funds for import of fertilizers from abroad to bridge the gap between supply and demand. Therefore these resources are not specifically meant to manage the environmental impacts of the chemicals. For the sound management of chemicals throughout their life cycle in the country, there is a need to recognize chemical management as a separate entity and the resources should be allocated accordingly in the budgetary process.

In order to implement SAICM in Pakistan for initiatives like data management and dissemination system, inventory system, GHS, development of PRTRS, national training programme for capacity building of public, private, and non-governmental institutions, establishment of poison control and information centers, disaster management planning, solid waste management programme, awareness raising campaigns, technology transfer, review of legislation, a considerable financial resources are required. These financial requirements can be met with development of a sustainable financial system in national development planning and from international organizations like IOMC, GEF etc.

13.1. Comments/Diagnosis

- Present financial resources do not meet the requirement for sound management of chemicals in the country.
- There is no separate allocation of fund for chemical management and waste management in the national development plans.
- The funding resources can be explored for chemical management initiatives within the mechanism of international agreements and from other international organisation like IOMC and GEF.

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14. Conclusion

Implementation of SAICM in Pakistan is part of the UNITAR's initiative "National SAICM Pilot Projects" (2006-2009) which has been executed in Belarus, Mongolia, Pakistan, Panama, and Tanzania, with the financial assistance of Government of Switzerland as a contribution to SAICM Quick start Programme. As part of this programme the National chemical Profile has been prepared which will be followed by other two baseline documents, i.e. National Capacity Assessment of Pakistan for SAICM, and National Programme for Chemicals and Waste Management.

Concluding this Pilot Project, a Two Day National Chemicals Forum, on "Strategic Approach to International Chemical Management" was held on 30-31 March 2009 in Islamabad, organized by the Ministry of Environment, Pakistan. Around two hundred stakeholders from different segments of the society participated in the forum. The National Chemical Forum was an innovative participatory mechanism with the purpose of providing an open, transparent and inclusive forum for discussing issues of common interest and also new and emerging issues. The Forum provided stakeholders the opportunity to place issues on the national agenda and emphasize their special needs and concerns with respect to improving chemicals management.

At Forum, the national chemical profile prepared under the supervision of IC-Wing, Ministry of Environment was presented to the stakeholders. Recommendations were made on it and the course for work in a number of new areas was charted. In light of the adoption of the Strategic Approach to International Chemicals Management (SAICM) by the Government of Pakistan, forum considered the future role of prepared national chemical profile as a contribution to the implementation of SAICM. The Forum's recommendations and agreed action items then were integrated in the national chemical profile.

The Chemical Management Profile is the second profile after 2000 and has been prepared with extensive stakeholders' participation and UNITAR comprehensive guidelines. However due to lack of information and harmonized database at sectoral/ institutional level it was difficult to develop the profile on chemical management. However stakeholders considered it as a remarkable achievement by being first "integrated" chemical profile ever been prepared in Pakistan. Profile development was faced with many challenges related to accessing information at government agencies.

The National Chemical Profile is an important component of the national information system prepared for exchanging information regarding existing structures and implementation related to chemical management in Pakistan. The scope of the national profile covers latest facts and information available in the country, presented in 14 chapters according to UNITAR guidelines

and Supplementary Note to the UNITAR/IOMC National Profile Guidance Document. The Profile made a considerable contribution in defining further priorities in chemical management for the related government agencies. It is anticipated to provide some insights to decision-making processes to guide the country towards sustainable development.

Pakistan is not a large producer of industrial chemicals but it one of its main importer. Illegal import of chemicals had been inspected in the country but there is no possible way to identify how many of the chemicals were imported in hidden way. There is unchecked illegal traffic of banned chemicals especially pesticides through border movement especially in Balochistan. There should be some mechanism developed for control of illegal traffic, and capacity building of law enforcing agencies and custom department.

The data related to obsolete chemical stocks, chemical waste site, and contaminated areas generally does not exist or not provided by the relevant stakeholders. There are very few waste disposal/ treatment/recycling facilities in the country. The information about these facilities could not be collected due to non availability of database. Pakistan does not have proper disposal sites and methods/technologies for treating wastes, which consequently contributes to environmental pollution and health problems. Technical infrastructure for recycling and recovery as well as for disposal of chemicals in the country is at a very low profile. *There and urgent need to develop and implement a life cycle-based integrated solid waste management (ISWM) programme in the country*.

There is no sustainable data collection and monitoring system in chemical management, particularly for chemical transportation, storage and disposal. In addition comprehensive research and analysis of chemical lifecycle management is needed. Pakistan does not have developed chemical inventory system for storage, transport and disposal. The mechanism for Pollution Transfer and Released Registers (PRTRS) is absent. Globally Harmonized System for labelling and hazard identification (GHS) is also not implemented. In absence of such critical elements the capacity for data management of concerned institutions is very poor.

Problems related to chemical production, import, export and use were identified and prioritized for the environmental and health areas. The statistical data related to priority concerns of chemical management in Pakistan is very meagre. In absence of such critical information it is difficult to prioritise the issues. Database related to occupational accidents, chemical accidents, chemical poisoning, chemical injuries, drinking water contamination, food contamination, and deaths caused due to chemical accidents, chemicals transport, and disposal of waste is absent. Chemical life cycle information is very important for chemical hazards and risk assessment and mitigation measures.

Legislation related to different aspects of life cycle of chemicals, especially with reference to import, export, production, is very comprehensive. There are some lope holes related to chemical use especially in consumer products. The legislation dealing with disposal, transportation and storage

of chemicals is insufficient to absent. These areas are required to be addressed urgently. There does not exist any law directly related to transport and storage of chemicals. Explosive act is present but that too does not cover all aspect of chemical handling and safety. Legislation related to consumer chemicals including food product is not complete. This is causing serious health hazards due to uncheck use of chemicals in consumer and food products. Most of the existing legislation was not enacted for the specific purpose of chemical life cycle management in particular e.g. Carriage of Goods by Sea Act, The Motor Vehicle Act, The Railways Act, Explosive Substances Act, Mines Act, fatal Accidents Act, dose not cover all aspects of chemical management. Therefore their environmental content is ancillary. *For sound management of chemicals and waste it is necessary to revise existing legislation and policies to include chemicals life cycle management concept in it.*

Penalties for environmental offences are generally punitive rather than reformatory. The cases of adulterations in chemicals, if any are dealt with under the pure food rules. Similarly, no specialized legislation exists to control the import, production, storage, transportation, distribution, use/handling of any kind of chemicals except that the disposal/handling of toxic and hazardous substances are dealt with under the Pakistan Penal Code and the Explosives Act, 1884 and Hazardous Substances Rules, 2006. The ineffectiveness and non-enforcement of regulatory framework are the major drawbacks with the inspections, monitoring, vigilance and public awareness. There is a serious lack of trained technical human resource in every related department. This can be enhanced with the properly accredited NGOs for such purpose. Now new acts are proposed but few amendments in existing laws will be suffice. Various non regulatory mechanisms and voluntary programmes are important in reducing the risks. *To improve the implementation of policies and regulatory framework the capacity of law enforcing and monitoring agencies should be build up.*

Information provided in the national profile gives an overview of the ministerial responsibilities in managing chemicals that are considered vital for the country, namely pesticides, fertilizers, industrial chemicals and consumer products, in different phases of their life cycles. The mandates of ministries and departments are clearly defined and there does not exist any overlapping. However if there any controversy arise, the matter can be sorted out in inter-ministerial committee for management of chemicals. *There is no need for a new ministry dealing with chemical management but a strong mechanism for inter-ministerial coordination at federal as well as provincial level is required. The close coordination between provincial and federal government and among provinces themselves is also necessary.*

There is a need for capacity building of existing institutions with reference to implementation of policies, rules, regulations and acts. Effective chemical management depends on financial allocation to implement strategy and plan. There is a lack of critical infrastructure required for monitoring. There is a need for enhanced coordination between Ministries of Food, Health, Agriculture & Live stock and Environment. Participation of Ministry of Health in the registration process, particularly in case of pesticides that are used in Public Health should be enhanced. There

should be a national monitoring and surveillance system. Ministry of Health should plan for vector control management and public health pesticide management awareness programme, in collaboration of ministry of Environment. *Institutional capacities are needed to be strengthened in terms of improved availability of information, filling gaps in the understanding of chemicals related health issues, risk assessment methods, protection of vulnerable groups including children, workers and population in general, promotion of safe alternatives and needs for prevention.*

Participation of non-governmental organizations, trade associations, research institutions and community groups in policy making and policy implementation is very important for chemical management in the country. In Pakistan all these stakeholders are contributing and taking some effective measures. There is a need for a stronger coordinating and consultative mechanism among the Government, NGOs and community at grass root level. Some of the important NGOs, CSOs and trade associations are part of committees made for chemical management. These organizations are playing a vital role in implementation of international voluntary initiatives like ISO standards 9000, 14000 and OHSAS 18001. They are also cooperating in Pak-EPA's SMART programme for self monitoring and reporting.

NGOs, CSOs and public interest groups have direct linkage with local communities hence their role in dissemination of information and creating awareness among workers and local population is very effective. They arrange seminars, workshops, focal groups meetings and interact with common man. There are a large number of NGOs and CSOs working in Pakistan and many of them are involved in environmental issues.

They have right to access to environmental tribunals, labour courts and other similar institutions for any complaint related communities benefit. Although a good number of NGOs and CSOs are working for environmental issues but there is no NGO, CSO, working exclusively for chemical management in Pakistan. There role is indirect. These organizations require capacity building in chemical management exclusively. They have the capacities for policy analysis, legislation, research on alternatives, trainings, education, data collection/dissemination and raising awareness. *There a need of acreditization of these civil society organization and interest groups so that they can play an effective role in monitoring and inspections.* Once some mechanism for accredit non-governmental organization is brought in they can play better role in dealing with environmental issues.

Technical advisory committees have been formed at the national level to improve coordination among ministries for sound management of chemicals. The main advisory committee is National Technical Advisory Committee on Chemicals (NTACC). Beside this, Agricultural Pesticides Technical Advisory Sub – Committee and Steering Committee for Elimination of Adulteration in Pesticides have been formed as well. *The presence of some of very important sectors/ ministries/organizations have been neglected in the NTACC, e.g. representation of ministry for Petroleum & Natural Resources, Labour, Railway, Communication, Ports & Shipping, National Disaster Management*

Cell, Rescue 115 Service, and academia is not there. After the addition of above mentioned ministries/departments, the existing mechanism will cover nearly all important aspects of chemical life cycle which require inter-ministerial cooperation and coordination.

There are many gaps in the data management for chemicals in Pakistan. The availability and quality of available data in many areas is not satisfactory. Without reliable data the chemical management is not possible. Therefore in this regard a serious effort is required. National Health Data Management System (NHDMS) is present but the data for toxic exposures and the emergency services in relation to chemical incidents is missing. There is a dire need for capacity building of NHDMS, for improved data generation for decision making. Data related to chemical accidents, deaths caused due to industrial accidents, injuries, mitigation measures taken is nearly absent. Industries neither maintain such records nor do they report to authorities due to fear of reprisal.

The national data is maintained by the relevant departments and agencies. There is no harmonization in available data for analytical purpose. Due to behavioural problems and lengthy procedures it often takes too much time to acquire data from government agencies. Access to international database is rather easy as every thing is available on internet. *Therefore National Chemical Information Mangement and Dissemination System should be developed and integrated with National Environmental Information Management System (NIEMS), a project implemented by Ministry of Environment.*

As far as the technical infrastructure is concerned, a large number of laboratories have been established throughout the country related to chemical analysis. Where as a some of them have been accredited through National Accreditation Council of Pakistan, where the laboratory quality standards are being maintained. But still there are other laboratories which still require certification. The Standard Reference chemicals, required to compare result of analysis, are very expensive and there availability in the country is insufficient. The laboratory grade chemicals required for lab analysis are although available in the country on demand but their quality standards are required to be monitored as the practice of adulteration is common. There is lack of professionals who could work or use advanced equipments and tools. *It is therefore considered that the technical capacities of R & D institutions should be enhanced for analytical and monitoring facilities and an in-depth country wide need assessment study may be conducted to know their requirements of technical human resource, equipment and infrastructure in dealing with chemicals issues.*

Beside there is a need to incorporate chemical life cycle management concept in academic curricula at university level. Although education in chemistry, chemical engineering, environmental management and environmental studies is available in the country but there are no specific course available for chemical management. *The additional modules are required in the university curricula with reference to the life cycle chemical management, integrated waste management, waste treatment/recycling technologies, hazard/ risk assessment tools etc.*

The National Disaster Management Plan does not include chemical accidents response and management strategy in it. Disaster management in Pakistan basically revolves around natural disasters (floods, earthquake and drought) with a primary focus on rescue and relief. The disaster management related to chemical accidents is though part of the framework but still not implemented. There does not exist any mechanism for inventories of installations and transport routes at risk of chemical incidents. Fire, police and other emergency services does not have specific equipment, including protective clothing, to deal with chemical incidents and staffs are not specifically trained for such incidents. There are no chemical hazard identification systems both in the transport and industrial/commercial sectors except in very few large enterprises.

There are no dedicated chemical emergency services in the country. Only few hospitals have proper patient decontamination facilities and stocks of antidotes, medicines, and appropriate equipment for chemical emergencies. The emergency medical supply for the people and animals is very limited. There is no special training programme to train the emergency services (e.g. fire, police, civil, defence) personnel dealing with chemical incidents, as well as medical and paramedical staff in handling and treating chemically exposed persons.

Disaster management, development planning and environmental management institutions operate in isolation and integrated planning between these sectors is almost lacking. Within disaster management bodies in Pakistan, there is a dearth of knowledge and information about hazard identification, risk assessment & management, and linkages between livelihoods and disaster preparedness. Disaster management policy responses are not generally influenced by methods and tools for cost effective and sustainable interventions. *There is a dire need for development of emergency response infrastructures/ training programmes and technical human resource in the country for chemical disaster management.*

Enhancement of workers' and public awareness and knowledge is an essential element for the success of national chemical safety management, since it will enable them to safeguard their health and the environment from avoidable chemical hazards. At present, all stakeholders including government, academic, and business sectors, as well as NGOs, are involved in educating workers and public about chemical risks and the proper management through different approaches to some extent. In general these efforts seem to be inadequate. Normally the factory workers are not fully aware of risks to the environment, health, and safety from chemicals, and measures which should be taken in order to protect themselves from chronic or acute exposure to hazardous chemicals in everyday life, as well as at the time of a chemical of a chemical emergency. *Occupational Health and Safety (OHS) and Environment Health and Safety (EHS) policies, laws and programmes for factory workers and general public should be developed and implemented.*

NGOs especially are playing very important role in raising awareness and educating the public for effective participation in national environmental management initiatives (e.g. as stated in agenda 21 or the implementation of Stockholm Convention) as well as access to justice in environmental

matters. There is a dire need to Raise the awareness of decision-makers and legislatures concerning chemical safety and encourage them to take timely action to implement sound management measures. There is a need to improve the understanding of communicators and the media concerning chemical safety issues and encourage them to better communicate these issues to the public.

Pakistan is a member of numerous international programs / agreements (Agenda21, FAO, Code of Conduct, Montreal Protocol, Basel Convention, Stockholm Convention, Vienna Convention and GATT / WTO agreements, ILO Convention 155). It has good linkages with international organizations such as IFCS, IPCS, UNEP, WHO, FAO, UNIDO, ILO, WTO, ADB and UNITAR. The focal point of each of the international cooperation is usually located at the institution considered to be the prime responsible agency.

Pakistan is also participating in international/regional SAICM meetings, and is National SAICM Focal Point in the QSP Pilot Project and QSPTF Project. SAICM Polite project is under implementation and this document is an outcome of it. The overall progress in implementation of international agreements is generally good. Pakistan has incorporated Basel Convention, Montreal Protocol, and Rotterdam Convention in the environmental laws and has been implemented in full strength. Pakistan still needs to implement Globally Harmonized System of Classification and Labelling of Chemicals (GHG). *The major grey area in implementation of international agreements is the poorly managed national data system related to chemical life cycle.*

Through the international linkages, several projects have been funded and given technical assistance in the areas of chemical safety, risk reduction, environment quality monitoring system, and environmental health impact assessment. Assistance has been provided by various organizations, such as GEF, UNIDO, UNITAR, and WHO. Pakistan has long commitment to work for global chemical safety, since the establishment of IFCS in 1994. In framework of this cooperation Pakistan would have an Updated National Chemicals Profile, Capacity Assessment for the chemicals management, National Action Plan and Integrated National Chemicals and Waste Management Programme. Outcomes of the projects will have great significance for Pakistan in terms of improving chemicals and waste management, which are still overlooked in the national priorities and strategies.